IN NEW REPORTS, IMF WATCHDOG PINPOINTS POLICY MISSTEPS

What went wrong in Argentina?

During the final days of 2001, despite exceptional support from the IMF, Argentina's economy imploded: the government defaulted on its debt and abandoned the peso's parity with the U.S. dollar, which it had maintained since 1991.

For much of the 1990s, Argentina had been promoted as a success story, including by the IMF. What went wrong and what lessons can the IMF learn? This is the topic of a recent report by the Independent Evaluation Office (IEO). Needless to say, primary responsibility for policy choices lies with country authorities, and the crisis essentially resulted from the failure of Argentine policymakers to take corrective measures early enough. However, the report argues that the IMF erred by supporting for too long policies that were unable to keep the exchange rate peg viable.

Argentines protesting the freezing of their savings storm a bank entrance, 2002.

The report says that, before the crisis, IMF surveillance focused on the right issues but underestimated the buildup of dollar-denominated public debt and the implications of stalled tax and labor market reforms. In 2001, the IMF committed resources totaling $22 billion, and this support, combined with strong policy adjustments, initially had some chance of turning the situation around. Subsequent disbursements, however, supported policies that were fundamentally inadequate to resolve the crisis. Political obstacles in Argentina proved formidable, but neither did the IMF use its program relationship effectively. An earlier shift in the IMF's strategy would have mitigated some of the inevitable costs of exit. This did not occur because contingency planning and risk analysis were inadequate.

What can be done to prevent another Argentina? One recommendation is that the IMF adopt a contingency strategy from the outset of a crisis, including "stop loss rules"—criteria that would help the IMF determine if the initial strategy was working and if the approach, at some point, needed changing. Another is that the IMF's Executive Board play a stronger, more informed role in decision making. For this to happen, IMF member countries—especially the ones with the largest quotas and votes—need to uphold the role of the Board as the prime locus of decision making.

Poverty program falling short

In 1999, the IMF and the World Bank adopted a new approach to their work with low-income countries to encourage greater country ownership of policies, sharpen the focus on poverty reduction, and improve collaboration between the IMF and the Bank and among all development partners. To do this, new instruments were created: Poverty Reduction Strategy Papers (PRSPs), written by the countries concerned; the IMF's Poverty Reduction and Growth Facility (PRGF), which replaced its Enhanced Structural Adjustment Facility (ESAF) for concessional lending; and the World Bank lending instrument: Poverty Reduction Support Credits.

How has the new approach fared? A recent report by the Independent Evaluation Office (IEO) analyzes the experiences of countries with PRSPs completed by end-2002, with in-depth studies of Guinea, Mozambique, Nicaragua, Tajikistan, Tanzania, and Vietnam. It concludes that, while PRSPs have significant potential, they have not provided enough of a strategic road map for policymaking. Thus, achievements to date have fallen short of expectations. As for PRGF-supported programs, there have been changes in the right direction, but programs are still a long way from being fully embedded in a country-owned growth and poverty reduction strategy. Among other changes, the IEO calls for greater flexibility in the way PRSPs are formulated to accommodate the diversity of country political and administrative systems and constraints.

For more, see *www.imf.org/ieo*.

30 YEARS AGO IN *F&D*

"At least through the 1950s, and possibly longer, the key decisions bearing on international economic relations were made by a relatively few countries. During much of the last decade, such decisions were the result of conferences among the ten major industrial powers. As time has gone on, developing countries, too, have become full participants in the decision-making process and increasingly greater attention is being paid to the consequences for them of all international economic relations."

Margaret G. de Vries
IMF Historian, 1973–87, quoted in *F&D*, September 1974

EVENTS IN 2004

September 20, New York
Action Against Hunger and Poverty—World Leaders Meeting

October 2–3, Washington, D.C.
IMF–World Bank Annual Meetings

November 4–5, Washington, D.C.
IMF Annual Research Conference

November 18, New York
Launch of the 2005 UN Year of Microfinance

November 20–21, Santiago, Chile
Asia-Pacific Economic Cooperation Economic Summit

December 5–7, New Delhi, India
World Economic Forum, India Economic Summit

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A New Set of Measures on Capital Account Restrictions

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This paper extends the IMF's post-1996 disaggregated capital account indices back to 1983 for a representative sample of 34 countries. All the information used to construct the indices comes from IMF's Annual Report on Exchange Arrangements and Exchange Restrictions *and is widely available. It is shown that the disaggregated indices do a better job than the pre-1996 single dummy in reflecting both global trends toward capital account liberalization and country-specific liberalization episodes that occurred during the period. Given the frequency of IMF reporting procedures, the disaggregated indices still fail to accurately track temporary control programs designed to fight off crises. Moreover, the lack of systematic information on enforcement means that the indices remain de jure. Some tentative solutions to these limitations are suggested.* [JEL C82, F02, F33]

The Asian crisis of late 1997 and the subsequent collapses in Russia, Brazil, and Argentina have sparked a vigorous debate about how best to improve the current global financial architecture. In this context, recent papers by De Gregorio, Edwards, and Valdés (2000), Edison and Reinhart (2001), and Miniane and Rogers (2003) have tried to assess the effectiveness of capital controls in shaping the size and maturity of capital flows.

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One fundamental limitation in the capital controls literature has been the lack of a reliable measure of capital account openness. Capital controls can take many different forms, making it time-consuming to track all changes in restrictions within a single country. Moreover, the construction of any capital controls index raises the problem of aggregation. By how much should a measure drop if a country relaxes one of its many restrictions? Last but not least, the effectiveness of capital controls depends crucially on the government's willingness and ability to enforce them. Assuming one has qualitative evidence on enforceability, how should it be weighted in the index?

As a result of the lack of a reliable index of capital controls, many studies trying to assess the ability of capital controls to affect financial flows have followed a case-study approach.[1] Papers that have attempted to study the effects of capital controls cross-sectionally, such as Grilli and Milesi-Ferretti (1995), have commonly relied on the 0/1 IMF dummies. The pre-1996 editions of IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (*AREAER*) provide dummies for all member countries in six separate categories: bilateral payments arrangements with members and nonmembers, restrictions on payments for current account transactions, restrictions on payments for capital account transactions, import surcharges, advance import deposits, and surrender or repatriation requirements for export proceeds. Besides the obvious limitations of a dichotomic dummy, Eichengreen (2001) has pointed out that the dummy for capital account transactions accounts only for restrictions on residents, not on nonresidents.

To remedy the lack of suitable capital control measures, the IMF changed reporting procedures starting with the 1996 edition of the *AREAER*.[2] For each of the above mentioned categories, the "new" *AREAER* provides dummies in not one but several different subcategories of transactions. In the case of capital account transactions, there are 13 such subcategories, some of which are in turn further disaggregated.[3] Moreover, a distinction is now made between controls on inflows and outflows.

The new reporting procedures have prompted several authors, some within the IMF's staff, to build capital control indices based on the disaggregated *AREAER* classification (Table 1).[4] Barry Johnston and Natalia Tamirisa are rightly credited with initiating this trend (Johnston and Tamirisa, 1998; Tamirisa, 1999 and 2003). The authors build indices for 45 countries by averaging over all

(*text continues on page 280*)

[1]See Dooley (1996), Eichengreen (2001), and Edison and others (2002) for surveys of the capital controls literature.

[2]Note that the new reporting procedures covered only 52 countries in the first year and were subsequently extended to all the member countries.

[3]The following subcategories are related to capital account transactions: capital market securities, money market instruments, collective investment securities, derivatives and other instruments, commercial credits, financial credits, guarantees, sureties, and financial backup facilities; direct investment, liquidation of direct investment, real estate transactions, personal capital movements, provisions specific to commercial banks and other credit institutions; and provisions specific to institutional investors. These subcategories are in turn disaggregated in the new *AREAER*.

[4]Table 1, based on a similar table by Edison and others (2002), summarizes the main features of various indices presented in this paper.

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Table 1. Summary of Alternative Capital Control Measures

	Name	Information Source	Coverage	Coding	Advantages	Disadvantages
Based on *AREAER* information	IMF dummy	*AREAER*	All IMF member countries, 1967–1995.	0/1 dummy depending on whether country has controls on outflows.	Extensive coverage.	– Accounts only for controls on outflows. – Single dummy is too limited.
	Johnston and Tamirisa (1998)	*AREAER*	45 countries for the year 1996.	Average of all possible 0/1 dummies in the new *AREAER*.	– Discriminates between controls on inflows and outflows. – Most disaggregated among *AREAER* indices.	Coverage restricted to post-1996 period.
	Rossi (1999)	*AREAER*, others nonspecified.	15 countries, 1989–1997.	For 1997, average of 0/1 dummies over all disaggregated categories of transactions. For 1989, three possible values depending on whether 1997 value is high, intermediate, or low. In between, linear interpolation if country had gradual change, or one-time change otherwise.	Discriminates between controls on inflows and outflows.	– 1989 index can take only three values. – 1989 index depends on 1997 index. – Values in between 1989 and 1997 are computed through linear interpolation or one-time change. – Limited coverage.
	Brune and others (2001)	*AREAER*	173 countries, 1973–1999.	Sum of all 0/1 dummies over five disaggregated categories, four of which separate controls on inflows and outflows.	– Extensive coverage. – Discriminates between controls on inflows and outflows.	– Not publicly available. – Only five categories of transactions. – Pervasive lack of information in the *AREAER?*

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	Quinn (1997)	*AREAER*	63 countries, 4 years publicly available: 1958, 1973, 1982, and 1988.	For capital account receipts and payments, assigns a value between 0 and 2 in increments of 0.5 depending on severity of the restrictions.	– Takes into account the severity of restrictions. – Discriminates between inflows and outflows.	– Limited public availability. – Limited disaggregation. – Aggregation over different degrees of severity is problematic.
	Miniane (2004)	*AREAER*	34 countries, 1983–2000.	Average of all possible 0/1 dummies over 13 categories of capital account transactions.	– Substantial disaggregation. – Indicates systematically when coding is done by induction rather than through explicit information.	– Limited country coverage. – No distinction between controls on inflows and outflows.
De facto measures	Edison and Warnock (2003)	Standard and Poor's/IFC.	29 emerging economies, 1988–present.	Computes the share of domestic equities (measured in market capitalization) that are open for foreign purchase.	– Monthly measure. – Metric is very appropriate.	– Restrictions on domestic equity purchases by foreigners are a limited subset of all possible restrictions.
	Lane and Milesi-Ferretti (2001)	Authors' own calculations.	67 countries, 1970–1998.	Computes portfolio and direct investment assets and liabilities as a share of GDP.	– Measure is direct mapping of the common trade openness measure.	– Changes in asset prices can lead to changes in the measure with no corresponding change in positions and/or in de jure restrictions. – Low values in the index may be because of factors other than capital account closeness.

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possible 0/1 dummies in the new *AREAER*. Theirs may be the most disaggregated de jure measure yet, but it is limited by the fact that it covers only the post-1996 period.[5] Rossi (1999) tries to extend period coverage for a small sample of 15 countries. He builds Johnston and Tamirisa-style indices for 1997 as well as a "subjective" index for 1989. Values for intermediate years are approximated by a linear interpolation if the country experienced a gradual change in restrictions between the endpoints, or by a one-time change otherwise. Brune and others (2001) can only be praised for the coverage of their measure: 173 countries for the period 1973–1999. The index is a sum of 0/1 dummies over 5 different categories, which are in turn an aggregation of the 13 subcategories in the new *AREAER*.[6] Four of the five categories separate controls on inflows and outflows. The main drawback of Brune and others' data is that they are not publicly available. Also, early editions of the *AREAER* often lack information to code all five categories, let alone inflows and outflows separately.[7] It remains an open question how the authors tackled this problem.

Parallel to these de jure, *AREAER*-based efforts, researchers have been constructing de facto indices of capital account openness.[8] Edison and Warnock (2003) compute the ratio of total market capitalization of equities that are available for purchase by foreign investors over total market capitalization.[9] While their index has the great advantage of being both monthly and readily interpretable, restrictions on capital inflows for equity purchases are a small subset of possible capital controls. Another de facto index is based on the work of Lane and Milesi-Ferretti (2001) on countries' net external wealth and consists of the ratio of a country's portfolio and direct investment assets and liabilities over GDP. This is, in a sense, a capital account counterpart to the trade openness measures commonly used in the literature.

This paper builds on the tradition of disaggregated *AREAER*-based measures initiated by Johnston and Tamirisa. Specifically, I use text information in the *AREAER* to extend this methodology back to 1983 for a sample of 34 countries,

[5]Tamirisa (2003) also exploits the Organization for Economic Cooperation and Development's (OECD) *Code of Liberalization of Capital Movements* for years back to 1990. This publication provides information similar to what appears in the *AREAER* and is equally disaggregated. The main drawback is that the data are restricted to OECD countries.

[6]One of the categories deals with proceeds from invisible transactions, which is separate from capital transactions in the *AREAER*.

[7]As will become clear, many of the dummies in my sample did indeed lack explicit information. Given the coverage of Brune and others (2001) of very poor countries with sparse information and their separation of controls on inflows and outflows, the problem is likely to be even more pervasive in their sample.

[8]There are also measures that take advantage of de jure *AREAER* information without following the disaggregated methodology. A good example is Quinn (1997), who does not disaggregate over several subcategories of transactions but takes into account the severity of restrictions. This is an important step, but severity is a subjective concept, as is the aggregation over restrictions that vary in their degree of restrictiveness. Also, note that most of Quinn's data is not publicly available.

[9]There are some adjustments for cross-holdings of equities, state ownership, and so forth. Note that the Edison and Warnock index can be related to the measures by Bekaert and Harvey (2000) or Henry (2000), who construct dummies to date stock market liberalization periods.

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thus extending period coverage significantly. As will be shown in the paper, the disaggregated indices do a better job than the standard pre-1996 dummy at tracking both global trends towards capital account liberalization as well as country-specific liberalization episodes. Unlike the Johnston and Tamirisa data, my indices do not disaggregate beyond the 13 main subcategories of capital account transactions in the post-1996 classification. Moreover, they do not separate between controls of inflows and outflows despite a priori advantages of doing so, since it is questionable whether the pre-1996 editions of the *AREAER* contain enough text information for such a disaggregation. The indices are very transparent in this regard, as I have systematically indicated when the coding of a dummy was done through explicit information in the text and when it was the result of logical induction as explained further in the paper. To see why this is relevant information, note that a full 25 percent of the dummies for the early 1980s were coded through logical induction because of a lack of explicit indications.

The paper is organized as follows. Section I presents and justifies the choice of sample countries and explains in detail the sources of information and the methodology used in the construction of the indices. Section II compares the index with the pre-1996 IMF single dummy, as well as with the de facto measure by Lane and Milesi-Ferretti (LMF).[10] Section III addresses the limitations of the post-1996 methodology. In particular, the indices miss temporary capital control programs designed to fight off external crises, and their purely de jure nature says nothing about countries' enforcement of controls. Some possible solutions are suggested. Section IV contains concluding remarks.

I. Sample and Methodology

Countries and Period Covered

The choice of countries in the data set is somewhat arbitrary. The original impulse behind this project was to improve on the existing IMF single dummies to better study whether capital controls insulate countries from foreign monetary shocks (see Miniane and Rogers, 2003). Country selection for the indices was thus restricted by the availability of data necessary to pursue Miniane and Rogers's research. The list of countries includes Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Ecuador, Finland, France, Germany, Greece, Hong Kong, India, Italy, Japan, Korea, Luxembourg (pooled with Belgium before 1996), Malaysia, Mexico, the Netherlands, Norway, the Philippines, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. The data are annual and cover the period 1983 to 2000.[11]

[10]Comparison with the Rossi (1999) and Johnston and Tamirisa (1998) measures is not possible because of their different country/period coverage. Quinn has made only four years of data publicly available, and the Brune measure is not available at all.

[11]The paper later discusses a possible method to make the indices monthly in a relatively time-efficient manner.

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Despite the arbitrariness of the list, it is worth noting that the sample is diverse along several lines. The five main continents are represented, with particular emphasis on Europe, Asia, and the Americas. Countries range from poor (India, Ecuador) to very rich (Germany, Japan, etc.), with intermediate cases like Chile or Mexico. The whole spectrum of exchange rate arrangements is covered, from a full-blown currency board in Hong Kong, to a managed float in countries like Chile, to a free float in several OECD countries. It is hoped that this diversity somewhat compensates for the relative shortness of the list.[12]

Information Sources

There are many sources of information on capital controls, including country bulletins on laws enacted. A notable source is the *AREAER*, which not only contains the previously mentioned dummies but also contains very detailed reports on each country's exchange arrangement, administration of control, prescription of currency, regulations on import and import payments, payments for invisibles, exports and export proceeds, proceeds from invisibles, capital account transactions, and gold. For each country there is also a section called "Changes," where the date and details of any change in regulations in any of these categories is registered. As we shall see, the "Changes" section played a crucial role for the construction of my data.

I have decided to use the *AREAER* as the sole source of information. The reasons for this decision are twofold. First, the *AREAER* is the only publication that records and classifies the information in a systematic way, both throughout the years and, more importantly, throughout the countries. The same cannot be said about local publications, and this becomes an important consideration when constructing an index. Second, the *AREAER* is easy to access to verify the indices or their extension to a wider sample of countries or years.

Methodology

The "new" *AREAER* introduced in 1996 subdivides capital account transactions into 13 subcategories, to which I added a fourteenth as explained below:

- Capital market securities: shares or other securities of a participating nature, and bonds and other securities with an original maturity of more than one year.
- Money market instruments: securities with an original maturity of one year or less, such as certificates of deposit, Treasury bills, and so forth.
- Collective investment securities: share certificates or any evidence of investor interest in an institution for collective investment, such as mutual funds.
- Derivatives and other instruments: refers to operations in other negotiable instruments and nonsecuritized claims not covered under the previous three items.
- Commercial credits: covers operations directly linked to international trade transactions.
- Financial credits: credits other than commercial credits.

[12]The medium-term goal is to extend the data to a wider sample of countries.

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- Guarantees, sureties, and financial backup facilities: securities pledged for payment of a contract, such as warrants, letters of credit, and so on.
- Direct investment.
- Repatriation of profits or liquidation of direct investment.
- Real estate transactions.
- Personal capital movements: not considered in this paper because of a lack of consistent information in past editions of the *AREAER*.
- Provisions specific to commercial banks and other credit institutions: regulations that are specific to these institutions, such as monetary and prudential controls.
- Provisions specific to institutional investors: one common example is a limit on the share of the institution's portfolio that may be held in foreign assets.
- Multiple exchange rate arrangements. These are not part of the capital account subdivision of the *AREAER*, but I felt it was an important form of capital control. The *AREAER* systematically provides information on multiple exchange rate regimes.

The rules to construct dummies in each category are as follows:

- The starting point is the disaggregated dummies provided by the 1996 to 2001 editions of the *AREAER*. Note that these dummies correspond to the period 1995 to 2000, since each edition reports on restrictions existing as of December 31 of the previous year.
- Using text information in the 1995 edition, I fill as many of the 13 subcategories as possible for the year 1994. The rule is always the following: one if at least one restriction for that item, zero otherwise.
- The next step is the "Changes" sections of both the 1995 and 1996 editions. For instance, the text in the 1995 edition might not mention anything about subcategory *X* in 1994, but the "Changes" section in the 1996 edition might refer to the elimination of some restriction in *X* during 1995. If one subcategory remains blank after completing this process, I assign it the same value it had in 1995. I call this rule "filling by default."
- In the rare case that a subcategory has an NA (not available) value for 1995, I keep the NA unless the text has some explicit information for 1994.
- Once the 1994 indices have been completed, the process is repeated for 1993, 1992, . . . , back until 1983.

Other elements in the construction of the indices are worth mentioning. First, whereas the post-1996 editions clearly distinguish between controls on inflows and outflows, the text information in pre-1996 editions may not always contain information on both types of flows. My indices then account for restrictions on inflows *and* outflows without systematically discriminating between the two. This is in contrast with the pre-1996 IMF dummies, which, as noted earlier, are limited to restrictions on outflows. Second, some countries have restrictions on foreign equity participation in some sectors. The new *AREAER* will compute this as a double restriction in both capital market securities and in foreign direct investment (FDI). I believe this to be double counting and thus compute the measure as a single restriction on FDI. Since no approach is unambiguously correct, I indicate these sensitive cases with a note in the relevant cell on the spreadsheet. Third, many countries have restrictions on foreign investment in sectors related to defense and public order. Contrary to the *AREAER*,

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I chose not to consider these as capital controls. I again indicate these sensitive cases with a note.[13]

Finally, given that the *AREAER* fails to provide consistent information on whether countries enforce their restrictions, I attribute a value of 1 whenever a control exists, regardless of whether it is enforced. These are fully de jure measures. An exception happens whenever the *AREAER* indicates explicitly that a given restriction has never been used or enforced. In this case I consider it as nonexistent.[14] Once again, I report these rare situations with a note in the relevant cell.

II. Comparison with Alternative Measures

Space considerations prevent a display of the 13 dummies for all countries and all years in the paper. An average over the 13 dummies for each country and each year is presented in Table 2. Tables 3 and 4 present the IMF single dummy and the LMF measure, respectively.[15]

Global Trend Toward Capital Account Liberalization

Most economists agree that in the past two decades the world has slowly but steadily moved toward greater capital account openness. While this trend may have been deeper in developed countries, it was not necessarily restricted to them.[16] To see whether the disaggregated indices capture this trend, I computed a global index for each year by simply averaging over the individual country indices. I also computed a global index from the single dummies and the LMF measure.[17] As can be seen in Figure 1, the disaggregated global index (labeled "Miniane" index in the figure) exhibits a pronounced and continued downward trend, from a peak near 0.7 in 1983 to a low around 0.41 in 1999–2000. It is also interesting to note that the downward trend seems to accelerate from the late 1980s to early 1990s. As I show in the next subsection, this is precisely the period during which many European and some Latin American countries were opening their capital accounts.

The single-dummy and LMF measures exhibit a similar downward trend despite a reversal in the mid- to late 1990s for the former.[18] An important difference between

(text continues on page 291)

[13]These small changes explain why my disaggregated indices may differ slightly from those published by the IMF for the years 1995–2000.

[14]One such example is restrictions on FDI instituted in the United Kingdom in 1973.

[15]No dummies are provided for Switzerland before 1995. There are no data for Greece in the LMF measure, and Luxembourg is pooled with Belgium.

[16]The following section addresses specific liberalization episodes in both developing and developed countries. Also, in the words of Michel Camdessus, then the IMF's managing director: "There is also a considerable amount of work to be done at the national and international level to ensure that the preconditions for the freedom of capital movements are in place. But the big picture is clear: there is an irreversible trend toward capital account convertibility. . . ." (Camdessus, 1998).

[17]In Table 4 we can see that a higher value of the LMF measure means more openness, in contrast to the other two indices. For comparability purposes the LMF global index is computed from 1 minus the original LMF value.

[18]Even though the LMF index appears to have the most pronounced downward trend, cardinal comparisons between indices are not possible since they measure very different things.

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Table 2. Disaggregated Indices

	Argentina	Australia	Austria	Belgium	Brazil	Canada	Chile	Colombia	Denmark	Ecuador	Finland	France	Germany	Greece	Hong Kong SAR	India
1983	0.917	0.5	0.692	0.615	1	0.231	1	1	0.692	0.846	0.923	0.692	0.231	0.923	0.077	0.917
1984	0.917	0.5	0.692	0.615	1	0.231	1	1	0.615	0.769	0.923	0.692	0.308	0.923	0.077	0.917
1985	0.917	0.5	0.692	0.615	1	0.231	1	1	0.615	0.846	0.923	0.692	0.231	0.923	0.077	0.917
1986	0.917	0.5	0.692	0.615	1	0.231	1	1	0.615	0.692	0.923	0.692	0.231	0.846	0.077	0.917
1987	0.750	0.5	0.692	0.615	1	0.231	1	1	0.615	0.692	0.923	0.692	0.231	0.846	0.077	0.917
1988	0.750	0.5	0.692	0.615	1	0.231	1	1	0.154	0.615	0.923	0.538	0.231	0.846	0.077	0.917
1989	0.667	0.5	0.538	0.615	1	0.231	1	1	0.154	0.615	0.846	0.385	0.231	0.846	0.077	0.917
1990	0.500	0.5	0.538	0.538	1	0.231	1	1	0.077	0.615	0.615	0.385	0.231	0.615	0.077	0.917
1991	0.500	0.5	0.308	0.538	1	0.231	1	1	0.077	0.538	0.308	0.385	0.231	0.615	0.077	0.917
1992	0.500	0.5	0.308	0.538	1	0.231	1	1	0.077	0.538	0.231	0.385	0.231	0.538	0.077	0.917
1993	0.417	0.5	0.308	0.538	1	0.231	1	1	0.077	0.538	0.231	0.385	0.231	0.462	0.077	0.917
1994	0.417	0.5	0.308	0.538	1	0.231	1	1	0.077	0.462	0.231	0.308	0.231	0.077	0.077	0.917
1995	0.417	0.5	0.308	0.538	1	0.077	1	1	0.077	0.462	0.231	0.308	0.231	0.077	0.077	0.917
1996	0.308	0.5	0.308	0.462	1	0.077	1	0.833	0.077	0.462	0.231	0.308	0.231	0.077	0.077	0.917
1997	0.385	0.5	0.308	0.462	0.923	0.077	1	0.833	0.077	0.462	0.231	0.308	0.308	0.077	0.077	0.923
1998	0.462	0.462	0.308	0.462	0.846	0.077	1	0.846	0.231	0.462	0.231	0.231	0.231	0.077	0.231	0.923
1999	0.462	0.462	0.308	0.154	0.846	0.154	0.923	0.846	0.231	0.462	0.231	0.231	0.077	0.077	0.231	0.923
2000	0.462	0.462	0.308	0.154	0.846	0.154	0.923	0.846	0.231	0.385	0.154	0.308	0.077	0.154	0.231	0.923
Average	**0.592**	**0.494**	**0.462**	**0.513**	**0.970**	**0.188**	**0.991**	**0.956**	**0.265**	**0.581**	**0.517**	**0.440**	**0.222**	**0.500**	**0.103**	**0.918**
1983–91	0.759	0.5	0.615	0.598	1	0.231	1.000	1.000	0.402	0.692	0.812	0.573	0.239	0.821	0.077	0.917
1992–00	0.425	0.487	0.308	0.427	0.940	0.145	0.983	0.912	0.128	0.470	0.222	0.308	0.205	0.179	0.128	0.920

Note: For a given country and year, the index represents the average over the 13 different dummies.

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Table 2. *(concluded)*

	Italy	Japan	Korea	Luxembourg	Malaysia	Mexico	Netherlands	Norway	Philippines	Portugal	Singapore	S. Africa	Spain	Sweden	Switzerland	Turkey	U.K.	U.S.
1983	0.769	0.692	0.846	...	0.846	0.923	0.462	0.769	0.923	0.923	0.231	0.769	0.923	0.846	0.308	0.923	0.077	0.4615
1984	0.769	0.538	0.846	...	0.846	0.923	0.462	0.692	0.923	0.923	0.231	0.769	0.923	0.769	0.308	0.923	0.077	0.3077
1985	0.769	0.538	0.846	...	0.846	0.923	0.462	0.692	0.923	0.923	0.231	0.846	0.923	0.769	0.308	0.923	0.077	0.3077
1986	0.769	0.538	0.846	...	0.846	0.923	0.077	0.692	0.923	0.538	0.231	0.846	0.846	0.846	0.231	0.923	0.077	0.3077
1987	0.769	0.538	0.846	...	0.846	0.923	0.077	0.692	0.923	0.538	0.231	0.846	0.846	0.769	0.231	0.923	0.077	0.3077
1988	0.462	0.462	0.846	...	0.846	0.923	0.077	0.692	0.923	0.538	0.231	0.846	0.846	0.769	0.231	0.923	0.077	0.3077
1989	0.462	0.462	0.846	...	0.846	0.923	0.077	0.231	0.923	0.615	0.231	0.923	0.833	0.462	0.231	0.846	0.077	0.2308
1990	0.231	0.462	0.846	...	0.846	0.923	0.077	0.231	0.923	0.538	0.231	0.923	0.833	0.462	0.231	0.615	0.077	0.2308
1991	0.231	0.462	0.846	...	0.846	0.846	0.077	0.231	0.923	0.462	0.231	0.923	0.750	0.462	0.231	0.615	0.077	0.2308
1992	0.231	0.462	0.846	...	0.846	0.846	0.077	0.231	0.846	0.308	0.231	0.923	0.250	0.308	0.231	0.615	0.077	0.2308
1993	0.231	0.462	0.846	...	0.846	0.846	0.077	0.231	0.846	0.308	0.231	0.923	0.250	0.308	0.231	0.615	0.077	0.2308
1994	0.231	0.462	0.846	...	0.846	0.846	0.077	0.231	0.846	0.308	0.231	0.846	0.250	0.308	0.231	0.615	0.077	0.2308
1995	0.231	0.462	0.846	...	0.846	0.846	0.077	0.231	0.917	0.308	0.231	0.846	0.250	0.308	0.154	0.615	0.077	0.2308
1996	0.231	0.385	0.846	0.077	0.846	0.833	0.077	0.231	0.846	0.231	0.231	0.846	0.308	0.308	0.154	0.750	0.077	0.2308
1997	0.231	0.385	0.846	0.077	0.846	0.833	0.077	0.231	0.846	0.231	0.308	0.846	0.308	0.308	0.154	0.750	0.077	0.2308
1998	0.231	0.231	0.769	0.077	0.846	0.833	0.077	0.231	0.846	0.231	0.385	0.846	0.308	0.308	0.154	0.750	0.077	0.2308
1999	0.231	0.154	0.769	0.077	0.846	0.833	0.077	0.231	0.846	0.154	0.385	0.846	0.231	0.308	0.154	0.750	0.077	0.2308
2000	0.231	0.154	0.769	0.077	0.846	0.846	0.077	0.231	0.846	0.231	0.462	0.846	0.231	0.308	0.154	0.750	0.077	0.2308
Average	**0.406**	**0.436**	**0.833**	**0.077**	**0.846**	**0.877**	**0.141**	**0.389**	**0.889**	**0.462**	**0.265**	**0.859**	**0.562**	**0.496**	**0.218**	**0.768**	**0.077**	**0.26**
1983–91	0.581	0.521	0.846	...	0.846	0.915	0.205	0.547	0.923	0.667	0.231	0.855	0.858	0.684	0.256	0.846	0.077	0.2991
1992–00	0.231	0.350	0.821	0.077	0.846	0.840	0.077	0.231	0.854	0.256	0.299	0.863	0.265	0.308	0.179	0.690	0.077	0.2308

Source: Author's own data.

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Table 3. IMF Single-Dummy Indices

	Argentina	Australia	Austria	Belgium	Brazil	Canada	Chile	Colombia	Denmark	Ecuador	Finland	France	Germany	Greece	Hong Kong SAR	India
1983	1	1	1	0	1	0	1	1	1	0	1	1	0	1	0	1
1984	1	0	1	0	1	0	1	1	1	0	1	1	0	1	0	1
1985	1	0	1	0	1	0	1	1	1	0	1	1	0	1	0	1
1986	1	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1
1987	1	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1
1988	1	0	1	0	1	0	1	1	0	0	1	1	0	1	0	1
1989	1	0	1	0	1	0	1	1	0	0	1	1	0	1	0	1
1990	1	0	1	0	1	0	1	1	0	0	1	0	0	1	0	1
1991	1	0	0	0	1	0	1	1	0	0	0	0	0	1	0	1
1992	1	0	0	0	1	0	1	1	0	0	0	0	0	1	0	1
1993	0	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1
1994	0	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1
1995	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	1
Average	**0.769**	**0.077**	**0.615**	**0**	**1**	**0**	**1**	**1**	**0.385**	**0.308**	**0.615**	**0.538**	**0**	**1**	**0**	**1**
1983–88	1	0.167	1	0	1	0	1	1	0.833	0.333	1	1	0	1	0	1
1989–95	0.571	0	0.286	0	1	0	1	1	0	0.286	0.286	0.143	0	1	0	1

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Table 3. *(concluded)*

	Italy	Japan	Korea	Malaysia	Mexico	Netherlands	Norway	Philippines	Portugal	Singapore	S. Africa	Spain	Sweden	Switzerland	Turkey	U.K	U.S.
1983	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1984	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1985	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1986	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1987	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1988	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1989	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1990	0	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1991	0	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1992	0	0	1	0	1	0	1	1	1	0	1	1	1	0	1	0	0
1993	0	0	1	0	1	0	1	1	0	0	1	1	0	0	1	0	0
1994	0	0	1	0	1	0	1	1	0	0	1	0	0	0	1	0	0
1995	0	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0
Average	**0.538**	**0.077**	**1**	**0**	**1**	**0**	**0.923**	**1**	**0.769**	**0**	**1**	**0.846**	**0.769**	**0**	**1**	**0**	**0**
1983–88	1	0	1	0	1	0	1	1	1	0	1	1	1	...	1	0	0
1989–95	0.143	0.143	1	0	1	0	0.857	1	0.571	0	1	0.714	0.571	0	1	0	0

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Table 4. Lane and Milesi-Ferretti Indices

	Argentina	Australia	Austria	Belgium	Brazil	Canada	Chile	Colombia	Denmark	Ecuador	Finland	France	Germany	India	Italy	Japan
1983	0.027	0.217	0.061	0.183	0.099	0.330	0.084	0.078	...	0.087	...	0.119	0.111	0.005	...	0.060
1984	0.038	0.190	0.064	0.179	0.098	0.326	0.089	0.087	...	0.086	...	0.125	0.116	0.004	...	0.059
1985	0.046	0.248	0.088	0.235	0.099	0.346	0.076	0.107	...	0.063	...	0.167	0.185	0.004	...	0.076
1986	0.047	0.342	0.087	0.242	0.104	0.388	0.094	0.122	...	0.080	0.066	0.173	0.187	0.004	...	0.080
1987	0.041	0.387	0.092	0.272	0.093	0.418	0.126	0.127	...	0.084	0.081	0.182	0.163	0.006	...	0.080
1988	0.057	0.427	0.095	0.339	0.090	0.409	0.154	0.120	...	0.096	0.097	0.197	0.172	0.006	...	0.090
1989	0.047	0.438	0.136	0.538	0.090	0.417	0.183	0.127	...	0.112	0.123	0.258	0.236	0.007	0.094	0.119
1990	0.124	0.434	0.130	0.538	0.094	0.405	0.209	0.133	...	0.119	0.138	0.251	0.199	0.007	0.099	0.119
1991	0.110	0.484	0.136	0.730	0.108	0.436	0.234	0.138	0.207	0.122	0.146	0.304	0.203	0.006	0.105	0.136
1992	0.131	0.487	0.130	0.950	0.124	0.450	0.249	0.138	0.196	0.136	0.143	0.302	0.190	0.009	0.088	0.120
1993	0.166	0.593	0.162	1.418	0.134	0.533	0.292	0.149	0.236	0.171	0.236	0.370	0.235	0.016	0.122	0.123
1994	0.174	0.606	0.187	1.588	0.175	0.576	0.424	0.185	0.322	0.194	0.334	0.401	0.255	0.033	0.135	0.139
1995	0.208	0.641	0.190	1.682	0.144	0.634	0.421	0.174	0.341	0.193	0.305	0.408	0.260	0.033	0.151	0.148
1996	0.231	0.655	0.233	1.996	0.165	0.713	0.444	0.228	0.389	0.203	0.384	0.452	0.311	0.046	0.155	0.177
1997	0.265	0.640	0.293	2.654	0.195	0.783	0.511	0.260	0.513	0.242	0.505	0.538	0.414	0.064	0.198	0.197
1998	0.267	0.783	0.383	4.381	0.209	0.936	0.592	0.305	0.636	0.263	1.066	0.683	0.587	0.063	0.282	0.259
Average	**0.124**	**0.473**	**0.154**	**1.120**	**0.126**	**0.506**	**0.261**	**0.155**	**0.355**	**0.141**	**0.279**	**0.308**	**0.239**	**0.019**	**0.143**	**0.124**
1983–90	0.053	0.335	0.094	0.316	0.096	0.380	0.127	0.112	...	0.091	0.101	0.184	0.171	0.005	0.097	0.086
1991–98	0.194	0.611	0.214	1.925	0.157	0.633	0.396	0.197	0.355	0.190	0.390	0.432	0.307	0.034	0.154	0.162

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Table 4. *(concluded)*

	Korea	Malaysia	Mexico	Netherlands	Norway	Philippines	Portugal	Singapore	S. Africa	Spain	Sweden	Switzerland	Turkey	U.K.	U.S.
1983	0.017	0.278	0.092	0.654	0.097	0.033	...	0.672	0.055	0.087	0.121	0.403	0.011	0.484	0.121
1984	0.016	0.256	0.100	0.695	0.097	0.036	...	0.653	0.066	0.097	0.122	0.431	0.012	0.486	0.115
1985	0.024	0.293	0.089	0.942	0.128	0.040	...	0.819	0.086	0.130	0.174	0.724	0.013	0.643	0.132
1986	0.038	0.326	0.121	0.908	0.160	0.042	...	0.942	0.082	0.148	0.202	0.763	0.013	0.719	0.161
1987	0.042	0.301	0.134	0.906	0.175	0.047	...	1.044	0.072	0.174	0.220	0.723	0.014	0.779	0.188
1988	0.043	0.270	0.160	0.887	0.177	0.067	0.088	1.045	0.067	0.179	0.244	0.729	0.016	0.758	0.201
1989	0.043	0.287	0.147	1.111	0.230	0.072	0.136	1.089	0.066	0.216	0.327	0.925	0.024	0.914	0.221
1990	0.047	0.302	0.156	1.008	0.241	0.071	0.161	1.113	0.057	0.218	0.370	0.748	0.026	0.863	0.220
1991	0.050	0.373	0.197	1.106	0.247	0.092	0.188	1.168	0.063	0.250	0.446	0.861	0.032	0.936	0.244
1992	0.062	0.437	0.218	1.004	0.200	0.092	0.179	1.103	0.072	0.227	0.388	0.874	0.036	0.853	0.242
1993	0.090	0.477	0.279	1.169	0.244	0.115	0.213	1.358	0.087	0.292	0.577	1.199	0.045	1.098	0.275
1994	0.106	0.498	0.189	1.270	0.302	0.143	0.251	1.496	0.105	0.335	0.700	1.225	0.059	1.105	0.291
1995	0.108	0.492	0.293	1.301	0.312	0.149	0.236	1.579	0.158	0.355	0.841	1.354	0.056	1.200	0.332
1996	0.107	0.527	0.340	1.477	0.361	0.183	0.277	1.758	0.198	0.378	0.899	1.568	0.060	1.313	0.363
1997	0.088	0.460	0.379	1.780	0.418	0.136	0.379	1.837	0.301	0.451	1.119	2.265	0.081	1.301	0.396
1998	0.238	0.721	0.357	2.235	0.546	0.225	0.485	2.481	0.442	0.620	1.455	2.684	0.071	1.560	0.475
Average	**0.070**	**0.394**	**0.203**	**1.153**	**0.246**	**0.096**	**0.236**	**1.260**	**0.124**	**0.260**	**0.513**	**1.092**	**0.035**	**0.938**	**0.249**
1983–90	0.034	0.289	0.125	0.889	0.163	0.051	0.129	0.922	0.069	0.156	0.222	0.681	0.016	0.706	0.170
1991–98	0.106	0.498	0.282	1.418	0.329	0.142	0.276	1.598	0.178	0.363	0.803	1.504	0.055	1.171	0.327

Source: Author's own computations using data provided by Gian-Maria Milesi-Ferretti.
Note: The indices are computed as portfolio and direct investment assets and liabilities as a share of GDP.

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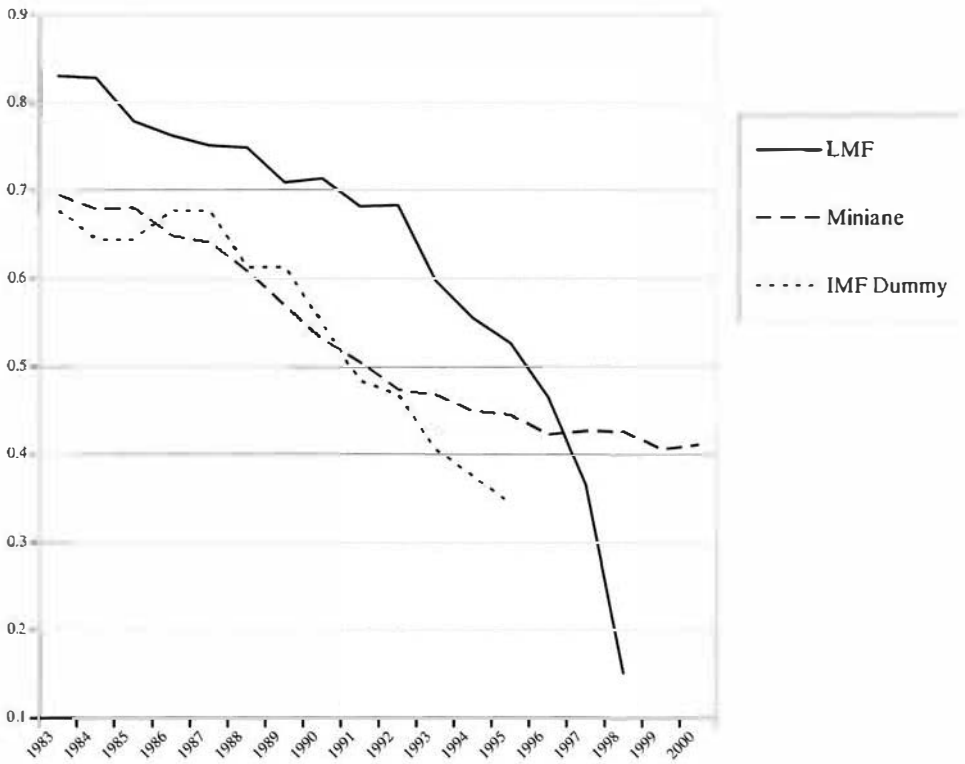
Figure 1. Evolution of Global Indices—All Countries



the three processes is that, in the case of the IMF dummy, the trend is driven solely by developed countries. To illustrate this, Figures 2 and 3 repeat the exercise in Figure 1 by constructing developing and developed countries subindices for each of the three measures.[19] All of them fall considerably throughout the period for the group of developed countries, but only the disaggregated and LMF measures fall for developing nations. The IMF dummy is flat (or increases) for much of the period and falls only in the last year of the sample.

Showing a more detailed perspective, Table 5 computes pairwise time-series correlations between global indices. While these are generally high (above 75 percent), they fall substantially to around 50 percent in the case of the developing countries' single-dummy subindex. Table 5 also computes for each of the three measures the share of countries for which the country-specific index was higher on average in the first half than in the second half of the period. That share is 100 percent, 82 percent, and 36 percent for the LMF, disaggregated, and single-dummy measures, respectively. In the case of developing countries, the IMF single dummy falls from

[19] I used two criteria for categorizing countries: whether the country is considered "emerging" and included in JP Morgan's Emerging Markets Bond Index (EMBI), and the World Bank's World Development Indicators, which classify a country as high income if annual GNP/capita exceeds US$9,076. Both criteria lead to the same selection except for South Korea, which was categorized as developing following the EMBI.

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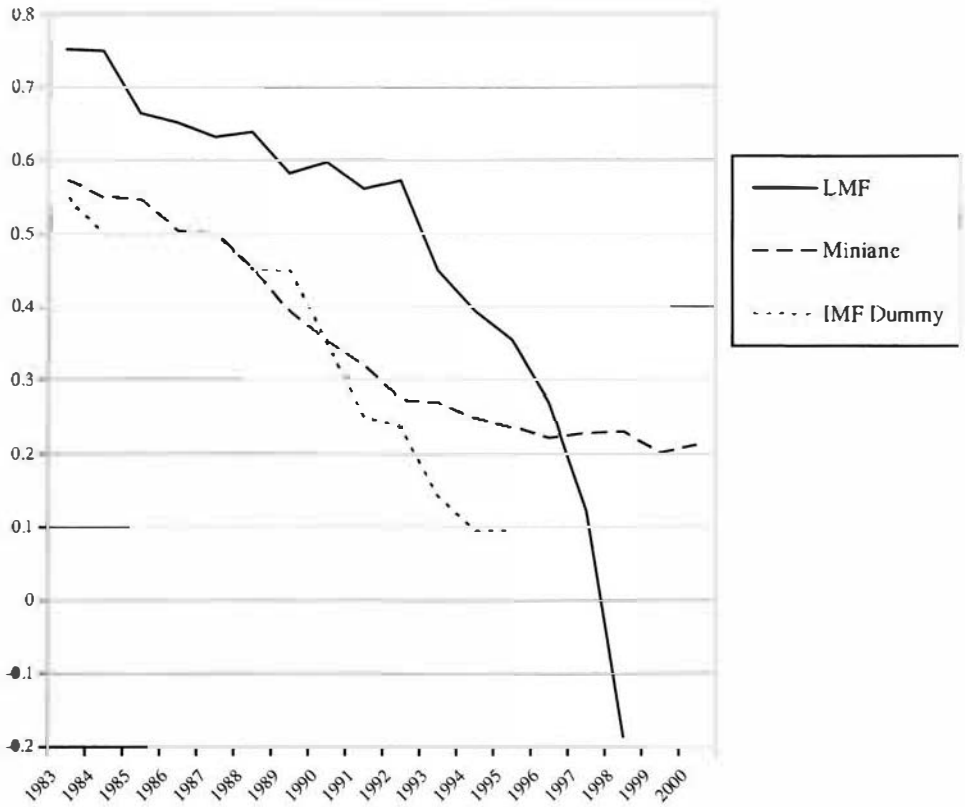
Figure 2. Evolution of Global Indices—Developed Nations



the first to the second half in just 17 percent of the countries. In short, the single dummies belie the fact that liberalization has also occurred in developing nations, albeit at a slower rate than in developed ones.

Cross-Sectional Comparisons

To compare the indices not through time but cross-sectionally, Table 6 ranks the countries from most to least open according to the three measures. For each measure, a country's index is computed as the average value across all years in the sample. Note that, in the case of the single dummies, all countries up to the United States rank as equally open, and all countries below Brazil as equally closed.[20] Reassuringly, the rankings are pretty similar across measures. If one decomposes the sample in three groups according to the IMF single dummy (above the United States, between the United States and Brazil, and below Brazil), then five out of nine countries in the top group also rank among the top nine in the two other measures.[21]

[20] See Table 3 for country details. This bundling of countries results from the crudeness of the 0/1 dummy. No two countries are tied in the disaggregated and LMF measures.

[21] Countries that appear in the same group in all three measures are marked with an asterisk in Table 6.

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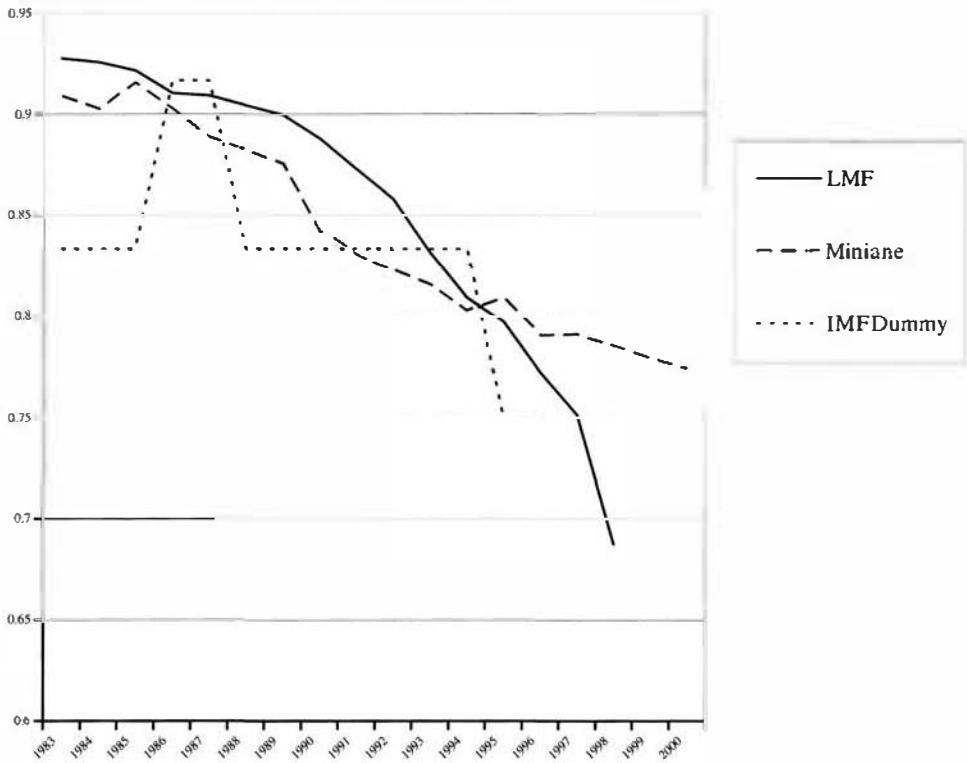
Figure 3. Evolution of Global Indices—Developing Nations



For the middle and lower groups, this number is 6 out of 13 and 6 out of 10 respectively. In other words, the measures agree pretty closely about which countries are very open or very closed and less so about the middle ground.

If one computes cross-country correlations (also in Table 6), the correlation is highest between the two *AREAER*-based measures (73 percent). This is not surprising given that they share a common source of information. Correlations remain relatively high (around 60 percent) with respect to the LMF measure. Finally, note that many countries in the single-dummy classification are shown as having no restrictions in any year (see Table 3). This is a fallacy that is refuted by the text in the *AREAER* itself. Indeed, no country in the disaggregated sample ever shows an index of zero for any year. This can be partly explained by the fact that the single dummies account only for controls on outflows as noted by Eichengreen (2001).

Country-Specific Liberalization Episodes

So far, comparisons between measures have dealt with general time-series or cross-sectional trends. The purpose of this section is to study specific liberalization episodes and show how these episodes are tracked by the disaggregated index but not by the single dummy. The LMF measure cannot be used to date liberalization

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Table 5. Summary Statistics for Global Trends

		Miniane	LMF	IMF dummy
		Correlation Between Global Indices		
	Miniane	1		
All countries	**LMF**	82%	1	
	IMF dummy	95%	94%	1
	Miniane	1		
Developed	**LMF**	77%	1	
	IMF dummy	95%	93%	1
	Miniane	1		
Developing	**LMF**	90%	1	
	IMF dummy	48%	54%	1
		Liberalization Measure		
	Miniane		82%	
All countries	**LMF**		100%	
	IMF dummy		36%	
	Miniane		86%	
Developed	**LMF**		100%	
	IMF dummy		48%	
	Miniane		75%	
Developing	**LMF**		100%	
	IMF dummy		17%	

Source: Author's own computations.

Note: The liberalization measure computes the percentage of countries in which the value for the second half of the period was lower than for the first half.

episodes, as it shows a rather smooth opening throughout the period for all countries in the sample. Table 7 summarizes the measures undertaken during 16 liberalization/tightening episodes captured by the disaggregated index.[22]

Japan's Big Bang

One of the most talked about liberalization processes has been Japan's Big Bang. Launched in late 1995, the Big Bang is a staggered but far-reaching reform of the financial sector, which policymakers hope will help the country tap more efficiently into its deep reserves of savings. The list of liberalizing measures pertaining to

(text continues on page 302)

[22] A liberalization is defined as a decline of at least 0.3 in the index. The set of liberalizations is quite robust to reasonable changes in this value. Note that some noteworthy capital control programs are not summarized in the table, as they are not captured by the index. These are mostly programs put in place in the midst of external crises. The next section addresses this issue in detail.

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Table 6. Cross-Sectional Comparison

Ranking of Countries

Miniane	LMF	IMFDummy
United Kingdom	Singapore	Belgium
Netherlands	Netherlands	Canada*
Canada	Belgium	Germany
Switzerland	Switzerland	Malaysia
Germany	United Kingdom	Netherlands*
Denmark	Sweden	Singapore*
Singapore	Canada	Switzerland*
United States	Australia	United Kingdom*
Norway	Malaysia	United States
Italy	Denmark	Australia
Japan	France	Japan
France	Finland	Ecuador
Austria	Chile	Denmark
Portugal	Spain	France*
Australia	United States	Italy*
Sweden	Norway	Finland*
Greece	Germany	Austria*
Belgium	Portugal	Sweden
Finland	Mexico	Portugal*
Spain	Colombia	Argentina
Ecuador	Austria	Spain*
Argentina	Italy	Norway
Turkey	Ecuador	Brazil*
Korea	Brazil	Chile
Malaysia	Japan	Colombia
South Africa	Argentina	Greece
Mexico	South Africa	India*
Philippines	Philippines	Korea*
India	Korea	Mexico
Colombia	Turkey	Philippines*
Brazil	India	South Africa*
Chile		Turkey*

Cross-Sectional Correlation

Miniane	LMF	IMFdummy
1		
59%	1	
73%	66%	1

Source: Author's own computations.

Notes: The ranking is from most to least open. In the IMF dummy ranking, all countries above the United States are tied with the United States, and all countries below Brazil are tied with Brazil. An asterisk denotes that the country appears in the same group in all three measures (see text for details).

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Table 7. Summary of Main Liberalization/ Tightening Episodes Captured In the Data

Country	Changes in the Index	Summary of Main Measures Undertaken
Argentina	Drops from 0.92 in 1986 to 0.31 in 1996	– September 1 and November 9, 1989: Liberalization of FDI, which can now be undertaken without prior approval and is subject to the same laws as those governing resident investors. – December 20, 1989: Foreign borrowing and lending are liberalized and proceeds from all loans are transacted in the free exchange market. – September 8, 1993: Elimination of remaining restrictions on the repatriation of capital and profits.
Austria	Drops from 0.69 in 1988 to 0.31 in 1991	– February 1, 1989: All restrictions on long-term transfers are abolished, except the issuance of securities on foreign capital markets and of foreign securities in domestic markets. – November 4, 1991: Foreign exchange controls are abolished.
Belgium	Drops from 0.46 in 1998 to 0.15 in 1999	– April 5, 1999: Most controls on transactions with securities of non-EU origin are eliminated.
Denmark	Drops from 0.69 in 1983 to 0.08 in 1990	– January 1, 1984: Purchases by residents of foreign shares listed on the stock exchange are freed, as are investments by nonresidents in futures markets. – June 11, 1985: The length of period allowed for residents' foreign exchange accounts in Danish banks is extended from one to three months. FDI of less than DKr 10 million no longer requires permission, compared with an earlier ceiling of DKr 5 million. Finally, the minimum maturity for finance loans contracted abroad is lowered from five years to one year. – October 1, 1988: Elimination of all remaining restrictions on inward and outward capital movements, excepting some real estate transactions.
Ecuador	Drops from 0.85 in 1983 to 0.39 in 2000	– April 5, 1983: Foreign loans with maturity of 18 months or more are authorized by the Central Bank. – January 9, 1984: Authorization is granted for FDI in the insurance, reinsurance, commercial banking, and financial companies sectors. Moreover, the limit on repatriation of profits is raised from 20 percent to 30 percent. – July 29, 1987: Relaxation of ceilings on nonresidents' equity participation in domestic companies despite setbacks in sectors such as communications or internal transport.

(continued)

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Table 7. *(continued)*

Country	Changes in the Index	Summary of Main Measures Undertaken
		– June 13, 1991: Limits on profit remittances are abolished. – December 29, 1993: Income tax rates on foreign companies are aligned with those of domestic companies. – January 25, 1994: Public sector foreign loan disbursements are no longer subject to commission. – January 27, 2000: Unification of reserve requirements for foreign currency-denominated and sucre-denominated accounts.
Finland	Drops from 0.92 in 1988 to 0.15 in 2000	– June 1, 1989: Regulations on FDI in the financial and insurance sectors are liberalized. – September 1, 1989: Regulations on outward and inward capital transfers are broadly liberalized. – December 19, 1989: Issues of markka-denominated bonds and shares abroad by residents or at home by nonresidents are liberalized. – September 1, 1990: Residents are allowed to purchase and sell derivative instruments on foreign shares. – January 1, 1991: Foreign exchange controls are abolished except those regarding the raising of loans abroad by private individuals. – January 1, 1992: Nonresidents are allowed to own shares in Finnish investment trusts. – January 1, 1993: Nonresidents are allowed to purchase Finnish securities and own Finnish corporations without restriction. Real estate transactions are liberalized. – January 1, 2000: Final relaxation of real estate transactions.
France	Drops from 0.69 in 1987 to 0.23 in 1998	– June 1, 1988: Restrictions on foreign borrowing are abolished. Domestic enterprises are allowed to operate foreign currency accounts in France or abroad. – September 24, 1988: EC residents are no longer required to obtain authorization for direct investments, except when there is actual acquisition of the firm. – March 9, 1989: All exchange restrictions for capital transactions by banks and enterprises are abolished. Residents of all OECD countries are allowed to issue foreign securities in France. – January 1, 1990: Firms based in OECD countries are permitted to issue securities in France. – October 31, 1998: The issuance of euro-franc securities is liberalized. – December 31, 1998: The issuance of certificates of deposits is liberalized.

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Table 7. *(continued)*

Country	Changes in the Index	Summary of Main Measures Undertaken
Greece	Drops from 0.92 in 1985 to 0.08 in 1994	– May 19, 1986: All restrictions applying to EC residents on the liquidation of investments and repatriation of profits are eliminated. – November 23, 1988: FDI laws pertaining to EC residents are liberalized. Personal capital transfers to EC residents are completely liberalized. – March 9, 1989: Exporting firms are allowed to contract foreign exchange loans of maturity less than six months. – July 1, 1989: Remaining restrictions on direct investments by EC residents are abolished. – August 20, 1990: Restrictions are lifted on the repatriation of profits, dividends, interest, amortization, or liquidated capital for non-EC residents. – June 11, 1992: Residents are allowed to acquire shares and bonds issued by non-EC entities under the same terms and conditions as those applied in EC member countries. – June 17, 1992: Credit institutions are allowed to lend to individuals permanently residing abroad. – March 23, 1993: All capital transactions with EU countries are liberalized, except credits with maturity of less than one year. – June 30, 1993: All capital transactions with non-EU countries are liberalized with some individual exceptions. – May 16, 1994: Remaining controls on short-term capital movements are abolished.
Hong Kong	Increases from 0.08 in 1997 to 0.23 in 1998	– September 7, 1998: The Hong Kong Stock Exchange reinstates the tick rule for short-selling and reviewed the list of securities eligible for short-selling. – August 31, 1998: The Hong Kong Futures Exchange imposes a special margin on open positions exceeding 10,000 contracts.
Italy	Drops from 0.77 in 1987 to 0.23 in 1990	– October 1, 1988: All but some restrictions on commercial and financial transactions by residents with nonresidents are abolished. – January 19, 1990: Residents are allowed to purchase short-term bonds and money market securities issued or payable abroad. – May 14, 1990: The remaining restrictions on banks' foreign exchange management are lifted.

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Table 7. *(continued)*

Country	Changes in the Index	Summary of Main Measures Undertaken
Japan	Drops from 0.69 in 1983 to 0.15 in 1999	– April 1, 1983: Banks are allowed to issue bonds abroad through their subsidiaries. – June 6, 1983: Liberalization of short-term euro-yen lending by Japanese banks. – April 1, 1984: Restrictions on sales of yen-denominated securities by foreign banks are eased. – August 1, 1984: Japanese brokers are allowed to enter international brokerage excepting transactions between the yen and the U.S. dollar. – July 1, 1985: Authorization is granted to foreign banks to participate in the trust banking business in Japan, including the management of corporate pension funds. – April 1, 1986: The ceiling on foreign currency-denominated assets purchases by pension funds is eased. – August 15, 1986: A similar easing is approved for the insurance sector. – May 22, 1987: Certain banks and securities companies are allowed to transact financial futures abroad for their own accounts. – January 9, 1988: Issuance of commercial paper by nonresidents is permitted. – June 16, 1989: The issuance of yen-denominated bonds abroad by nonresidents is fully liberalized. – July 30, 1990: Foreign deposit accounts are liberalized. – April 26, 1991: Reporting requirements for FDI are eased. – January 1, 1993: Further liberalization of FDI reporting requirements. With some exceptions, foreign investors are now required to report their investments only ex post. – August 2, 1995: Wide-ranging measures to promote overseas investments and loans by institutional investors, including liberalization of foreign currency-denominated loans and removal of restrictions of yen-denominated external loans. – January 1, 1998: Limits on pension funds' foreign exchange investments are removed. – April 1, 1998: The prior notice requirement for portfolio and direct investments abroad by residents is abolished. – April 1, 1998: The waiting period for loans extended to nonresidents is abolished.

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Table 7. *(continued)*

Country	Changes in the Index	Summary of Main Measures Undertaken
Netherlands	Drops from 0.46 in 1985 to 0.08 in 1986	– January 1, 1986: Restrictions on capital movements are lifted.
Norway	Drops from 0.77 in 1983 to 0.23 in 1989	– June 8, 1984: Foreign banks are allowed to operate in Norway subject to the same general conditions as Norwegian banks. – June 15, 1984: Residents are allowed to purchase (quoted) foreign shares as well as foreign bonds. – May 9, 1988: Nonresidents are allowed to purchase long-term bonds denominated in Norwegian kroner. – June 14, 1988: Residents are allowed to incur or provide commercial and financial guarantee obligations abroad. – June 30, 1989: Residents are allowed to acquire shares of foreign collective investment funds without prior authorization. – December 8, 1989: Individuals are allowed to obtain foreign currency loans abroad subject to a license. Legal entities are allowed to engage in financial leasing in foreign currencies with Norwegian banks without prior authorization and with foreign banks with liberally granted authorization.
Portugal	Drops from 0.92 in 1985 to 0.15 in 1999	– January 1, 1986: Most capital transactions with EC residents are freed. – July 18, 1986: Authorization procedures for FDI are eased. – February 2, 1989: Limits above which medium- and long-term capital transactions require approval are raised. – July 1, 1990: Investment in foreign securities listed in recognized exchanges are fully liberalized. – June 14, 1991: Restrictions on direct and real estate investment abroad by residents are eased. – September 1 and November 26, 1992: Financial credits from abroad are liberalized. – December 16, 1992: Easing of restrictions on escudo deposits for nonresidents, demand and term deposits abroad by residents, acquisition of money-market instruments by nonresidents, short-term lending in escudos to nonresidents, and foreign exchange operations between nonbank residents and nonresidents. – November 28, 1995: Remaining restrictions on FDI are lifted.

(continued)

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Table 7. *(continued)*

Country	Changes in the Index	Summary of Main Measures Undertaken
		– March 1, 1999: Abolition of controls on the introduction of foreign securities issued by residents of a non-EU member country that were not quoted on the issuer's country or on the country of issuance.
Spain	Drops from 0.92 in 1985 to 0.25 in 1992	– April 1, 1986: Easing of restrictions on residents' foreign currency-denominated financial loans. – June 27 and September 25, 1986: Authorization is no longer required for FDI in oil refining, mining, sea transport, and insurance. – November 7, 1986: Investments abroad by residents are liberalized, including portfolio investments. – March 13, 1987: Limits on foreign loans not related to merchandise trade are raised to pesetas 1.5 million. – May 25, 1987: Investments abroad are further liberalized, with real estate investments partially liberalized for the first time. – June 10, 1988: The minimum maturity period of foreign currency borrowing not subject to authorization is raised to three years. – December 19, 1988: Direct investments abroad in companies engaged in portfolio and real estate investment activities are permitted. – April 4, 1990: Remaining restrictions on purchases of foreign monetary instruments by residents are removed. – June 22, 1990: Residents are allowed to purchase securities denominated in pesetas and issued in Spain by nonresidents. – July 8, 1990: Nonresidents are allowed to freely purchase securities in Spanish exchanges. – December 27, 1990: Most remaining regulations limiting portfolio investments by residents abroad and by nonresidents in Spain are abolished. – April 16, 1991: Residents are allowed to maintain accounts in foreign currency in authorized banks. – July 1, 1992: Most remaining controls on capital transfers are abolished.
Sweden	Drops from 0.85 in 1983 to 0.31 in 1992	– February 21 and May 22, 1984: Restrictions on the maturity and amount of foreign currency borrowing are eased. – April 14 and June 24, 1986: Restrictions on direct investment abroad by residents are eased. – March 25, 1986: Residents are allowed to purchase derivative instruments on foreign securities.

(continued)

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Table 7. *(concluded)*

Country	Changes in the Index	Summary of Main Measures Undertaken
		– March 1, 1987: Further easing of restrictions of foreign borrowing. – January 9, 1989: All restrictions on the acquisition of foreign equity are abolished. – July 1, 1989: Virtually all remaining currency regulations are abolished, but transactions must still be carried through an authorized Swedish bank or broker. – January 1, 1992: Transactions need no longer be carried through authorized currency traders. – December 31, 1992: Residents are authorized to deposit funds in foreign banks.

various items in the capital account includes the following:[23] elimination of the approval period for outward direct investments in all but some sectors, elimination of the 5-3-3-2 rule for pension fund managers,[24] elimination of the waiting period to resell yen-denominated securities issued abroad to Japanese residents, elimination of the waiting period for loans extended by residents to nonresidents, and liberalization of foreign currency-denominated external loans by insurance companies.

The disaggregated index drops by 50 percent during the short period under consideration, from 0.46 in 1995 to 0.23 in 1998. Japan still had restrictions left at the end of 1998, such as ceilings on the investment in foreign currency-denominated bonds by credit cooperatives, limits on the share of their total assets insurance companies can invest in securities issued by nonresidents, and controls on inward direct investment, which prevented the index from dropping even further. Strikingly enough, the single dummy shows Japan as having no controls before the Big Bang. This is obviously erroneous in light of what has been said, even accounting for the fact that the dummy tracks only controls on outflows.

Liberalization episodes in Europe

Parallel to the creation of the European single market in goods and services, Articles 56 and 57 of the European Union Treaty call for the lifting of all restrictions on capital movements among Member States and between Member States and third countries, the latter with some qualifications. This pushed many European countries to liberalize their capital accounts in the mid- to late 1980s.

One such country is Austria. In 1989, the country started by eliminating virtually all restrictions on long-term capital transfers and pursued its efforts through

[23]A more detailed account appears in various editions of the *AREAER* publication.

[24]This rule required managers to hold 50 percent or more of assets under management in bank deposits, bonds, or loans; 30 percent or less in stocks; 30 percent or less in foreign currency-denominated assets; and 20 percent or less in real estate property.

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1991 when it abolished all remaining foreign exchange controls. Some restrictions on inward direct investment and the establishment of foreign banks remained. The disaggregated index for Austria does indeed fall from 0.69 in 1988 to 0.31 in 1991. Another interesting case is Denmark, which opted for a one-shot rather than a staggered approach, and on October 1, 1988, eliminated all restrictions on inward and outward capital transfers while maintaining some prudential measures regulating net positions in foreign currencies. Once again, the disaggregated index reflects the nature of these changes and falls from 0.62 in 1987 to 0.15 in 1988.

The single dummy also captures these liberalization events, as can be seen in Table 3, even though the values of 1 and zero overstate the level of restrictiveness before liberalization and understate it after. But for other European countries, the single dummy completely missed the liberalization episode. In the case of Greece, the dummy keeps a value of 1 up to 1995. However, Greece had previously undergone major reform starting in 1986 with the elimination of all restrictions applying to residents of other European Community (EC) countries and moving to the authorization granted in 1987 to repatriate capital and profits in respect to borrowings from non-EC countries; the full liberalization in 1989 of direct investments in EC countries by residents of Greece; the authorization granted in 1992 to acquire dividends, bonds, and shares issued in non-EC countries under the same conditions applied to EC member countries; and culminating in 1994 with the elimination of all remaining controls on short-term capital movements. Contrary to the common IMF measure, the disaggregated index in Table 2 closely tracks liberalization, falling from 0.92 in 1985 to 0.62 in 1990 to 0.08 in 1994.

Norway is another case where the disaggregated index picks up the opening of the capital account missed by the single dummy. Among other measures passed by Norway in 1989 one finds authorization granted to residents to provide commercial and financial guarantee obligations abroad with no permission from the Bank of Norway, authorization granted to nonresidents to issue bonds denominated in kroner in Norway subject to a license, and authorization for nonresidents to purchase bonds with a maturity of at least one year. While the disaggregated index falls from 0.69 in 1988 to 0.23 in 1989, the *AREAER* dummy remains equal to 1 up until the introduction of disaggregated indices.

Liberalization episodes in Latin America

Argentina is a well-known case of liberalization in an emerging economy. Starting with Carlos Menem's rise to power in 1989, Argentina embarked on a far-reaching liberalization of the economy, including an opening of the capital account.[25] Among the measures undertaken one can find the liberalization of international credit operations in December of 1989, or the liberalization of FDI contained in the Economic Emergency Law of September 1989. Indeed, the disaggregated measure falls from 0.75 in 1988 to 0.31 in 1996. The latter figure can be explained by the fact that Argentina left some restrictions in place: for example, mutual funds could not

[25] Argentina has reversed this trend in the past couple of years following the country's financial collapse. Reversal is not captured in the indices since it occurred after the end of the sample period.

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invest more than 25 percent of assets under management in non-Mercosur securities, and issues of derivatives by nonresidents required approval above and beyond that requested from domestic residents. Liberalization was also tracked by the IMF dummy, with one major caveat: the change in the dummy was recorded in 1993, a full four years after the main package of liberalization measures. And once again, the zero value of the index post-1993 overstates the degree of capital account openness.

Another Latin American country to have experienced an opening of its capital account between 1983 and 2000—albeit more gradually and with some setbacks—is Ecuador. Opening measures spread across many years have included a relaxation of foreign equity participation ceilings in July 1987 and the elimination of limits on profit remittances in June 1991. As of December 2000, Ecuador still retained controls on the issue of money market and collective investment instruments by nonresidents and required approval from the Central Bank for all foreign loans. When one looks at the disaggregated measure, it falls gradually from 0.85 in 1983 to 0.39 in 2000, with an increase in 1985. Puzzlingly enough, the IMF dummy has a value of zero in 1983–85, not at all consistent with the text information in the *AREAER,* which does signal substantial controls on inflows and outflows. After increasing in 1986 (consistent with the change in 1985 in the disaggregated measure), the IMF dummy falls back to zero in 1988. This is once again contradicted by the text information. Finally, the single dummy becomes 1 in 1993 at a time of partial easing of restrictions. The value of the IMF dummy does not seem close to representing actual policies in the country.

III. Limitations of the Measure (and Some Possible Solutions)

This section addresses some of the obvious and not so obvious limitations of the disaggregated measure and proposes tentative solutions. Arguably, the single greatest liability of the measure is that it does not discriminate between controls on inflows and outflows; the reasons for this choice on a pre-1996 *AREAER*-based measure have already been discussed.[26]

Missing on Liberalization and Tightening Episodes

A limitation of the data is that they miss important capital control programs instituted in the midst of external crises. Indeed, part of the reason why capital controls are back in vogue is the perception that Malaysia escaped a harsher fate during the recent Asian crisis by imposing a one-year holding period for nonresidents' portfolio capital in September 1998.[27] As can be seen in Table 2, these controls are not "recorded" in the indices. Similarly, the indices do not show any evidence of the

[26]Quinn's measure does not discriminate between the two types of flow either. Edison and Warnock (2003) measure only controls on inflows. One could, in principle, separate assets and liabilities in the Lane and Milesi-Ferretti measure, but the fact that one side is greater than the other may not mean different degrees of restrictiveness for inflows and for outflows.

[27]See Edison and Reinhart (2001) and Kaplan and Rodrik (2001) for formal analyses of Malaysia's experience.

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temporary control programs instituted in Portugal, Spain, or Sweden at the height of the 1992 exchange rate mechanism (ERM) crisis, such as Spain's imposition of a compulsory one-year, non-interest-bearing deposit to be held at the Central Bank.[28] There are two main reasons why the data fail to capture these episodes. First, the *AREAER* shows restrictions in place as of December 31 of each year: measures that are put in place for some months and then removed may not get factored into the index. Second, controls that are still in place as of December 31 of the year will not affect the index if they come on top of other existing restrictions in that subcategory. This is what happened in the case of Malaysia, a country that already had restrictions in all capital markets' subcategories.

Besides emergency tightenings, the data also miss some noteworthy liberalizations. For instance, Brazil's index value remains equal to 1 up until 1997, when it drops slightly to 0.92. But Brazil underwent an opening of its capital account before 1997. Starting in 1992, the country liberalized the participation by foreigners in the privatization process, nonfinancial residents were permitted to invest up to US$1 million abroad without prior approval, corporations established in Brazil were authorized to issue and place abroad securities that could be converted into equity, prepayment of foreign borrowing and import financing was permitted, and the minimum period for the renewal and extension of foreign credit was lowered. But why didn't the index fall? Consider the possibility to invest up to US$1 million abroad with no approval. This is certainly less restrictive than the previous situation where every single investment required authorization, but absence of full liberalization means the FDI category will still show a value of 1. The same happens with the lowering of the minimum period for renewal of foreign credit.

One possible solution to the problems recorded in this subsection would be to follow Cardoso and Goldfajn's (1997) methodology. They track every single capital control enacted in Brazil from 1983 to 1995. Every time a new control is put in place or an existing one becomes more stringent, their index goes up by 1, and the opposite happens following the relaxation or abandonment of existing measures. However, such a time-consuming undertaking may not be realistic for a sample of 34 countries.

Enforcement of Controls

Besides the severity of controls, the question remains as to what extent the controls are effectively enforced. In this respect, de facto measures such as Edison and Warnock's and Lane and Milesi-Ferretti's provide only partial answers. An alternative solution would be to weight the disaggregated indices by indirect proxies for enforcement, such as Transparency International's Corruption Perceptions Index. Even though some relatively uncorrupted countries may lack the means to enforce controls effectively, corruption indices are likely to be a good proxy for enforceability. The Transparency International measures are available for all the countries

[28]See Fielecke (1994) and Edison and Reinhart (2001) for an analysis of controls implemented during the ERM crisis.

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in the sample. They cover only the past eight years, but this is a small price to pay given that corruption is a relatively slow-changing phenomenon.

Data Frequency

There is no denying that a monthly rather than an annual index could be of great use for many research projects. It is theoretically possible to construct a monthly index from the yearly *AREAER* data in a reasonably time-efficient manner. Take for a given country its yearly index. If there is no change between years t and $(t + 1)$, then all months of $(t + 1)$ stay equal to the yearly $(t + 1)$ index. Whenever there is change from year to year, one can identify the subcategories where the change occurred from the disaggregated information in the yearly index. The "Changes" section of the year $(t + 1)$ edition of the *AREAER* will then specify the exact date of change in those subcategories. It remains to be seen whether one would obtain enough monthly variance for such an index to be of any use.

Are All Categories Relevant Throughout the Sample Period?

There is a risk that some of the post-1996 subcategories rendered important through financial innovation may have been irrelevant at the beginning of the sample period. This problem can be measured indirectly by computing the proportion of times that a given subcategory was filled by default rather than through explicit information. Indeed, for the year 1983, the categories "collective investment securities" and "derivatives and other instruments" were filled by default in 50 percent of the cases, versus 25 percent for all categories combined. There is no easy answer to this problem, but the usefulness of explicitly stating how a dummy was coded again becomes apparent. A researcher using the data can easily weight each subcategory by the proportion of countries in which the subcategory was coded through explicit information. This would indeed have assigned the smallest weight to the two categories mentioned above. Alternatively, one could exclude a subcategory if it was filled by default in more than x percent of the cases and examine the robustness of the final indices to reasonable changes in x.

IV. Conclusion

This paper adds to the growing list of capital control measures that build on the post-1996 disaggregated methodology. The indices, nominally 13 times more precise than the common IMF single dummy, do a better job at tracking both world trends toward greater capital account openness and specific liberalization episodes that occurred in various countries under study. The indices could be improved in several directions: greater country/year coverage, greater disaggregation, better consideration of the severity of the controls or their actual enforcement, better tracking of temporary capital control measures to fight speculative attacks, and more careful distinction between controls on inflows and outflows. As they stand, they are an important step forward relative to the previous IMF measures. They complement without substituting other indices recently published in the literature,

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sometimes through better country coverage and sometimes through greater disaggregation or explicit consideration of missing information. Together with these other indicators they can be of considerable help for researchers trying to quantify the costs and benefits of capital controls, a major issue in the current reformulation of the global financial architecture.

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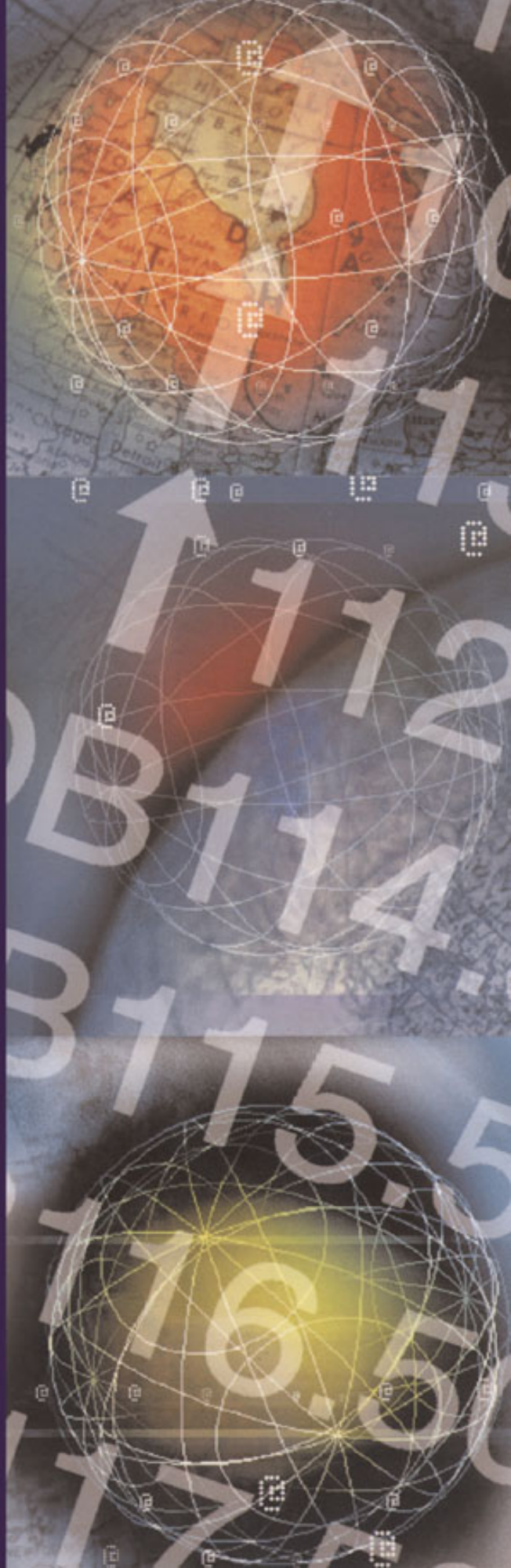

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List of Abbreviations

1993 SNA	*System of National Accounts 1993*
AEG	Advisory Expert Group for the review of the *1993 SNA*
AO	*Annotated Outline* for the revision of *BPM5*
BIS	Bank for International Settlements
BD	*OECD Benchmark Definition of Foreign Direct Investment*
BOPSY	*Balance of Payments Statistics Yearbook*
BOPTEG	Balance of Payments Technical Expert Group
BPM5	*Balance of Payments Manual*, fifth edition
CCH	Central clearing house
CDIS	Coordinated Direct Investment Survey
c.i.f.	Cost including insurance and freight
CPIS	Coordinated Portfolio Investment Survey
CSDB	ECB's central securities database
CUTEG	Currency Union Technical Expert Group
DITEG	Direct Investment Technical Expert Group
DQAF	Data Quality Assessment Framework
ECB	European Central Bank
ESA95	*European System of Accounts 1995* (Eurostat)
Esteva Report	*Final Report of the Working Party on the Statistical Discrepancy in World Current Account Balances*
EU	European Union
Eurostat	Statistical Office of the European Communities
f.o.b.	Free on board
Godeaux Report	*Final Report of the Working Party on the Measurement of International Capital Flows*
GFSR	*Global Financial Stability Report*
GSDB	Global securities database
IAS	International Accounting Standard
IATFFS	Inter-Agency Task Force on Finance Statistics
IIP	International investment position
ISWGNA	Inter-Secretariat Working Group on National Accounts
ITRS	International transactions reporting system
LCFAR	Liabilities constituting foreign authorities' reserves
MNC	Multinational corporation
NAICS	North American Industrial Classification System
NDFs	Nondeliverable forwards
OECD	Organisation for Economic Co-operation and Development
OTC	Over the counter
SEIFiC	Small economy with international financial center
SEFER	Survey of Securities Held as Foreign Exchange Reserves
SIC	Standard Industrial Classification
SIMSDI	IMF-OECD Survey of the Implementation of Methodological Standards for Direct Investment
SME	Small or medium-sized enterprise

SPEs	Special purpose entities
SSIO	Survey of Securities held by International Organizations
TFI	OECD Task Force on Insurance
TF-QA	ECB-Eurostat Task Force on Data Quality
TGRT	Technical Group on Reverse Transactions
TGTPH	Technical Group on Third Party Holdings
TPH	Third party holdings
UBO	Ultimate beneficial owner
WIIS	OECD Workshop on International Investment Statistics

Annual Report of the IMF Committee on Balance of Payments Statistics

I. Introduction

The IMF Committee on Balance of Payments Statistics was established in 1992 for the following purposes: to oversee the implementation of the recommendations contained in the reports of two IMF working parties that investigated the principal sources of discrepancy in global balance of payments statistics published by the IMF;[1] to advise the IMF on methodological and compilation issues in the context of balance of payments and international investment position statistics; and to foster greater coordination of data collection among countries. The membership of the Committee as of December 31, 2003 and its terms of reference are presented in Appendices 1 and 2, respectively. In 2003, the Committee held its sixteenth meeting in December, at the IMF headquarters in Washington, D.C.

This report is structured as follows: Section II presents the Executive Summary. Section III provides an overview of statistical discrepancies in the global balance of payments statistics published by the IMF's Statistics Department. Section IV discusses the Committee's work program during 2003, and Section V concludes with a discussion of the issues that the Committee plans to address in the coming year.

II. Executive Summary

Recent Trends in Global Balance of Payments Statistics

Balance of payments statistics reported to the IMF's Statistics Department and published in the 2003 *Balance of Payments Statistics Yearbook* (*BOPSY*) continue to show large and variable discrepancies on the global summations of current, capital, and financial account transactions. Discrepancies in 2002 fell somewhat for both the current and financial accounts, but several of the components recorded larger imbalances. The provision of revised data resulted in the widening of the discrepancies for several earlier years. For *goods*, although the imbalance for 2002 rose from the previous two years, there was a noticeable improving trend. Total credits and debits in *services* were almost in balance in 2002, but there were large offsetting imbalances in several of the components. The imbalance on income remained high. In the *financial account*, the imbalance in *direct investment* for 2002 fell sharply, but, for *portfolio investment*, the difference between measured assets and liabilities deteriorated substantially.

Data Quality

Since the financial crises of the 1990s, policymakers and other users of statistics are giving increased attention to the availability of comprehensive, timely, and reliable financial and economic data. In view of the IMF's responsibility for economic surveillance of its members' economic policies, and to assist users of the data to evaluate data quality, the IMF's Statistics Department developed the Data Quality Assessment Framework (DQAF) in 2001 for macroeconomic statistics. The DQAF provides a systematic approach and a common language for the assessment of data quality.

Following a request by the IMF's Executive Board in 2002 that IMF staff continue to elucidate good practice for data revisions policy, the Committee considered several papers on revision policies and practices at its meeting in 2003. Included in these were papers from the Statistics Department, Hong Kong SAR, Chile, India, the European Central Bank (ECB), and the Statistical Office of the European Communities (Eurostat.) In addition, the Committee received a joint paper by Eurostat and IMF staff, comparing the IMF's DQAF with Eurostat's quality definition. These papers were well received, and the Committee endorsed proposals for further work on data quality, including efforts to describe international best practices in dealing with revisions.

Revision to BPM5

The Committee considered the draft *Annotated Outline* (*AO*) for the revision of the *Balance of Payments Manual*, fifth edition (*BPM5*), which was developed by IMF staff. To reflect the Committee's comments, the draft will

[1] *Final Report of the Working Party on the Statistical Discrepancy in World Current Account Balances* (the so-called *Esteva Report*), IMF, Washington, D.C., 1987, and *Final Report of the Working Party on the Measurement of International Capital Flows* (the so-called *Godeaux Report*), IMF, Washington, D.C., 1992.

be revised and a final version of the *AO* sent to all balance of payments compilers and other interested parties in April 2004. Comments will be sought by July 2004.

The Committee also considered the IMF's proposed process for the preparation and release of the new manual by 2008. To that end, three technical expert groups were set up (one for issues relating to direct investment, one for issues relating to currency unions, and one for issues regarding balance of payments and the international investment position (IIP) more generally) to advise the Committee and subsequently the IMF's Statistics Department on input to the new balance of payments manual. These groups will draw from the specialized knowledge in these various areas of experts in all parts of the world. In addition, the Committee took note of the need to coordinate the rewriting of the new manual with the reviews of the *System of National Accounts 1993* (*1993 SNA*) and the *OECD Benchmark Definition of Foreign Direct Investment* (third edition (*BD3*)), which are being conducted concurrently to the revision to *BPM5*.

Portfolio Investment

The Committee was brought up to date on the 2001 and 2002 Coordinated Portfolio Investment Surveys (CPIS), as well as work being undertaken to enhance the collection and compilation of CPIS data. These have wider application to other elements in the balance of payments and the IIP, as well as other parts of the suite of macroeconomic statistics.

The Committee was informed that the results of the 2002 CPIS, and revised data for the 2001 CPIS, would be available in early 2004. The results were to be placed on the IMF's website (http://www.imf.org). Efforts by IMF staff continued to increase the participation and coverage of the survey. The Committee also endorsed a proposal by IMF staff to undertake, resources permitting, a survey of the methodology used by those that produce positions data on portfolio investment liabilities.

The Committee was advised that work continues to assess the possibility of collecting data on third party holdings (TPH), that is, holdings of securities by nonresident custodians. A meeting to discuss these issues, and to take them forward, is to be hosted by the ECB in May 2004. Jurisdictions with major custodial business will be invited to attend. Obtaining information on TPH has the potential to fill a major gap in the present coverage of the CPIS.

The ECB's central securities database (CSDB) has a potentially important role in improving the quality of portfolio investment statistics (flows, stocks, and income) by providing relevant information on individual issues of equity and debt securities. The database would not just assist the compilation of the balance of payments and IIP statistics, but would also represent a valuable input for other macroeconomic statistics, such as monetary and financial statistics and external debt. The ECB anticipates that the database will be operational toward the end of 2004 or early in 2005. Further enhancements are already planned thereafter.

The Committee also received the results of a survey exploring the information available on reverse transactions (repurchase agreements and securities lending without cash collateral) in the management information systems of financial institutions in nine countries. The information will provide important input for the CPIS and for the revised balance of payments manual.

International Financial Statistics

The Committee was informed that the Bank for International Settlements (BIS) continues to increase the number of participating central banks in its international banking statistics: by the end of 2003, Greece and Mexico began participating in the statistics on international bank activity on a locational basis and Australia, Greece, and Mexico joined the statistics on country risk exposures on a consolidated basis (Australia already participated in the locational statistics). It was noted that data quality has also improved, with data on loans, securities, and other assets and liabilities being provided separately in the locational statistics by nearly all participants, and information on currency and country breakdowns in the locational statistics and on an ultimate risk basis in the consolidated statistics having generally improved.

For *data on foreign exchange and derivatives markets*, the Committee was advised that a record 52 countries will participate in the next BIS triennial survey, which will be conducted in April 2004 covering turnover data on foreign exchange and over-the-counter (OTC) derivatives market activity on a locational basis and at end-June 2004 covering positions outstanding on OTC derivatives market activity on a consolidated basis. For the April part of the survey, nondeliverable forwards (NDFs) will be identified separately. The BIS also collects and publishes statistics on most OTC financial derivatives on a semiannual basis, covering stock data on notional and market values from approximately 60 major dealers in the Group of Ten countries on a consolidated basis. In addition, the BIS compiles and disseminates quarterly data on turnover and amounts outstanding for exchange-traded derivatives. The Committee was told that an increase in the frequency of the semiannual OTC derivatives statistics was not possible for the time being.

Direct Investment

The Committee's views were sought on a proposal that the IMF's Statistics Department had taken to the IMF's Executive Board to undertake a feasibility study as a precursor to a possible internationally coordinated survey of direct investment petitions, that is, a Coordinated Direct Investment Survey (CDIS). Such a survey would build on the successes of the CPIS and the IMF-OECD Survey on the Implementation of the Methodological Standards for Direct Investment (SIMSDI). The Committee was advised that the proposal is for the feasibility study to be conducted in 2004 and 2005, and, if the results indicate that a full survey can be undertaken, that it would be conducted in 2007 at the earliest. The proposal, at the minimum, is for benchmark positions data, broken down by counterpart jurisdiction. The Committee gave in-principle support to the proposal. The Committee was also advised that the IMF and OECD were launching another SIMSDI in late 2003.

Income

Following on discussions on income at its meeting in 2002, the Committee received several papers on the subject at its 2003 meeting. These papers raised questions about the current treatment of reinvested earnings in balance of payments statistics; inconsistent treatment of the income between and among different types of equity investment; the treatment of employee stock options; the outcome of work by the ECB comparing credits and debits on income between partner countries in the European Union (EU); and how the United Kingdom presents to users information on income in the balance of payments.

These papers provoked considerable interest and discussion. The Committee agreed that many of the issues would need to be discussed within the context of the new balance of payments manual.

Uses of Balance of Payments and International Investment Position Statistics

The Committee welcomed a paper by Uganda on the uses of balance of payments and IIP statistics for highly indebted sub-Saharan African countries, using Uganda as an example. The paper gave a wide-ranging description of the value of these data. It noted the role of the link between the balance of payments and the national accounts, in particular, with regard to public versus private sector saving, and how, initially, any shortfall in saving is made up by borrowing from the rest of the world. In the short term, this will lead to an appreciation of the domestic currency, but as debt levels rise, this appreciation will reverse itself. The paper noted that the form of financial inflows was important, indicating that direct investment in entities involved in the production of traded commodities was likely to be the most sustainable. The paper also drew the link between balance of payments and monetary policy, especially when associated with a sharp increase in government borrowing that has been financed from abroad. This development prompts the need to sterilize this increase in liquidity domestically with sales of treasury bills to nonresidents. However, the paper notes that such a policy is not sustainable in the longer term.

Other Issues

The Committee also received papers on other issues, with potential far-reaching implications for the compilation of balance of payments and IIP statistics, and the development of the new manual, on the links between international accounting standards and macroeconomic statistics; the use of an Internet survey for estimates of business travel in France; and security measures for Internet reporting in Japan.

III. Recent Trends in Global Balance of Payments Statistics

The discrepancies in the global summations of current and financial account transactions for 2002, as published in the 2003 *BOPSY*, narrowed overall, but significant underlying discrepancies persisted. In principle, the combined surpluses and deficits arising from the current, capital, and financial account transactions for all countries and international organizations should equal zero, as the credits of one country or international organization are the debits of another. In practice, however, the data do not offset each other. Statistical discrepancies occur in the global statistics, reflecting the incomplete coverage of transactions, and the inaccurate and inconsistent recording of cross-border transactions by countries resulting from, for example, differences in classification and practices, or in the time of recording transactions. Further, many errors and omissions offset or cancel each other and are therefore not reflected in the data on global discrepancies shown in Tables 1 and 2 of this report.

Global Current Account

The global discrepancy for the current account declined in 2002, but this overall decline masked increases in the discrepancies of several subcomponents of the current account. The discrepancy on *goods*, at its highest level after 1999, is a positive discrepancy (more exports than

Table 1. Global Balances on Current Account, 1996–2002
(In billions of U.S. dollars)

	1996	1997	1998	1999	2000	2001	2002	Average Imbalance 1996–2002
Current account balance	–32.3	29.9	–48.7	–80.0	–102.7	–117.8	–76.0	–61.1
Goods balance	98.3	114.0	70.5	45.7	16.3	1.7	44.1	55.8
Credit	5,348.2	5,553.9	5,443.8	5,646.8	6,369.1	6,106.8	6,369.3	...
Debit	5,249.9	5,439.9	5,373.3	5,601.1	6,352.8	6,105.1	6,325.2	...
Services balance	–20.0	–5.2	–0.5	–13.1	–11.2	–21.2	–8.7	–11.4
Credit	1,315.4	1,363.4	1,385.9	1,431.8	1,517.4	1,518.9	1,622.4	...
Debit	1,335.4	1,368.7	1,386.4	1,444.9	1,528.7	1,540.1	1,631.2	...
Transportation	–55.7	–55.7	–52.2	–50.3	–62.1	–53.9	–49.4	–54.2
Travel	31.8	34.5	28.4	27.3	31.7	37.4	34.4	32.2
Government services	–10.3	–10.9	–8.2	–17.7	–24.6	–22.6	–28.1	–17.5
Other services	14.1	26.9	31.5	27.5	43.9	17.9	34.3	28.0
Income balance	–80.2	–53.6	–87.3	–81.0	–65.3	–73.3	–91.0	–76.0
Credit	1,049.1	1,112.0	1,203.3	1,248.6	1,431.1	1,345.5	1,263.3	...
Debit	1,129.3	1,165.6	1,290.6	1,329.7	1,496.3	1,418.8	1,354.3	...
Compensation of employees	–7.5	1.8	–0.2	0.1	–1.0	–2.7	–2.7	–1.8
Reinvested earnings	67.9	58.1	37.2	72.7	67.1	90.5	78.2	67.4
Other direct investment income	–14.8	0.0	–2.2	–37.3	–34.6	–35.9	–26.3	–21.6
Portfolio and other investment income	–125.7	–113.5	–122.1	–116.5	–96.6	–125.2	–140.2	–120.0
Current transfers balance	–30.4	–25.2	–31.5	–31.6	–42.5	–24.9	–20.4	–29.5
Credit	366.0	355.4	369.1	377.5	363.3	380.0	421.2	...
Debit	396.4	380.6	400.5	409.0	405.8	404.9	441.6	...
Memorandum items								
Current account balance as percent of gross current account transactions	0.2	0.2	0.3	0.5	0.5	0.6	0.4	...
Goods balance as percent of gross goods transactions	0.9	1.0	0.7	0.4	0.1	0.0	0.3	...
Services balance as percent of gross services transactions	0.8	0.2	0.0	0.5	0.4	0.7	0.3	...
Income balance as percent of gross income transactions	3.7	2.4	3.5	3.1	2.2	2.7	3.5	...
Current transfers balance as percent of gross current transfer transactions	4.0	3.4	4.1	4.0	5.5	3.2	2.4	...

Source: IMF, *Balance of Payments Statistics Yearbook*, Vol. 54, Part 2, 2003.

imports) and as such offsets negative discrepancies (more payments than receipts) in *services*, *income*, and *current transfers*. Exports and imports of goods recovered from a slowdown in world trade in 2001. The 2002 levels of trade in goods were almost identical to the 2000 levels. The discrepancy in income was at its highest in the seven years under review, reflecting the increased discrepancy for portfolio and other investment income. On the other hand, the discrepancy for direct investment income declined for both reinvested earnings—which reached a record high in 2001—and other direct investment income.

Global Capital and Financial Accounts

The widening discrepancy in the capital account, which more than doubled in 2002, was largely due to an increase in debits (resource outflows) in capital transfers.

The discrepancy in the financial account, like that of the current account, declined by a third in 2002. Once again, this decline masked offsetting movements in the subcomponents' discrepancies. After two years of large discrepancies, the discrepancy of *direct investment* decreased to pre-2000 levels. Increased awareness of methodology and practices for measuring foreign direct

Table 2. Global Balances on Capital and Financial Accounts, 1996–2002[1]
(In billions of U.S. dollars)

	1996	1997	1998	1999	2000	2001	2002	Average Imbalance 1996–2002
Capital account balance	–0.2	2.2	–15.8	–17.6	13.8	–4.7	–11.5	–4.8
Credit	55.9	50.6	44.3	48.3	71.5	51.9	58.0	. . .
Debit	56.0	48.3	60.1	65.9	57.8	56.6	69.5	. . .
Financial account balance	111.0	91.1	–9.1	42.3	214.5	171.5	112.8	104.9
Direct investment	6.5	23.5	12.0	15.6	158.2	95.2	16.0	46.7
Abroad	–368.9	–442.8	–682.1	–1,077.8	–1,351.0	–702.6	–634.1	. . .
In the reporting economy	375.4	466.3	694.1	1,093.4	1,509.2	797.8	650.0	. . .
Portfolio investment	118.0	203.7	–202.0	148.2	72.7	32.9	210.3	83.4
Assets	–649.6	–740.1	–1,046.2	–1,362.7	–1,292.7	–1,200.9	–655.2	. . .
Liabilities excluding LCFAR[2]	767.6	943.8	844.2	1,510.9	1,365.4	1,233.8	865.4	. . .
Financial derivatives	–10.1	–6.6	–13.0	14.8	–9.1	6.4	2.9	–2.1
Assets	140.1	148.1	186.9	195.4	228.7	234.6	194.2	. . .
Liabilities	–150.2	–154.7	–199.8	–180.6	–237.8	–228.2	–191.3	. . .
Other investment	29.7	–83.3	205.8	–122.4	45.6	77.6	–87.2	9.4
Assets	–761.3	–1,330.5	–345.6	–540.0	–1,253.1	–718.8	–647.3	. . .
Liabilities excluding LCFAR[2]	791.0	1,247.3	551.4	417.6	1,298.7	796.4	560.1	. . .
Reserves plus LCFAR	–33.1	–46.2	–12.0	–13.9	–52.8	–40.6	–29.2	–32.5
Reserves	–189.5	–106.0	–42.3	–152.2	–173.1	–159.6	–265.4	. . .
LCFAR	156.3	59.8	30.3	138.3	120.4	119.0	236.2	. . .
Net errors and omissions	–78.5	–123.2	73.7	55.3	–125.6	–49.1	–25.3	. . .

Source: IMF, *Balance of Payments Statistics Yearbook*, Vol. 54, Part 2, 2003.

Note: In the financial account, a negative sign indicates an excess of recorded outflows: the absence of a sign in the balances indicates an excess of recorded inflows over outflows.

[1] Table 2 also includes the global balance on net errors and omissions.

[2] Liabilities constituting foreign authorities' reserves. The data in liabilities constituting foreign authorities' reserves were derived from information collected by the IMF from a sample of large reserve-holding countries. These data were used to adjust portfolio and other investment liabilities to align the data better with corresponding assets series.

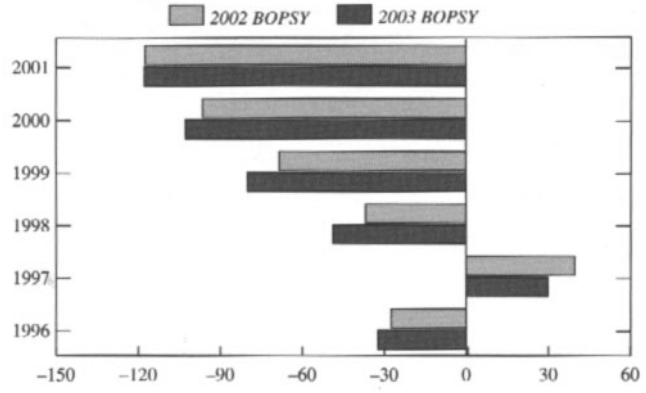
investment generated by SIMSDI might have been a factor causing a decline in the discrepancy but it is too early to be certain. Direct investment transactions (both inward and outward) were at their lowest level since 1998.

In 2002, *portfolio investment* recorded its highest discrepancy in the seven-year period under review (Table 2). Transactions in portfolio assets dropped dramatically to approximately half of the transactions recorded in each of the previous three years. The industrial countries, led by the United Kingdom and the United States, accounted for 94 percent of the decrease, which was spread among all portfolio instruments—equity (58 percent decline), bonds and notes (35 percent decline), and money market instruments (43 percent decline). This reported decline in portfolio asset transactions is consistent with financial market developments in 2002 as described in the *Global Financial Stability Report* (*GFSR*), March 2003. For instance, the *GFSR* noted that "falling prices in the major equity markets, sharply widening credit spreads, high levels of actual and implied volatility, and a withdrawal of banks from risk taking in response to loan and trading losses and falling share prices" negatively affected financial flows to emerging markets in 2002 (p. 34). On the other hand, reported portfolio liability transactions did not show the same large decrease, resulting in the large discrepancy even after adjustment was made by IMF staff for the sizable transactions in portfolio investment assets by reserve asset holders.

Future analysis and tracking of portfolio investment transactions data may be improved now that the CPIS is being conducted on an annual basis. The results of this position survey, for which data from selected countries are collected, may help in understanding the cause of the discrepancies in the portfolio transactions.

Figure 1. Impact of Revisions in 2002 on Global Current Account Imbalances, 1996–2001

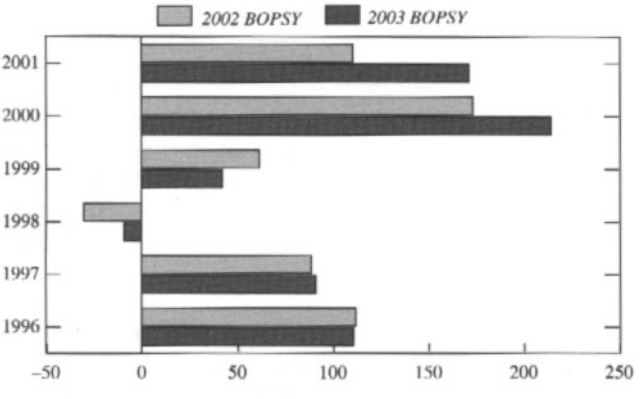
(In billions of U.S. dollars)



Sources: *2002 BOPSY,* Volume 53, Part 2 and *2003 BOPSY,* Volume 54, Part 2.

Figure 2. Impact of Revisions in 2002 on Global Financial Account Imbalances, 1996–2001

(In billions of U.S. dollars)



Source: *2002 BOPSY,* Volume 53, Part 2, and *2003 BOPSY,* Volume 54, Part 2.

The discrepancies for *other investment* are more volatile, changing from positive to negative over the past seven years. The data for other investment, before adjustments for transactions by reserve asset holders, are presented in Tables B-31 to B-33 of Part 2 of the 2003 *BOPSY*, and include a relatively small discrepancy of –$24 billion in 2002. However, there are large underlying discrepancies for the subcomponents of loans (–$253 billion) and other financial assets and liabilities ($229 billion). The latter includes trade credits, currency and deposits, and miscellaneous items such as capital subscriptions to international nonmonetary institutions.

As noted above, in compiling the global aggregates, the IMF adjusts the data for portfolio investment and other investment liabilities to take account of those liabilities for which counterpart asset transactions are classified as reserve assets.[2] Reserves increased substantially from $160 billion in 2001 to $265 billion in 2002, the highest net changes in transactions recorded in the past seven years.

Revisions

Revisions to global data for the 1996–2001 period appear in Figures 1 and 2. The largest revisions for the period, as reported in the 2002 and 2003 editions of the *BOPSY*, occurred in direct investment in 2001. Data for direct investment abroad transactions were revised upward by $82 billion and data for direct investment in the reporting country transactions were also revised upward by $69 billion. These offsetting revisions reduced the discrepancy on direct investment transactions for 2001 somewhat, but not significantly. However, the revisions from the United States' *Benchmark Survey of U.S. Direct Investment Abroad, 1999*, which is undertaken every five years, contributed to a significant reduction in the discrepancy for the financial account in that year. It can be seen that, although the total portfolio investment holdings by residents of the United States fell in 2002, it retained its ranking as the largest direct investor abroad, and the largest recipient of direct investment from foreign countries.

Figure 1 shows that the overall discrepancy for the current account in 2001 was almost identical in the two editions of *BOPSY*. A closer look at the subcomponents shows that there were revisions to each category, although they were not large. Revisions in the current account tended to increase the discrepancy (except for 1997, when there was a positive current account balance). The financial account is more variable, with revised data increasing the discrepancy in three of the six years.

[2]The information used to make these adjustments is derived from a confidential survey of the instrument composition of reserve assets in the major reserve-holding countries, which the IMF began to conduct in response to a recommendation of the *Godeaux Report*. The data compiled from the survey information are used only at the global level. Estimates are made for some reserve-holding countries that do not report this information.

IV. Work Program Undertaken by the Committee in 2003

The work undertaken by the Committee in 2003 reflected the priorities established in the medium-term work program at the end of 2002. Top priority was given to issues regarding data quality within the DQAF; updating the *BPM5*; and the concept of *residence*, specifically with regard to the treatment of nonpermanent workers and of entities without a physical presence. Other high-priority topics included issues regarding portfolio investment (the CPIS, reverse transactions, third party holdings), direct investment (metadata, borderline issues with other types of investment, permanent debt, and the possibility of conducting a coordinated direct investment survey), investment vehicles (such as mutual funds, hedge funds, and other private investment vehicles), statistical treatment of insurance activities, and the relationships between international accounting standards and the concepts in macroeconomic statistics. The Committee reviewed issues relating to global imbalances in balance of payments data; the policy application of balance of payments statistics; the extent to which countries report balance of payments data to the IMF's Statistics Department on the basis of the classification system of *BPM5*; and the harmonization of reporting of data by multinational corporations for balance of payments purposes. Inconsistencies in the treatment of returns on various types of equity were also considered, with a particular focus on reinvested earnings. Work undertaken by the BIS on international financial statistics was also reviewed by the Committee.

Other work undertaken during the year included methodological work on the classification for statistics on international trade in services. In addition, the Committee received papers on (i) an update on the way that France is meeting the challenge it faces in measuring its travel account, in light of the introduction of the euro, through the use of an Internet users survey; and (ii) the use of employee stock options in Japan.

Data Quality

Since the financial crises of the 1990s, policymakers and other users of statistics are giving increased attention to the availability of comprehensive, timely, and reliable financial and economic data. In view of the IMF's responsibility for economic surveillance of its members' economic policies, and to assist users of the data to evaluate data quality, the IMF's Statistics Department developed the DQAF in 2001. The DQAF provides a systematic approach and a common language for the assessment of data quality.

The framework comprises a generic assessment framework, as well as specific assessment frameworks for the main aggregates used for macroeconomic analysis and policy, covering monetary and financial, government finance, balance of payments, national accounts, and consumer and producer price statistics. Thus there is an overarching, generic framework for assessing data quality as part of the IMF's overall surveillance work, prompting more emphasis on accuracy and reliability of statistics.

In light of the increased importance placed on data quality, the Committee has taken a keen interest in issues related to quality. At its 2003 meeting, seven papers on quality-related issues were presented.

Papers were received from three countries (Chile, India, and Japan) on their revisions policies and practices. The paper from Chile noted that although no explicit revision policy exists in Chile, the revision practice is well accepted by users. The main objective of such practice has been to give stability to historical data and at the same time incorporate up-to-date information for the most recent quarters. The paper explained that the primary reason for major revisions is methodological changes. The paper also raised two important issues: (i) how to deal with high-frequency data (such as weekly and monthly dissemination of selected balance of payments components) and (ii) the need to harmonize revision policy with other data sets, particularly with national accounts and external debt.

The Indian paper explained that the main consideration for the choice of revision cycle in India is the time lag for receiving source data. Quarterly data undergo revision until the last quarter of financial year and revisions are not frequent for annual data. In general, no large changes occur after revision as the practice is to use comprehensive data when preparing the data released for the first time.

The paper from Japan distinguished four types of revision (statistical, methodological, definitional, and presentational) and elaborated on the Japanese practices. The paper explained that balance of payments data are revised only once and the IIP data are not revised, as the view is that frequent data revision may impair the credibility of statistics. Relying on comprehensive and timely international transactions reporting systems (ITRS) as the main data source has meant that there has been less need for revisions. The paper noted that Japan intends to review the revision policy, primarily because (i) there have been cases where large-value transactions have been omitted, and (ii) retained earnings are not recorded in the period they are earned. A move toward more frequent revisions is now being considered and issues involved in this process are being reviewed. The Committee found these practical papers interesting and stimulating, noting that there is often a difficult balance between accuracy and

timeliness of data, and that users may need to be educated on the reasons for revisions.

The Committee was provided with a paper by IMF staff on revisions policy for official statistics that had been prepared for the International Statistical Institute meeting in Berlin in August 2003. The Committee found the paper to provide a very useful framework for revisions policy. Several suggested improvements were offered, including the need for consistency across related macroeconomic statistical data sets (for example, between the balance of payments and the national accounts, and monetary and financial statistics; between the balance of payments and the IIP; and between the IIP and external debt data) and with socio-demographic statistics (for example, between the national accounts and households surveys) in order to view macroeconomic statistics within a broader context; coordination where statistics are produced by different agencies; emphasis on the absence of political interference, so that pre-release of data to ministers is clearly stated and adhered to; and that causes of revisions, and their contributions, be provided. A range of future revisions was also considered to be valuable (though difficult) as a means of both informing users and defusing criticism of subsequent revisions. Although the Committee emphasized that revisions do not represent errors, it was noted that errors can arise, and that these may be beyond the control of the compiling agency. Under those circumstances, it was suggested that users be informed that revisions may be larger than usual. It was also suggested that options on backcasting of newly created series might be included in the document, especially as it was noted that if the compiling statisticians do not make the estimates, users will, and that these data are likely to be weaker. It was also noted by some members of the Committee that it was important to bear materiality in mind, as trivial revisions add little to the analytical value of the data series, while potentially causing users difficulties.

The Committee also received a joint paper from IMF and Eurostat staff on their respective data quality approaches, namely the DQAF of the IMF and the quality definition of Eurostat. The paper pointed out that the two approaches were modified to harmonize common areas. The paper elaborated on the structures, purposes, and uses of both approaches, but noted that, while the IMF DQAF focuses on process-oriented indicators with qualitative measurements, the Eurostat approach focuses on output-oriented indicators with quantitative measures. The two approaches serve similar purposes and complement each other, although the DQAF provides a more holistic approach. The paper proposed that the way forward would be to further exploit the complementarity of the two approaches. The Committee was advised that the Eurostat framework does not pay as much attention to institutional arrangements as does the DQAF because these are set up by regulation in the EU countries, and therefore they do not need to be monitored in this framework. Moreover, as part of the balance of payments regulation, member states are required to make regular quantitative quality reports.

The Committee welcomed this paper and suggested that the IMF and Eurostat might try to bring the two approaches into a single document. However, several members cautioned about placing too much emphasis on quantitative measures, especially as such an emphasis might militate against revisions to data.

The ECB presented a paper to the Committee on the work of a joint ECB-Eurostat Task Force on Quality (TF-QA). The interim report had not yet been approved at the time of the Committee meeting, but had been extensively commented upon by member countries. The approach followed by the TF-QA involves several steps: from the selection of those dimensions/elements contained in the DQAF that were deemed as most relevant for quantitative measurement to identification of possible measures, as well as testing and analysis of indicators and outcomes. The paper noted that the quality dimensions that could, directly or indirectly (through elements), be measured quantitatively are accuracy and reliability, and serviceability. Methodological soundness is assessed in qualitative terms through the "European Union balance of payments and international investment positions statistical methods," ECB, November 2003 (last update of the so-called "B.o.p. Book") and by the *Accession Countries Manual*, ECB, May 2003, which set out the agreed standards and requirements and assesses remaining departures in the countries' data. Eurostat complemented them with a questionnaire on services. Regarding integrity and accessibility, quantity measurement is generally not appropriate, but the paper noted that these dimensions are well covered by the EU countries. The TF-QA is working to further refine the use and dissemination of quality indicators in reports, in line with the needs of compilers and users and an appropriate balance between quantitative measures and qualitative assessments.

The Committee found that the paper raised some important issues. Some concern was expressed regarding the interpretation of the quantitative information. It was felt that some countries may be making improvements on a continual basis, but that these might not be reflected in the quantitative measures. At the same time, the Committee noted that some quantifications will not affect quality, whereas others will; it was suggested that some nuance might be required. It was also pointed out that one of the assumptions in the paper is that errors are nor-

Box 1. Some Major Changes Proposed in the *Annotated Outline* for the Revision of the *Balance of Payments Manual*, Fifth Edition

1. Increased emphasis on the IIP and Other Changes in Financial Assets and Liabilities Account.
2. Review of the concept of residence, with particular focus on the "12-month rule" and entities without a physical presence (such as special purpose entities (SPEs), trusts, and holding companies).
3. Consideration of increased use of fair value, in light of possible changes in international accounting standards.
4. Refinement of the definition of reserve assets.
5. Consideration of inclusion of untraded securities in Other Investment.
6. Adoption of the new treatment for the measurement of output of other depository corporations and insurance companies, in light of resolution of issues by OECD Task Forces.
7. Treatment of employee stock options.
8. Harmonization of institutional sectorization with the *1993 SNA* and the *Monetary and Financial Statistics Manual 2000* (with a particular focus on mutual funds and entities without a physical presence).
9. Increased harmonization with the *1993 SNA*, particularly in light of its concurrent review.

mally distributed, but no evidence was provided to support this assumption. Equally, it was pointed out that where there have been revisions, analysis might be undertaken to explain the reasons. The ECB indicated that refinements will continue to be made. It was pointed out that the participants need experience in interpretation of revisions, but, in time, it was felt that the use of indicators will fall with the rise of the focus on analysis.

The Committee received a paper from Hong Kong SAR that described the experience of the Census and Statistics Department of Hong Kong SAR in applying the DQAF for the assessment of the quality of the balance of payments statistics. The Committee found the paper very interesting, and especially relevant for developing countries that are introducing more surveys because their ITRS are not as viable following the abolition of exchange controls. In this situation, it was noted, there is often interest from a wide range of institutions that want to collect data. In an attempt to overcome "survey fatigue," statistical agencies may try to combine their requirements into one survey. As a consequence, there are frequently too many respondents. It was noted that countries in this situation need to develop their practices regarding transparency. In addition, it was noted that customs authorities are not often interested in collecting statistics; their focus is revenue collection, with the result that the quality of the c.i.f./f.o.b. adjustment suffers. A similar difficulty is in regard to the collection (and usefulness) of data at market value rather than book value when there is no readily observable market price.

It was explained that in Hong Kong SAR, the Census and Statistics Department identifies the concentration of respondents for direct investment, portfolio investment, and other investment. It was indicated that the marginal improvement in the data for small companies was not cost effective. The importance of both book value and market value information was emphasized. Fluctuations in market value may be very large, so there is benefit in also knowing book values. Regarding the question of conversion of data from a c.i.f. basis to an f.o.b. basis, it was suggested that it might be better for the balance of payments compiler to make the adjustment.

Revision to BPM5

At its 2002 meeting, the Committee considered a draft unannotated outline for revising *BPM5*. On the basis of this and other related documents, the Committee gave approval, in principle, to the proposal to revise *BPM5* and asked the IMF's Statistics Department to prepare a more detailed, annotated outline. Accordingly, IMF staff prepared a draft *AO* and circulated it in September 2003 to the Committee and other interested parties, such as the Inter-Secretariat Working Group on National Accounts (ISWGNA), for comment. These comments were taken into account and a revised version was presented to the Committee at its 2003 meeting.

The *AO* sets out, in considerable detail, a series of proposals for modifying both the structure and some of the concepts in *BPM5*. The document also asks a number of questions, seeking input on the proposed changes and possible alternatives. The Committee endorsed the IMF staff proposal that the *AO* be circulated, in early 2004, to all interested parties, including balance of payments compilers, for comment by mid-2004. See Box 1 for some of the major changes proposed in the *AO*.

The Committee also considered proposals from the IMF's Statistics Department for the process of consultation and review in the revision to *BPM5*. Included in these proposals was the creation of three technical expert groups, which would provide advice to the Committee and the IMF for input to the new manual. Membership of these technical groups will be drawn from experts in balance of payments and IIP methodology from all over the world. These technical groups will be for (i) issues related to direct investment (DITEG); (ii) issues related to currency unions (CUTEG); and (iii) balance of payments issues, more generally (BOPTEG).

It was agreed that DITEG will work with the OECD's Workshop on International Investment Statistics (WIIS), which has long had a role in direct investment methodology, and has been responsible for three editions of the *OECD Benchmark Definition of Foreign Direct Investment* (*BD*). In order to continue this function, the WIIS has created the Benchmark Advisory Group to revise the third edition of the *BD*. Once DITEG's work has been completed, it is planned that the Advisory Group will use the agreed outcome to prepare a fourth edition of the *BD* (BD4). DITEG will attempt to conclude its work as soon as possible. It is expected to meet only three times and to conclude its work in early 2005. DITEG will report to both the WIIS and to the Committee. A list of the issues that the Committee agreed should be considered by these expert groups is shown in Box 2.

In conjunction with these processes for consultation and discussion by, and within, the balance of payments community will be the link to the process to revise the *1993 SNA*. The ISWGNA has created an Advisory Expert Group (AEG), with a similar remit to the roles of the technical expert groups for the balance of payments revision, that is, the AEG will examine proposed changes and report back to the ISWGNA. The IMF's Statistics Department is represented on both the ISWGNA and the AEG, which will permit ready coordination of effort between the revision to the *1993 SNA* and to *BPM5*.

Residence

The Committee also considered the question of residence, in particular, the treatment of nonpermanent workers within the balance of payments framework. Papers were presented by South Africa, Hong Kong SAR, and India. The paper from South Africa noted that nonpermanent workers were an important issue in southern Africa, and the paper suggested that the strict application of the 12-month residence rule may be inappropriate in that region. The paper argued that the "center of economic interest" for many of the workers from Lesotho, Swaziland, and Mozambique in South Africa was their "home" country, not South Africa, even though they may be working in South Africa for much longer than 12 months. This was reflected in the institutional arrangements among the various countries, especially between South Africa and Lesotho and Mozambique. For example, it was noted that taxes that are levied on the incomes of workers from these countries while working in South Africa are payable to their "home" countries, not to the Government of South Africa. The paper from Hong Kong SAR noted that nonpermanent workers are a major element in the Hong Kong SAR's balance of payments, especially with regard to movements with the People's Republic of China (in both directions), but also for nationals of other countries who come to Hong Kong SAR for periods frequently well in excess of the usual 12-month rule, but who maintain considerable links with their former residence. For many such cases, the application of the concept of "center of economic interest" is not always easy to establish. The paper argued that the new manual should provide clear guidance on how residence should be determined for such cases. The paper from India echoed many of the concerns presented in the other two papers, especially with regard to Indians working abroad.

The Committee took note of these papers. Several members pointed out that the circumstances described had more general application. The Committee agreed that these issues need to be taken into account when the new balance of payments manual is written.

Portfolio Investment

The Committee was brought up to date on the 2001 and 2002 CPIS, as well as on work being undertaken to enhance the collection of CPIS data. This work has wider application to other elements in the balance of payments and the IIP, as well as other parts of the suite of macroeconomic statistics. It covers investigations into how to measure holdings of securities by nonresident custodians (that is, TPH); the results of a questionnaire on the information systems of financial institutions that are involved in reverse transactions (repurchase agreements and securities lending without cash collateral); and the development of the ECB's CSDB.

The Coordinated Portfolio Investment Survey

The CPIS, which is coordinated by the IMF's Statistics Department, is an international survey of the holdings of portfolio investment assets. The survey provides data on holdings of equity, and long-term and short-term debt securities, by counterpart jurisdiction of issuer. The survey

Box 2. List of Topics Referred by the Committee to the Technical Expert Groups Set Up for the Revision of the *BPM5*

BOPTEG

Topic	*Priority*[1]
1. Activation of guarantees	High1
2. Accrual principles for debt arrears	High1
3. Nonperforming loans, valuation of loans and deposits, write-offs, valuation of traded loans in balance sheets, and related issues	High1
4. Rules for identification of branches	High1
5. Multiterritory enterprises	High1
6. Institutional sector classification	High1
7. Residence of households	High1
8. SPEs and shell and holding companies (units, sectorization, residence, and transactions)	High1
9. Residence of corporations (see also SPEs and holding companies)	Medium
10. Application of direct investment to government corporations	Medium
11. Untraded and formerly traded securities in portfolio investment	High2
12. Traded loans—criteria to become portfolio investment	High2
13. Goods for processing	High1
14. Repairs on goods	Medium
15. Direct investment—reinvested invested (including negative reinvested earnings)	High1
16. Retained earnings of mutual funds and rerouting of investment income of technical reserves of life insurance enterprises and pension funds	High1
17. Interest on debt securities	High1
18. Income on securities lending and reversible gold transactions	Low
19. Treatment of technical assistance	High2
20. Mutual insurance	Medium
21. Reinsurance	High1
22. Appendices:	
– Changes from *BPM5*	Ongoing
– Reconciliation with *SNA*	High2
– Process for amending the revised manual	High2
– Risk issues	High2
– Exceptional financing	High2
– Insurance and reinsurance	High2
– Financial services and income	High2
– Finance leasing	High2
– Standard components	High2
– Debt reorganization	High2
– Reverse transactions	High2
– Tourism	Low

BOPTEG

Topic	*Priority*[1]
23. Other possible appendices	Low
– Data dissemination and quality	High2
– Payments for use of assets	Medium
– Transactions with IMF	High2
– Research agenda	Ongoing

DITEG

Topic	*Priority*[1]
1. Valuation of direct investment equity	High1
2. Valuation of branch intangible assets	High1
3. Land owned by nonresidents	High2
4. Ultimate beneficial owner/ultimate destination	High2
5. Direct investment—10 percent threshold of voting power/equity ownership	High1
6. Indirect investment— fully consolidated system, U.S. methodology, or 50 percent ownership.	High1
7. Inclusion in direct investment of transactions between a nonfinancial direct investment enterprise and an affiliated financial SPE	High1
8. Reverse investment—classification	High1
9. Round tripping	High2
10. Permanent debt between affiliated financial intermediaries	High2
11. Use of maturity and full instrument split for direct investment	Medium
12. Mergers and acquisitions	High1
13. Direct investment—reinvested earnings (including negative reinvested earnings)	High1
14. Other possible appendices	
– Bring together all direct investment issues (stock, flows, and income between affiliates)	High1
– Bring together all direct-investment-related issues (transactions in goods and services, income, financial flows, and stocks between affiliates)	Low

CUTEG

Topic	*Priority*[1]
1. Issues paper for research related to economic and currency unions	High1

[1]Indicates the priority accorded to the topic: High1 indicates that the subject will be considered at the first meeting of the technical expert group, High2 indicates that the topic will be considered at the second meeting of the technical expert group. Should there be time, the other topics will be considered according to the priority indicated.

Table 3. Geographic Breakdown of Total Portfolio Investment: Top Ten Economies by Holders and Issuers, at Year-End 2001

(In millions of U.S. dollars)

Investment from: / Investment in:	1 United States	2 United Kingdom	3 Japan	4 Luxembourg	5 Germany	6 France	7 Italy	8 Switzerland	9 Netherlands	10 Ireland	Other	Total value of investment
1 United States	...	308,986	490,200	177,910	108,168	116,530	74,001	76,389	137,334	155,281	1,433,572	3,078,371
2 United Kingdom	504,318	...	110,356	60,309	72,961	68,603	33,731	23,066	40,787	88,650	277,067	1,279,847
3 Germany	131,442	130,030	111,307	150,101	...	86,353	59,566	56,612	68,221	32,637	333,720	1,159,988
4 France	141,786	130,577	64,422	59,187	74,191	...	43,911	26,445	45,191	18,964	170,152	774,826
5 Netherlands	146,357	72,359	46,139	54,174	86,571	84,493	53,154	34,646	...	13,141	106,754	697,787
6 Italy	47,455	91,069	33,986	46,999	80,991	73,557	...	6,452	44,045	26,716	127,847	579,117
7 Japan	196,359	94,090	...	27,342	10,399	17,273	12,115	10,273	11,508	9,653	144,379	533,392
8 Luxembourg	12,549	22,039	45,864	...	103,235	30,643	106,052	66,389	8,349	12,988	112,977	521,084
9 Cayman Islands	58,659	45,965	132,785	20,230	12,319	21,489	17,776	11,772	2,975	6,611	67,654	398,235
10 Canada	200,474	15,184	21,910	11,054	4,513	10,389	2,737	5,660	2,919	4,876	28,659	308,374
Other	809,120	393,746	232,786	213,308	238,267	201,002	148,979	178,101	124,341	71,687	670,923	3,282,259
Total value of investment	2,248,519	1,304,044	1,289,754	820,614	791,616	710,330	552,022	495,804	485,669	441,204	3,473,704	12,613,281

has been conducted on an annual basis since 2001 (following a limited survey in 1997).

Of the 67 jurisdictions that participated in the 2001 CPIS, all but one have agreed to continue to participate on an annual basis. One particularly noteworthy aspect of the CPIS is that about 20 small economies with international financial centers (SEIFiCs) now take part on a continuing basis. Overall, the willingness of so many countries to participate reflects the benefits that they anticipate will flow from the availability of data on creditor holdings of securities issues.

The data from the survey help to fill an important statistical gap by providing a database that counterpart debtor countries may use to construct estimates of their own outstanding securities liabilities, as well as assisting other data analysts in understanding this fast-growing cross-border exposure. Tables 3 and 4 provide, in matrix form, summary results of the 2001 CPIS for the 10 largest holders and issuers of securities. More detailed results can be found on the IMF website (http://www.imf.org/bop). Total securities reported in the 2001 CPIS were $12,613 billion, and, in 2002, $13,731 billion. It can be seen that, although the total portfolio investment holdings by residents of the United States fell in 2002, it retained its ranking as the major investing country.

Among the more salient features of the results is the importance that some small economies play in international financial markets. For example, Luxembourg is both a major source and destination of cross-border portfolio investment, while the Cayman Islands is one of the principal destinations.

To assist jurisdictions to undertake the survey, the survey guide[3] has been translated into French, Spanish, Arabic, Russian, and Chinese. These documents are available from the IMF on request. The guide sets out the purpose of the survey and the conceptual underpinnings, and offers compilers advice on how to undertake a survey of this nature (such as how to establish a survey frame; how to develop contacts with respondents; software requirements; to address low or nonresponse rates; what data validation procedures might be put in place; follow-ups with respondents; and data release).

The Committee also discussed the usefulness of the CPIS. Several members pointed out how the data are used to analyze the breakdown of their holdings. In addition, given that the geographical breakdown of liabilities are hard to estimate from more standard sources of data, the derived liabilities were felt to be particularly valuable. It was also felt that the data would become increasingly important as the time series develops.

In view of the importance of having a revisions policy (as part of data quality), IMF staff presented the Committee with a proposal for a revisions cycle for the CPIS. The proposal is that the first, preliminary release of the CPIS data for any particular year would be made toward the end of the year following the reference date, that the data would be revised about six months later, and that they would then be revised again at the time of the release of the next year's preliminary release. The Committee agreed with the proposal.

As part of its ongoing attempts to involve as many jurisdictions as possible in the CPIS, the IMF's Statistics Department held a workshop for members of the Arab League, the Islamic Republic of Iran, and India, in Beirut, in June. The Statistics Department also seeks to assist SEIFiCs to the maximum extent possible, in view of their limited resource base and their importance in the survey. Accordingly, a workshop for SEIFiCs was also held in Bermuda in May. Funding for the workshops was provided by Government of Japan through the Japan Administered Account for Selected Fund Activities. The workshops were designed to provide compilers with the opportunity to exchange their experiences in conducting the 2001 CPIS; to encourage those who have not yet decided to participate in the CPIS to do so; to see how the survey might be conducted more efficiently and effectively; to establish a network of contacts among the compilers; and to indicate what plans they had for the 2002 survey.

In order to obtain as comprehensive a picture as possible of cross-border asset holdings of securities, and so that counterpart liabilities can be constructed, comparable information to the CPIS is necessary on securities held as reserve assets and securities assets of international organizations, as these assets, by definition, are not included in countries' holdings of portfolio investment assets. To this end, the IMF's Statistics Department conducts two annual surveys, Survey of Securities Held as Foreign Exchange Reserves (SEFER) and Survey of Securities Held by International Organizations (SSIO). The results of these surveys are available on the IMF's website (http://www.imf.org/bop).

In line with the IMF Statistics Department's view that all data should be supported by metadata (to explain to users such elements of the survey as the methodology employed, the survey frame, the response rate, and other related issues), all jurisdictions that participated in the CPIS were asked to complete a metadata questionnaire. Sixty-four jurisdictions did so. The results of this ques-

[3]See *Coordinated Portfolio Investment Survey Guide*, second edition, IMF, Washington, D.C., 2001.

Table 4. Geographic Breakdown of Total Portfolio Investment: Top Ten Economies by Holders and Issuers, at Year-End 2002
(In millions of U.S. dollars)

Investment in: \ Investment from:	1 United States	2 United Kingdom	3 Japan	4 Luxembourg	5 Germany	6 France	7 Italy	8 Netherlands	9 Ireland	10 Switzerland	Other	Total value of investment
1 United States	...	358,459	499,048	176,180	103,462	120,009	70,609	147,061	185,983	80,158	1,537,431	3,278,401
2 United Kingdom	452,107	...	94,846	65,533	73,405	75,839	32,925	49,758	118,967	25,748	336,556	1,325,683
3 Germany	94,761	128,410	121,007	171,262	...	113,763	56,461	106,095	45,478	61,691	422,459	1,321,387
4 France	123,375	97,127	66,552	69,241	80,335	...	53,984	53,536	23,664	33,661	237,104	838,579
5 Netherlands	124,493	84,028	41,959	62,918	104,498	106,712	54,150	...	20,824	43,122	162,799	805,503
6 Italy	40,919	107,584	45,214	67,165	98,245	110,338	...	52,751	36,843	8,444	153,076	720,580
7 Luxembourg	8,720	20,568	55,799	...	123,973	37,432	146,750	8,263	15,507	81,969	132,520	631,501
8 Japan	193,975	86,438	...	22,832	17,545	16,520	8,637	12,054	11,130	10,263	138,006	517,398
9 Cayman Islands	56,253	51,109	175,166	24,447	18,328	26,563	13,002	4,368	7,798	15,423	108,875	501,330
10 Spain	36,452	26,943	16,065	23,490	49,056	60,358	11,729	28,463	19,260	4,004	53,162	328,981
Other	802,863	434,063	278,863	240,332	230,306	213,338	147,812	107,655	80,041	158,509	767,476	3,461,258
Total value of investment	1,933,918	1,394,729	1,394,520	923,399	899,152	880,871	596,058	570,003	565,494	522,992	4,049,465	13,730,601

tionnaire have also been placed on the IMF website. The information will play an important role in the analysis of the results and in the exchange of information between and among the participating countries and will be valuable for users and compilers. Knowledge of the metadata is an integral part of analyzing the data.

Third Party Holdings

At its 2003 meeting, the Committee considered a report from the Technical Group on Third Party Holdings (TGTPH). This group had been set up by the Committee in 2000, with a remit to examine how TPH might be captured in official statistics. TPH are securities that have been placed with a custodian, resident in one jurisdiction, directly by end-investors resident in another jurisdiction. It is likely that there are many instances of TPH, especially by households or small or medium-sized enterprises (SMEs), involving in total substantial amounts of securities. As such holdings lie outside the scope of balance of payments and IIP statistics of the economy of the custodians' jurisdiction, and as households and SMEs are usually not covered in surveys of end-investors, these holdings are likely to be missed in countries' IIPs and their CPISs.

In its initial work, the working group on TPH found that (i) there were many different types of business models used by custodians, so that there was no simple approach that would permit these holdings to be readily identified; (ii) there were often multiple custodian chains, so that there were major risks of double counting; and, as a result (iii) the focus of any further work should be on high-worth individuals, as in this area there would likely be less risk of double counting and custodian records might be more readily usable for statistical purposes. Following this earlier work, the TGTPH held discussions in 2003 with Euroclear (in Brussels) and Clearstream (in Luxembourg) to determine the extent to which these bodies, as depositories, could identify the ultimate beneficial owners (UBO). Except in a few, very limited, instances, neither of these bodies were able to do so.

In light of this outcome, the Committee agreed to the proposal by the TGTPH that the next step explore how holdings on TPH might be identified by those few jurisdictions with major international custodial business. In view of the highly concentrated nature of the custodial industry, it is expected that a very high proportion of the TPH of high worth individuals could be captured from custodians in only a few jurisdictions. To that end, the ECB offered to host such a meeting, which offer was accepted. The TGTPH will prepare for consideration at that meeting an issues paper, together with a draft questionnaire that might serve as the basis for further discussions with custodians in the jurisdictions that agree to participate in such a survey. Should such a survey proceed, the first step would be to find out the types of business models that custodians use, in order to avoid any double counting and to minimize the respondent burden. There are still several problems that have to be addressed before any data on the value of TPH cross-border holdings by high-worth individuals might be available, including the lack of clarity in some countries as to whether they have the legal authority to request the information.

Reverse Transactions

The Committee has discussed reverse transactions on many occasions, reflecting their importance, their complexity, and the difficulty in measuring them. Reverse transactions (repurchase agreements, securities lending without cash collateral, gold swaps, and gold loans or deposits) have grown rapidly in volume and complexity in recent years, as financial markets round the world have come to use them much more extensively and effectively. The nature of reverse transactions has also evolved since *BPM5* was published. As a result, the Committee, at its 2001 meeting, took a number of decisions in principle: (i) to continue the current recommended treatment of recording repurchase agreements (involving cash collateral) and gold swaps as collateralized loans and to assess further the availability of supplementary information on the sector of the counterparty and the issuer of the security; (ii) not to record a transaction at all for securities lending (without cash collateral) and gold loans/deposits, but instead to provide supplementary information similar to that recommended for repurchase agreements and gold swaps; and (iii) in the event that the asset acquired under a reverse transaction is on-sold outright, the seller of that asset so acquired should record a negative asset (that is, a "short" position).[4]

Even so, the Committee felt that it was necessary to pursue the extent to which the supplementary information (on sector of the counterparty and the issuer of the security for repurchase agreements and securities lending) was available, and to determine how to classify the payment for the use of the lent asset in securities lending and gold loans/deposits. To address these issues, the technical group on reverse transactions (TGRT) was set up. The group comprised representatives of nine economies (Belgium, Hong Kong SAR, Japan, Portugal, South Africa,

[4]The Committee recognized that, for practical reasons related to data sources or institutional arrangements, the recommendations may not be easily followed in some countries.

Spain, Switzerland, the United Kingdom, and the United States), the IMF, the ECB, and the BIS. The technical group's mandate was to explore how the reporting of reverse transactions can be improved (for monetary statistics, for flow of funds accounts and for sectoral balance sheets, as well as for balance of payments and IIP statistics), bearing in mind the Committee's decision on the appropriate treatment.

As a first step, in 2002 the TGRT undertook a survey of a selection of end-investors, custodians, brokers/dealers, and fund managers in the economies of the participants in the technical group, to determine whether these institutions' information systems could readily identify when reverse transactions take place. The results of this survey were presented to the Committee at its meeting in 2003. Among the important results were: (i) the introduction in the United States of a new reporting system, by financial institutions, that allows the identification of reverse transactions; and (ii) a significant minority of respondents to the survey indicated that they record repurchase agreements as both a collateralized loan and a transaction in the underlying security (the so-called "four way reporting"). These are important developments as they open routes for improved measurement of reverse transactions. The new system in the United States is not compulsory (it is not a government sponsored exercise), but most of the custodians in New York use the software. At present, Treasury securities are not covered, but that will change in 2004. The Committee requested that the TGRT explore with the authorities in the United States whether this software might be available for use in other countries. At the same time, a significant minority of respondents to the survey indicated that they record reverse transactions as both a loan and a transaction in the underlying asset, which may mean that this approach could become more widespread and result in improved measurement.

As to the appropriate treatment of the fee on securities lending and gold loans, the TGRT was unable to come to a consensus. The issue will be explored more fully during the revision to the *BPM5*.

In its work on how reverse transactions are recorded, the TGRT examined the role of central clearing houses (CCHs) in tripartite repurchase agreements. These institutions are becoming increasingly important and may have a major impact not only on how the data are collected but also on what the data represent. At present, there is no standard reporting practice, especially for gross versus net reporting. Moreover, as these clearing houses are not *other depository institutions*, transactions by banks with other banks but channeled through the clearing houses, will have an impact on monetary aggregates. The Committee requested that the TGRT investigate CCHs in more detail.

Global Securities Databases

Several participants in the CPIS use a security-by-security approach to obtaining the information of portfolio investment asset holders. This approach can provide very high-quality data, provided that there are other sources of information against which the information can be checked. One of the major ingredients for high-quality data, using a security-by-security approach, is a securities database.

From previous work on the CPIS, it has become evident to the Committee that there is considerable interest in the development of a global securities database (GSDB). A GSDB, as so envisaged, would be a multidimensional database, with information on such variables as the name, sector, and jurisdiction of the issuer of each security; the amount issued and its date of issue; the currency and coupon (if any) of the issue; the maturity date(s); and, possibly, the sector of holder of the security. Price information would also be included. Such a GSDB has a potentially very wide application: in addition to the CPIS, it could be used for the construction of estimates of portfolio investment transactions in the balance of payments; for external debt estimates; for the international reserves and foreign currency liquidity template; for monetary statistics; for flow of funds tables; for the sectoral balance sheets in the national accounts; and for financial soundness indicators.

In response to its own needs and those of its members, the ECB has undertaken a comprehensive exercise to create its CSDB, which has many of the features of a GSDB. The Committee was advised of the progress that the ECB has made in this exercise. There are to be three "feeders," viz. (i) commercial providers, including national numbering agencies; (ii) the internal sources of the European System of Central Banks (ESCB), including the member states' national central banks' databases; and other sources, such as the BIS, Euroclear, and Clearstream. The Committee welcomed these developments and requested that it be kept informed. It is anticipated that the CSDB will be operational about the end of 2004.

In addition to the ECB's database, the BIS has maintained a securities database for several years, primarily for international securities but increasingly for domestic securities as well. The Committee was advised that the coverage of international securities is good (with data coming from commercial providers) but that the coverage of national securities on issue is currently limited to 42 countries. Data quality on securities has improved as the frequency of reconciliation of data from commercial

providers is now on a quarterly basis. Sector classification has also improved, with public and private splits now available for banks, nonbank financial institutions, and other businesses. Use of commercial data providers on domestic issues is being assessed, and a decision was expected by the end of 2003. Time series on international securities have been improved, having been carried back to 1966.

International Financial Statistics

The Committee was informed that the BIS continues to increase the number of participating central banks in its international banking statistics: by the end of 2003, Greece and Mexico began participating in the statistics on international bank activity on a locational basis and Australia, Greece, and Mexico joined the statistics on country risk exposures on a consolidated basis (Australia already participated in the locational statistics). It was noted that data quality has also improved, with data on loans, securities, and other assets and liabilities being provided separately in the locational statistics by nearly all participants, and information on currency and country breakdowns in the locational statistics, and on an ultimate risk basis in the consolidated statistics having generally improved. Most participating central banks submit their data to the BIS within 12–13 weeks. As of end-2004, the BIS will be collecting enhanced consolidated banking data that will cover more detailed and comprehensive data on country risk exposures on an ultimate risk basis including exposures from derivative instruments.

For data on foreign exchange and derivatives markets, the Committee was advised that a record 52 countries will participate in the next BIS triennial survey, which will be conducted in April 2004 and will cover turnover data on foreign exchange and OTC derivatives market activity on a locational basis and at end-June 2004 covering positions outstanding on OTC derivatives market activity on a consolidated basis. For the April part of the survey, nondeliverable forwards (NDFs) will be identified separately. The BIS also collects and publishes statistics on most OTC financial derivatives on a semiannual basis, covering stock data on notional and market values from approximately 60 major dealers in the Group of Ten countries on a consolidated basis. In addition, the BIS compiles and disseminates quarterly data on turnover and amounts outstanding for exchange-traded derivatives. Data quality in the forthcoming triennial survey is expected to improve by the following: (i) the definition of "dealers" and "in-house" or related-party deals has been clarified; (ii) data will be collected consistently on a sales desk basis, as opposed to a trading desk basis; and (iii) there will be greater use of concrete examples for data reporting in the guidelines to the survey. It is hoped that the data will be reported earlier than in the previous survey, so that turnover data can be disseminated a month earlier in September and amounts outstanding data a month earlier in November 2004. The Committee was told that an increase in the frequency of the release of the semiannual OTC derivatives statistics was not possible for the time being.

Direct Investment and Direct-Investment-Related Issues

The Committee gave consideration to a number of issues related to direct investment, including borderline issues, investment vehicles, the SIMSDI, a proposal for a feasibility study of a possible internationally coordinated survey of direct investment position, that is, a CDIS, and harmonized reporting by multinational corporations.

Borderline Issues

At the Committee's 2002 meeting, the United States had presented a paper that raised several points on borderline issues, to which the Committee had been asked to provide written comments. At the 2003 meeting, a summary of those responses was presented. There was general support for the position of the United States on the treatment of mutual funds, that, in the main, they should not be classified as direct investors, though there may be circumstances where they might be considered direct investment enterprises. However, Committee comments showed the need for a definition of what constitutes a mutual fund, and how mutual funds are distinguishable from other types of collective investment schemes, such as trusts, and other similar investment vehicles (such as real estate investment trusts). As to the treatment of trusts by the United States, there was no disagreement with the U.S. position. Regarding permanent debt, there was no clear view on what might be done, but, as with mutual funds, there was a general view that permanent debt needed to be defined more clearly. The Committee responses did not support the practice in the United States regarding the specific exemption from direct investment of transactions and positions between nonfinancial parents in the United States and their financial affiliates in the Netherlands Antilles. As to shell companies, there was no consensus, but several responses noted that the U.S. approach would lead to global asymmetries. There was general support of the approach by the United States regarding the treatment of agents, and support for the new manual to be more precise on this topic. The responses also supported the approach in the United States to the treatment of corporate inversions, and that the existing treatment of financial derivatives is appropriate.

Two specific issues were raised in the response of the United Kingdom. The first is with regard to a corporation with dual residence, that is, where it is incorporated in the United Kingdom and in another country: all the transactions, assets, and liabilities are allocated in a fixed proportion between the two countries. The second issue was with respect to "toll processing" within a corporate family. Goods are sent from the parent to a foreign affiliate for processing, and then returned without a change of ownership. A processing service charge is recorded, rather than exports and imports of merchandise, which is what *BPM5* recommends.

In light of these responses, the Committee indicated support for a proposal that the new manual should include a recommendation for a supplementary ownership-based presentation. It also discussed whether the current 10 percent rule for the establishment of a direct investment relationship should be revisited in light of the international accounting standard that uses 20 percent. Opinions were mixed, ranging from emphatic support for the proposal to an equally strong disinclination to reopen the issue. Given this diversity of views, it was decided that there was a need to consider the issue further. It was also proposed that the IMF's Statistics Department take up this issue with the WIIS.

Following on from the paper that was presented in 2002, the United States presented another paper on issues related to the borderlines between direct and portfolio investment. The paper explores issues related to whether mutual funds with "feeder/master" relationships and some types of hedge funds (especially those involving limited partnerships) might be considered to have direct investment relationships. The paper also raises questions about the appropriate classification of holding companies with cross-border relationships. It noted that, whereas, in the Standard Industrial Classification (SIC), trusts are treated as financial entities, and estates are not, in the North American Industry Classification System (NAICS), trusts and estates are both treated as financial entities. Moreover, in the SIC shell companies are not explicitly mentioned, but in NAICS they are not classified as financial entities. In the United States, all three types have been treated as financial entities, but, beginning in 2003, with the adoption of NAICS, the United States treats trusts and estates as SPEs, but not shell companies. The paper also discussed the question of the treatment of insurance intercompany/branch claims, noting that these should not be considered to be direct investment, if they represent technical reserves. On the other hand, the paper argued that private equity funds in which the ownership share meets the 10 percent threshold should be treated as direct investment.

The Committee found that the paper raised some very important questions. It was of the view that holding companies that hold only domestic companies be classified on the basis of the activities of their principal operating companies. However, the Committee was not clear whether this same principle should be applied in the case where the holding companies hold only foreign operating companies.

Treating SPEs as financial or nonfinancial entities would affect the treatment of transactions between them (as to whether or not nonequity and nonpermanent debt transactions were recorded as direct investment). The Committee felt that, for some uses, there were those who preferred to "look through" SPEs (though this is likely to lead to global imbalances as different compilers will treat them differently), while it was noted that they perform some function, which might suggest that they be shown in a supplementary presentation. As to the treatment of positions on insurance technical reserves of policyholders between related entities, the Committee felt that *BPM5* clearly indicated that these were not direct investment. The Committee agreed that all these issues needed to be addressed in the new balance of payments manual.

Survey of Methodological Standards for Direct Investment

At the end of October 2003, the IMF published *Foreign Direct Investment Statistics: How Countries Measure FDI, 2001*, which contained the results of the joint IMF/OECD update of the 1997 SIMSDI.[5] The 2001 SIMSDI update was restricted to 61 countries—a subset of the 114 countries that participated in the 1997 SIMSDI—and covered the 30 OECD countries and 31 other countries, including all subscribers to the Special Data Dissemination Standards.

The report on the results of the 2001 update showed that there have been marked improvements since 1997 in both the availability of direct investment statistics, particularly in position data, and in the application of a number of the recommendations set out in *BPM5* and *BD3*.[6] However, it also showed that there are gaps in the available data and there remain a number of important areas where the majority of countries surveyed have not yet implemented the international recommendations. The

[5]Copies of this publication were distributed to members of the Committee in early November 2003.

[6]Summary metadata prepared in consultation with the countries and cross-country comparison tables organized by statistical issue have also been posted on the IMF's website, see http://www.imf.org/external/np/sta/di/mdb97.htm.

report provided a wealth of information on country compilation and dissemination practices and how these practices compared across countries and against the recommendations set out in the international statistical manuals.

At the request of the IMF's Executive Board for a seminar on the topic of foreign direct investment, the IMF's Statistics Department prepared a paper, "Foreign Direct Investment Trends and Statistics" (SM/03/363, October 28, 2003), and a summary paper (SM/03/363, Supplement 1, October 28, 2003). These papers drew heavily on the SIMSDI results.

The IMF and OECD are launching another joint SIMSDI survey in late 2003. The questionnaire for the 2003 SIMSDI has been modified to take into account the changes in the methodology introduced since 1997, and will be sent to significantly more countries than the 61 covered by the 2001 SIMSDI update. As with the 2001 update, summary metadata drafted in consultation with national compilers and cross-country comparison tables will be prepared and are expected to be posted on the IMF's website in late 2004. A joint IMF/OECD report will also be prepared and is expected to be published in 2005. At the seminar, the IMF's Executive Board supported continuing the SIMSDI exercise and extending it to cover a larger segment of the IMF's membership.

Coordinated Direct Investment Survey

The Committee's views were sought on a proposal that the IMF's Statistics Department had taken to the IMF's Executive Board to undertake a feasibility study as a possible precursor to a CDIS. Such a survey would build on the successes of the CPIS and SIMSDI. The proposal is for the feasibility study to be conducted in 2004 and early 2005, and, if the results indicate that a full survey can be undertaken, that it would be conducted, at the earliest, in 2007. The proposal is for benchmark positions data, broken down by counterpart jurisdiction. The Statistics Department had advised the Executive Board of the potential value of a CDIS, in the light of the key importance of direct investment data and the discrepancies in the existing data. It also advised the Board of the complexities of such an undertaking. The Department had stressed the importance of conducting a feasibility study before embarking on a much more ambitious exercise than either the CPIS or SIMSDI. The Board had supported the idea of a feasibility study, even while recognizing the difficulties of a fully fledged CDIS. It was noted that the feasibility study and the work on direct investment for the new manual would be undertaken in tandem. Work would need to be done on various methodological issues before the full survey could be carried out. The feasibility study would be carried out in conjunction with the OECD and other international organizations with an interest in direct investment statistics, with the work being undertaken at the same time as the DITEG, so that the CDIS, should it proceed, would be based on the new methodological standards in the new balance of payments manual and BD4.

The Committee generally supported the proposal, but recognized the difficulties that a CDIS would involve. Among these, the Committee felt that a common basis for valuing direct investment positions would be the most problematic.

The Committee was informed of progress on a joint project between the ECB and Eurostat on the harmonization of reporting by multinational corporations (MNCs). While offering the prospect of considerable synergies to reduce respondent burden, the process still required considerable further work. Most of the reactions from MNCs to an initial approach by the two agencies had indicated a general level of support, but, for many of the MNCs, much of the information that would be requested under a Uniform Reporting Model was not readily available and would require major investment in information technology. The Committee was advised that, if harmonized reporting for MNCs were to be adopted in the EU, there would be possible benefits for non-EU countries, leading to a unified reporting format for all national compilers.

Income

Following on discussions on income at its meeting in 2002, the Committee received several papers on the subject at its 2003 meeting. A paper from Canada noted that, during recessions, dividends have been paid in excess of the enterprise's earnings. While this would, without the imputation of reinvested earnings, have led to a deterioration in the net lending of the enterprises concerned, with the imputation of reinvested earnings, such a deterioration is not observed. The Canadian paper argued that the imputation of reinvested earnings series tended to be counterintuitive. The paper also indicated there also are concerns in Canada about inconsistencies between the imputation of reinvested earnings in balance of payments statistics and the absence of a similar imputation between similar ownership relationships in resident:resident relationships where there is an equivalent ownership level (that is, 10 percent or more of ordinary shares or voting power). The paper also noted that, for the accounts for the rest of the world in the national accounts, reinvested earnings are excluded, with a reconciliation statement provided as a link to the balance of payments. At Statis-

tics Canada, there is concern about imputing a flow when there has not been a transaction.

Related to the paper from Canada was one from IMF staff that elaborated on a similar paper presented to the Committee at its 2002 meeting, identifying apparent inconsistencies in the treatment of returns on holdings in equity. Four alternatives were proposed in the paper to address some of these inconsistencies: (i) treat dividends payable as the only distribution of earnings of corporations and unincorporated entities (thereby eliminating reinvested earnings and the imputation of premium supplements on the technical reserves of life insurance companies and pension funds); (ii) retain the present treatment, but extend to situations where one resident entity holds 10 percent or more in another resident entity (thereby creating symmetry between resident:nonresident relationships and resident:resident relationships); (iii) reroute all saving of corporations and unincorporated entities to the ultimate beneficial owners (thereby reducing all saving by the financial and nonfinancial business sectors to zero); and (iv) regard the payment of dividends as a withdrawal of equity (thereby eliminating any *income* on equity).

The Committee found that the paper raises fundamental questions on income and saving, issues that also need to be taken up in other forums (such as the review of the *1993 SNA* and Eurostat's *European System of Accounts 1995* (*ESA95*). Given that the review of the *1993 SNA* is not intended to involve major changes, it is very likely that a major project of this nature may lie beyond the purview of the present exercise. Even so, the Committee thought that it might be worthwhile raising the issues with national accountants to see whether they would be prepared to consider the issue in this current review of the *1993 SNA*.

The Committee also received a paper from Japan on employee stock options, which also discussed the results of a survey conducted by the Bank of Japan on the use of stock options, payable to residents of Japan by nonresident corporations. Such arrangements are quite common, and have a long history (going back at least 20 years in some cases). The paper also pursued some of the classification issues, suggested that stock options be treated as financial derivatives, and recommended that the question of the appropriate treatment of stock options be considered in the revision to the *1993 SNA* as well as the new balance of payments manual. The Committee welcomed the paper, found it an interesting issue, and agreed that the treatment of stock options is a matter for the new balance of payments manual and the revision to the *1993 SNA*.

The Committee also was given papers by South Africa, the ECB, and the United Kingdom, on income-related topics. The paper from South Africa discussed the classification of mutual funds and the treatment of their earnings, and indicated that there is a case for showing share/units in mutual funds as a separate subclassification within equities, given their distinct nature and their growing cross-border importance. The paper also supported the position of the United States that mutual funds should not be direct investors under any circumstances, but that it is possible that they could be direct investment enterprises. The paper from the ECB noted that the approach by *ESA95* (that all saving by mutual funds should be deemed to be distributed to their shareholders, and then the portion that is not distributed as dividends is shown as being reinvested back in the mutual funds through the financial account) ensures consistency between creditor and debtor. However, the paper recognized that the approach in *ESA95* does not apply equally for interest of collective investment schemes and their income on equity. The United Kingdom provided the Committee with a presentation of what the United Kingdom provides to a group of its users, with regard to income in the balance of payments. It was noted that the issue of negative reinvested earnings had been discussed with this group, some members of whom doubt the usefulness of the artificiality introduced by these imputations. The Committee found these presentations very interesting and valuable input for the new manual.

The ECB also provided the Committee with a paper on the outcome of work that had been done comparing results on income credits and debits on portfolio investment between counterpart members of the EU. The paper pointed out that there are large differences, especially during periods of large changes in interest rates. The paper noted that there are different approaches to the calculation of income flows in different member states: from the use of market indicators for calculating accruals on a purely aggregate basis, to using aggregate data supplemented by security-by-security data, to pure security-by-security, and these different approaches may contribute to the differences in the results. The paper noted that, for example, the use of an aggregate approach, even when using the same conceptual basis, may produce different results from a security-by-security approach, as the weights of nonresident holdings is unlikely to be equal across all securities. The application of market rates may obscure these different weights. The paper also compared the advantages of these two approaches and concluded that the security-by-security approach, taken together with a central securities database, will tend to produce more accurate results. This approach, however, has to be set against the costs of setting up and maintaining a system to cope with the volume of transactions.

Uses of Balance of Payments and International Investment Position Statistics

The Committee was presented with a paper by Uganda on the uses of balance of payments and IIP statistics for highly indebted sub-Saharan African countries, using Uganda as an example. The paper gave a wide ranging description of the value of these data. It noted the role of the link between the balance of payments and the national accounts, in particular, with regard to public versus private sector saving, and how initially any shortfall in saving is made up by borrowing from the rest of the world. In the short term, this will lead to an appreciation of the domestic currency, but as debt levels rise, this appreciation will reverse itself. The paper noted that the form of financial inflows was important, indicating that direct investment in entities involved in the production of traded commodities was likely to be the most sustainable. The paper also drew the link between the balance of payments and monetary policy, especially when associated with a sharp increase in government borrowing that has been financed from abroad. This development prompts the need to sterilize this increase in liquidity domestically with sales of treasury bills to nonresidents. However, the paper notes that such a policy is not sustainable in the longer term.

The paper also raised data collection and quality consideration in an economy that has been liberalized quickly. In the Ugandan case, this liberalization had led to the removal of many restrictions, but, in so liberalizing, many of the data sources for the balance of payments and the IIP were lost. Uganda is endeavoring to recover these data sources, but it has proved very costly and a loss of time series.

The paper was very well received by the Committee, recognizing the importance that balance of payments compilers need to place on uses of their statistics, and the link to other data sets (such as the national accounts and the monetary and financial statistics). The Committee felt that the paper should serve as an important input on the chapter on uses in the new balance of payments manual, together with the South African paper that was presented to the Committee at its 2002 meeting.

Reporting Under BPM5

The Committee reviewed the progress countries were making in reporting balance of payments and IIP data to the IMF's Statistics Department on the basis of the classification system of *BPM5*, as well as the use of electronic reporting. For the 2003 *Balance of Payments Statistics Yearbook*, 157 countries reported balance of payments data using the coding system of *BPM5* (compared with 151 in 2002). One hundred and fifty-eight countries reported in electronic form (compared with 144 in 2002) Twenty countries are now reporting using the IMF Internet Correspondent System. One hundred countries now report quarterly balance of payments statistics to the IMF. A growing number of countries are reporting IIP data: for 2003, there were 83 comprehensive reporters, and a further 12 that provided partial IIP data.

Other Issues

The Committee also received papers on other issues, with potentially far-reaching implications for the compilation of balance of payments and IIP statistics, and the development of the new manual, on the links between international accounting standards and macroeconomic statistics; the use of an Internet survey for estimates of business travel estimates in France; and security measures for Internet reporting in Japan.

Two papers (one from the ECB, one from Eurostat) were presented on international accounting standards, and their links to macroeconomic statistics, specifically with regard to the International Accounting Standard (IAS) #39 ("The Recognition and Derecognition of Assets"). The Committee was informed that the European Commission has decided that for all listed companies the international accounting standards will become compulsory at the consolidated level, and that several member states have also required that individual entities will do so as well at the national level. As a result of these decisions, and because the IAS are close to the international statistical standards, there should be an increase in data quality at the national level. This was especially important for direct investment, for which EU member states use different accounting standards, and also given that EU member states are moving away from bank reporting systems to direct surveys to measure direct investment. Reinvested earnings would also likely be reported on a basis more in line with the current operating performing concept, as the IAS, if properly implemented, would also permit the separation of current operations from other holding gains and losses, for example. However, to the extent that some (unlisted) enterprises do not adopt the IAS there will be some inconsistencies in reporting compared with those that do. The Committee was also advised that the IAS is apparently moving to full application of market price principles for all assets and liabilities, including deposits and loans, which would be a major change from *BPM5*, which recommends the use of nominal value. To the extent that this change occurs, it would mean that the creditor approach to the measurement of interest would become more widely used. It was pointed out that the IAS for insurance, especially for

reinsurance, would assist the implementation of reporting for balance of payments purposes.

The Committee also recognized the potential impact that the adoption of fair value accounting would have on Basel II capital reserve requirements, and the associated implication for financial soundness indicators. It was noted that this issue causes tension between those users interested in market valuations (or proxies thereto) and those who feel that nominal value is a better principle for deriving debt-service ratios and sustainability. It was also pointed out that the same issue arises with regard to tradable instruments for both market prices and nominal values. It was noted that, while there is concern about estimation (as evidenced by provisioning, for example), fair value is considered to be more realistic, and the impact on capital and reserves would be recognized incrementally. It was noted that nominal value adjusted for loan loss provisions might be closer to realizable value. Overall, the Committee saw the potential advantages from the general adoption of the IAS. Although not much impact can be expected soon, as these standards will be adopted progressively, there were some concerns on conceptual grounds about the adoption of fair value. It was noted that the impact on the data of the introduction of IAS would generally be negative in the short-to-medium term, but that there appeared to be genuine longer-term benefits.

The Committee was informed that new sources of information for travel in France had been operational since April 2003, and were consistent with the previous data. The Committee was advised that one of these new data sources is a survey of Internet users. Up to 10,000 respondents are contacted each month to a filter question about foreign travel; a maximum of 500 respondents are identified. These are then asked further questions about their foreign travel. It was noted that business travel constitutes an important part of France's travel debits, and that 12 percent of all overnight stays outside France is for business reasons. It was also observed that two-thirds of business travel is outside the euro area, whereas personal travel by residents of France are more often within the euro area. Average business travel costs are substantially higher than personal trips, up to six times more. The Committee found this development to be very interesting, while recognizing that there were still some measurement issues that might need to be addressed.

The Committee received a paper on the security measures that the Bank of Japan is employing to secure information in an open network for electronic procedures on reporting data for balance of payments purposes. The procedures provide: (i) Bank of Japan server authentication; (ii) user authentication; (iii) data encryption; (iv) prevention of illegal access to the Bank of Japan server; (v) access control for electronic files at the Bank of Japan; (vi) access logging; (vii) virus checking; and (viii) backup. It was pointed out that there are many firewalls in sequence in the system, to maximize security and to ensure that the intranet system is secure. It was noted that many of the features in the new Bank of Japan system were modeled on those of the Bureau of Economic Analysis in the United States. Several Committee members thought that this paper had many useful features that could be considered for their own development of electronic reporting.

V. Future Work Program

Appendix 3 sets out in detail the medium-term work program agreed to by the Committee in 2003. Subjects are ranked by priority. The rankings are not intended to reflect the absolute importance of each topic but rather to reflect the relative priority assigned to each topic by the Committee, given the limited time and resources available for research and investigation.

Top priority for the Committee is (i) the updating of *BPM5*, (ii) direct investment issues, and (iii) data quality. For the updating of *BPM5*, the IMF staff will (a) prepare and disseminate the final version of the *Annotated Outline* to interested parties, especially balance of payments compilers, (b) draft several chapters of the new manual, and (c) prepare methodological documents for consideration by the Committee and technical expert groups. For issues relating to direct investment, IMF staff will provide progress reports on (i) the feasibility study to conducting a coordinated survey on direct investment positions, and (ii) the 2003 SIMSDI. As to data quality, Committee members will provide comments on the IMF staff paper on revisions policy for official statistics, and on the ECB's quantitative indicators for assessing data quality that were presented to the 2003 meeting of the Committee.

High priority is accorded to portfolio investment, investment vehicles, reverse transactions, and heavily indebted poor countries. For portfolio investment, IMF staff will report on the 2002 and 2003 CPISs, the TGTPH will report back to the Committee on progress in developing an approach to the measurement of third party holdings in major financial centers, and the ECB will report on progress on the implementation of its CSDB. Members of the Committee have been asked to provide comments on the paper from the United States on investment vehicles. For reverse transactions, the TGRT will provide progress reports on (i) the extent to which the software used by financial institutions in the United States could be adopted by financial institutions in other countries; and (ii) provide a paper on the "four transac-

tions" approach to measuring reverse transactions, including worked examples. Uganda and IMF staff will prepare a paper on how debt forgiveness, under the Heavily Indebted Poor Countries (HIPC) Initiative, is treated in the balance of payments and the IIP.

The Committee gave medium priority to global imbalances, implementation of *BPM5*, central clearing houses, international trade in services, external debt and the IIP, international financial statistics, financial derivatives, reporting systems, and data processing. IMF staff will prepare a paper that highlights imbalances, at a global level, in balance of payments statistics, and the TGRT will provide a report on central clearing houses. IMF staff will provide the Committee with a report on the activities of the Inter-Agency Task Force on Statistics on International Trade in Services. There will also be a report on the activities of Inter-Agency Task Force on Finance Statistics. The BIS will report on developments in international financial statistics, and Japan and France will present papers on changes to their reporting systems. Australia will provide a report on the restructuring and reengineering of its economic statistics program, while the United States will inform the Committee on the introduction of its survey on cross-border holdings and transactions in financial derivatives.

A paper by IMF staff on "short" positions was accorded a low priority.

VI. 2004 Meeting

The next meeting will be held at the South Africa Reserve Bank in Pretoria, in the week of October 25, 2004.

Appendix 1
IMF Committee on Balance of Payments Statistics: Composition as of December 31, 2003

Chair

Carol S. Carson
IMF, Statistics Department

Members

Zia Abbasi
Australian Bureau of Statistics
Abdulrahman Al-Hamidy[1]
Saudi Arabian Monetary Agency
Michael Atingi-Ego
Bank of Uganda
Stuart Brown
Office for National Statistics, United Kingdom
Teresa Cornejo
Banco Central de Chile
Robert Heath
IMF, Statistics Department
Teruhide Kanada
Ministry of Finance, Japan
Ralph Kozlow
U.S. Department of Commerce
Philippe Mesny
Banque de France
Lily Ou-Yang Fong
Census and Statistics Department, Hong Kong SAR
Michael Debabrata Patra
Reserve Bank of India
Neil Patterson
IMF, Statistics Department
Art Ridgeway
Statistics Canada
Eduardo Rodriguez-Tenés
Bank of Spain
Sergei Shcherbakov[2]
Central Bank of Russia
Hidetoshi Takeda
Bank of Japan
Ernest van der Merwe
Reserve Bank of South Africa

Representatives of International Organizations

Ayse Bertrand
Organisation for Economic Co-operation and Development
William Cave
Organisation for Economic Co-operation and Development
Ivo C. Havinga
United Nations Statistical Division
Jean-Marc Israël
European Central Bank
Markus van Wersch
Statistical Office of the European Communities
Rainer Widera
Bank for International Settlements

Secretariat

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[1]Mr. Al-Hamidy was accompanied by Mr. Jamal Al Kamees at the 2003 Committee meeting.

[2]Mr. Shcherbakov was unable to attend the 2003 Committee meeting.

Appendix 2
Terms of Reference of the IMF Committee on Balance of Payments Statistics

1. The Committee will oversee the implementation of the recommendations presented in the Report on the Measurement of International Capital Flows and in the Report on the World Current Account Discrepancy, advise the IMF on methodological and compilation issues in the context of balance of payments and international investment position statistics, and foster greater coordination of data collection among countries.

2. The Committee will bring to the attention of the IMF new developments that impact on the compilation of statistics of cross-border transactions or related stocks of financial assets and liabilities, and work with the IMF in determining how these activities should be treated in accordance with *BPM5*.

3. The Committee will investigate ways in which data collection can be better coordinated among countries, with a view, inter alia, to facilitating the exchange of statistics among countries (e.g., bilateral transactions or stock data). It will also identify related areas for study and determine how work in those areas should be carried forward.

4. In carrying forward its work, the Committee will collaborate with other national compilers and with appropriate international organizations.

5. In consultation with the IMF's Statistics Department, the Committee will determine its work program and will meet under IMF auspices at least once a year.

6. The Committee will prepare an annual report for presentation to the Managing Director of the IMF.

Appendix 3
Medium-Term Work Program of the IMF Committee on Balance of Payments Statistics: End-December 2003

Subject	Issue	Action
Top Priority		
Updating *BPM5*	Prepare and disseminate *Annotated Outline*, draft several chapters of the new manual, and prepare methodological documents for consideration by the Committee and technical expert groups	Papers by IMF staff and technical expert groups
Direct investment	Possible coordinated survey on direct investment positions	Progress report by IMF staff on feasibility study
	Survey of Implementation of Methodological Standards for Direct Investment	Progress report by IMF staff on the 2003 survey
Data quality	Follow up on IMF staff paper on revisions policy for official statistics	Committee members to provide comments
	Quantitative indicators for assessing data quality	Committee members to provide comments on ECB's paper to 2003 Committee meeting
High Priority		
Portfolio investment	2002 and 2003 Coordinated Portfolio Investment Survey	Report by IMF staff
	Third party holdings: Consultation with potential respondents	Progress report by technical group
	Development of central securities database	Report by ECB
Investment vehicles	Follow up on paper by United States	Committee members to provide comments
Reverse transactions	Practical aspects of treatment of reverse transactions, following up on U.S. systems to identify reverse transactions	Paper by working group on reverse transactions
	Conceptual paper on treatment of reverse transactions as both collateralized loans and transactions in the security, with examples	Paper by working group on reverse transactions
Heavily indebted poor countries	Treatment of HIPCs in balance of payments and the IIP	Joint paper by IMF staff and Uganda
Medium Priority		
Global imbalances	Indication of imbalances in global balance of payments statistics	Paper by IMF staff
Central clearing houses	Investigation of nature of operations	Paper by working group on reverse transactions
Implementation of *BPM5*	Update on implementation and practical difficulties in implementing *BPM5*	Paper by IMF staff on *BPM5* reporting to the IMF's Statistics Department
International trade in services	Implementation of *Manual on Statistics of International Trade in Services*	Paper by IMF staff on activities of the Task Force on Statistics of International Trade in Services
External debt and IIP	Improve reporting of external debt data within the IIP framework	Paper by IMF staff on developments at Inter-Agency Task Force on Finance Statistics

Subject	Issue	Action
International financial statistics	Use and improvement of international financial statistics	Paper by BIS
Reporting systems	Changes in manner in which data on balance of payments statistics are reported	Papers by Japan and France
Data processing	Reengineering of systems for economic statistics	Paper by Australia
Financial derivatives	New collection system for international transactions and positions in financial derivatives	Paper by United States
Low Priority		
Portfolio investment	Statistical treatment of short positions	Paper by IMF staff

IMF Publication

Debt-Sustainability in Low-Income Countries - Proposal for an Operational Framework and Policy Implications

INTERNATIONAL MONETARY FUND

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AND
INTERNATIONAL DEVELOPMENT ASSOCIATION

Debt Sustainability in Low-Income Countries—Proposal for an Operational Framework and Policy Implications

Prepared by the Staffs of the IMF and the World Bank

Approved by Mark Allen and Gobind Nankani

February 3, 2004

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Abbreviations and Acronyms

ARD	Agriculture and Rural Development
BADEA	Arab Bank for Economic Development in Africa
CBM	Credit-Buydown Mechanism
CEMLA	Center for Latin American Monetary Studies
CFF	Compensatory Financing Facility
CIRR	Commercial Interest Reference Rate
CPA	Country Program Assessments
CPIA	Country Policy and Institutional Assessment
DAC	Development Assistance Committee
DMFAS	Debt Management and Financial Analysis System
DRI	Debt Relief International
EIB	European Investment Bank
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GNI	Gross National Investment
HIPC	Highly Indebted Poor Country
ICRG	International Country Risk Guide
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFF	International Finance Facility
IMF	International Monetary Fund
JBIC	Japan Bank for International Cooperation
LICUS	Low Income Countries Under Stress
MDB	Multilateral Development Bank
MDGs	Millennium Development Goals
MEFMI	Macroeconomic and Financial Management Institute of Eastern and Southern Africa
NPV	Net Present Value
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
PPG	Public and Publicly Guaranteed (debt)
PRGF	Poverty Reduction and Growth Facility
PRSP	Poverty Reduction Strategy Paper
RER	Real Exchange Rate
SOE	State Owned Enterprise
UNCTAD	United Nations Conference on Trade and Development
UNITAR	United Nations Institute for Training and Research
WAIFEM	West African Institute for Financial and Economic Management

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EXECUTIVE SUMMARY

1. **This paper develops an operational framework for debt sustainability assessments in low-income countries and draws policy implications for donors, creditors, and borrowers.** Low-income countries face significant challenges in meeting their development objectives, especially the Millennium Development Goals (MDGs), while at the same time ensuring that their external debt remains sustainable. The aim of the proposed framework is to guide borrowing decisions of low-income countries in a way that matches their need for funds with their current and prospective ability to service debt, tailored to their specific circumstances. Given the central role of official creditors and donors in providing new development resources to these countries, the framework simultaneously provides guidance for their lending and grant-allocation decisions to ensure that resources to low-income countries are provided on terms that are consistent with their long-term debt sustainability and progress towards achieving the MDGs.

2. **While the concept of debt sustainability in low-income countries is somewhat different than in middle-income countries, excessive debt in low-income countries is a serious problem.** Given low-income countries' reliance on official flows, debt sustainability depends largely on the willingness of official creditors and donors to provide positive net transfers through new financing. Nevertheless, high debt levels can be problematic as they may require debt restructuring and forgiveness which is disruptive and costly and the burden of a debt overhang may undermine urgent progress on policy reform. High debt levels also force lenders to allocate scarce concessional resources in a manner that keeps high debtors afloat, often at the expense of other deserving countries.

3. **The proposed debt sustainability framework is based on two broad pillars: (i) indicative country-specific external debt-burden thresholds that depend on the quality of the country's policies and institutions; and (ii) an analysis and careful interpretation of actual and projected debt-burden indicators under a baseline scenario and in the face of plausible shocks.** The proposed debt thresholds are based on empirical analyses undertaken both at the Bank and the IMF which demonstrate that there is significant dispersion in the debt ratios that countries can sustain; countries with weaker institutions and policies are likely to experience debt distress at significantly lower debt ratios. Projections of debt burden indicators are essential for a forward-looking analysis, and need to incorporate, among other things, judgments on the evolution of domestic public debt and private external debt over the projection period as well as the impact of normal volatility on a country's repayment capacity. These two pillars, in combination with other relevant country-specific considerations, can help in the design of an appropriate external borrowing strategy under which the amount and terms of new financing would facilitate progress toward achieving the MDGs and generate a sustainable debt and debt-service outlook.

4. **The proposed framework has important policy implications for donors, creditors, and borrowers.** There are two broad areas where policy changes in donor and creditor assistance would be needed. First, creditors would need to review current lending

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policies to ensure that they appropriately reflect countries' risk of debt distress. This would almost certainly require an increase in the concessionality of financing to low-income countries, including an increase in the volume of grants. Second, since an appropriate mix of concessional loans and grants would provide only limited capacity to absorb large, unforeseen, exogenous shocks, creditors may also wish to consider new or modified concessional lending instruments to deal with such eventualities.

5. **While donors and creditors can help low-income countries achieve debt sustainability, the primary responsibility lies with low-income countries themselves**. As they strive to reach the MDGs, these countries will need to preserve debt sustainability by keeping new borrowing in step with the capacity to repay, adopting better policies and institutions that help accelerate growth, managing debt prudently, and increasing resilience to exogenous shocks.

6. **The debt sustainability framework proposed in this paper will have no bearing on the implementation of the HIPC Initiative.** The HIPC Initiative deals with the existing debt overhang in HIPCs and is built upon binding thresholds to achieve debt reduction, which ensures equal treatment of countries under this Initiative. The proposed debt sustainability framework, in contrast, serves the different purpose of informing judgments on appropriate future borrowing policies in low-income countries.

7. **Subject to both Boards' approval of the suggested approach, the next step will consist of developing detailed guidelines for Bank and Fund operations, consistent with the framework**. These will be prepared separately, but in a coordinated way, tailored to each institution's policies, practices, and lending instruments. Once such operational guidelines are in place, Bank and Fund staff will periodically review the experience with their implementation, introduce improvements as necessary, and more generally, continue to conduct research on the issues, in close consultation with partners and stakeholders.

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I. INTRODUCTION

8. **Low-income countries face significant challenges in meeting their development objectives, including the Millennium Development Goals (MDGs), without sowing the seeds for debt-servicing problems in the future.** In the past, despite access to low-cost financing, many low-income countries accumulated high levels of debt that imposed a heavy burden on their economies and ultimately required costly debt relief to be resolved. With many "graduated" HIPCs experiencing rising debt burdens again, and debt ratios in some other low-income countries also reaching elevated levels, there is a clear need for guidance on how much debt these countries can afford to accumulate.[1] Such guidance is particularly urgent in light of the sizeable spending requirements associated with achieving the MDGs. Attempts to meet these requirements through large additional borrowing, even if provided on concessional terms, could create serious debt-servicing problems in the future and undermine the very objectives they are meant to achieve.

9. **This paper develops an operational framework for debt-sustainability assessments in low-income countries outside the HIPC Initiative and draws policy implications for donors, creditors, and borrowers.**[2] [3] Many of the key issues were highlighted in a Fund staff paper of May 2003, and discussed by Fund Executive Directors during an informal Board seminar.[4] In the Bank, Executive Directors had an opportunity to discuss these issues in the context of two technical briefings in July and December 2003.[5]

---

[1] In post-completion point ("graduated") HIPCs, the calculated NPV of debt-to-exports ratios have risen due to a combination of weaker than expected export earnings (often reflecting depressed commodity prices), new borrowing, lower discount rates, and changes in exchange rates. See IMF and World Bank, *Heavily Indebted Poor Countries—Status of Implementation* (SM/02/264, 9/23/02, and DC2002-0020, 9/21/2002).

[2] For the purpose of this paper, low-income countries are defined as all countries that are eligible for IDA and PRGF loans, respectively.

[3] For the Fund's operational purposes, the debt-sustainability framework for low-income countries would complement the framework already adopted for countries with significant market access, see IMF, *Assessing Sustainability* (SM/02/166, 5/28/02) and IMF, *Sustainability Assessments—Review of Application and Methodological Refinements* (SM/03/206, 6/11/03).

[4] See IMF, *Debt Sustainability in Low-Income Countries—Towards a Forward-Looking Strategy* (SM/03/185, 5/28/03).

[5] See IDA, *Debt Sustainability in the Context of Achieving the Millennium Development Goals* (IDA/SecM2003-0453), July 22, 2003 and IDA, *The HIPC Initiative: Origins, Eligibility Criteria, Current Status and Future Challenges* (OM2003-0061), November 21, 2003.

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This report builds on the discussions at the respective Boards, and incorporates feedback from extensive consultations with various stakeholders.[6] The aim of the proposed framework is to guide borrowing decisions of low-income countries in a way that matches their needs for funds with their current and prospective ability to service debt, tailored to their specific circumstances. Given the central role of official creditors and donors in providing fresh funds to these countries, the framework simultaneously provides guidance for their lending and grant-allocation decisions to ensure that resources to low-income countries are provided on terms that are consistent with their long-term debt sustainability.

10. **Subject to both Boards' approval of the suggested approach, the next step will consist of developing detailed guidelines for Bank and Fund operations, consistent with the framework.** These will be prepared separately, though in a coordinated way, tailored to each institution's policies, practices, and lending instruments. Once such operational guidelines are in place, Bank and Fund staff will periodically review the experience with their implementation, introduce improvements, refinements, and alterations, as necessary, and, more generally, continue to conduct research on the issues, in close consultation with partners and stakeholders.

11. **The rest of this paper is structured as follows:** Section II discusses the concept and importance of debt sustainability in the specific context of low-income countries. Section III develops the proposed operational framework for debt-sustainability assessments, consisting of indicative country-specific thresholds and long-term projections and stress testing of debt-burden indicators. Section IV examines implications of the framework for creditors and donors, focusing on the need to provide financing on appropriately concessional terms and to design instruments that mitigate the impact of exogenous shocks. Section V probes the main implications for borrowers, acknowledging that they bear the ultimate responsibility for ensuring that their debts remain sustainable. Section VI presents the main conclusions, and Section VII summarizes the key issues for discussion.

II. Why is Debt Sustainability Important?

12. **The concept of debt sustainability in low-income countries is different from that in middle-income countries that rely primarily on private financing.** While low-income countries are a diverse group—ranging from poor countries with weak policy records and histories of war and civil strife to relatively advanced economies that have some access to private capital inflows and are on the verge of becoming emerging markets—most countries in this group rely predominantly on official financing (Figure 1). As a result, the

[6] The staffs of the two institutions consulted widely with government officials, bilateral donor agencies, representatives of multilateral development banks, academics, and non-government organizations. On all these occasions, helpful comments were received that have helped shape the proposed framework contained in this paper.

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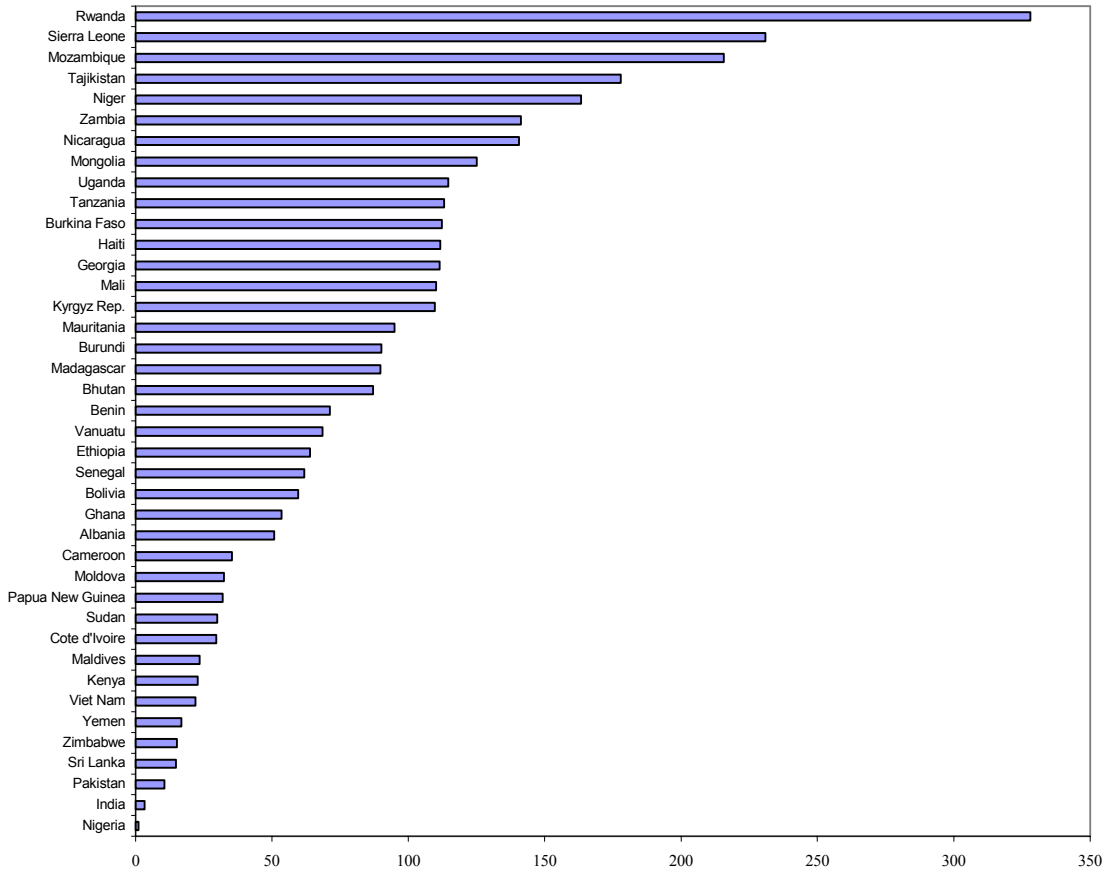
Figure 1. Official Development Assistance to Selected Low-Income Countries, Average 1995-2000 1/
(In percent of total government revenue, excluding grants)



Source: World Bank World Development Indicators, Global Development Finance, IMF Government Finance Statistics, 2003, and IMF staff estimates.
1/ ODA flows include loans and grants net of principal repayments.

sustainability of their debt—i.e., the condition that this debt can be serviced without resort to exceptional financing or a major future correction in the balance of income and expenditure—is largely de-linked from the sentiments of the market, as embodied in spreads on market interest rates. Indeed, to the extent that donors and creditors base the allocation of new aid flows on the implied *net* transfers to recipient countries—effectively providing more gross transfers to those countries with higher debt-service payments—debt sustainability is a particularly blurred concept in these countries.[7] Debt can be serviced for long periods, or

[7] Empirical analysis shows that this describes the past behavior of creditors and donors fairly accurately. See for example, Birdsall et al. (2002) and Powell (2003).

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suddenly become unsustainable, depending on the willingness of official creditors' and donors to provide positive net transfers through concessional loans and grants.

13. **Even though the risks are different, excessive debt in low-income countries is a serious problem, and debt sustainability remains an essential condition for economic stability.** The high cost of unsustainable debt for economic growth and development is borne out by the experience of many heavily indebted poor countries, and has been a focus of debate in the literature in the context of the debt-overhang theory. [8] In a nutshell, it can be argued that, if a country is expected to service and repay its debt from its own future resources, high debt creates adverse incentives associated with (present and anticipated) distortionary taxes. But if debt service that is considered excessive relative to the available resources is expected to be covered by increased aid flows or debt relief, this may undermine a government's incentives to maintain sound macroeconomic policies and increase its own repayment capacity.[9] An additional consideration is the cost of a debt restructuring itself, which can be highly disruptive to economic activity and undermines the development of a credit culture by eroding the sanctity of credit contracts. Moreover, as countries with heavy debt-service obligations require larger gross official inflows to finance a given primary deficit, they are more vulnerable to a discontinuation, or interruption, of official flows—or to a general shift in aid policies as a result of changing priorities of creditors and donors. This issue may become more pressing in the future, because the predominance of multilateral debt, both in existing stocks and new borrowing, reduces these countries' ability to have temporary liquidity problems alleviated through Paris Club reschedulings. With very limited alternative financing options, these countries face higher risks not only of becoming unable to meet their debt-service obligations, but also of seeing their social and developmental progress halted, or even reversed, in the event that official aid recedes. This creates uncertainties about the future that tend to discourage governments and private investors from engaging in longer-term commitments. Finally, a rising share of revenues devoted to debt-service payments—even if financed by new aid flows—weakens a government's ability to implement its own policies, particularly as aid flows are often earmarked. The result can be a severe loss of ownership that undermines public support for policy reforms and brings governments under pressure to renege on their debt-service obligations.

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[8] The literature on the debt overhang, which was originally developed in the context of middle-income countries' excessive indebtedness to private creditors but has been increasingly applied also to low-income countries, is vast. A few prominent examples are Cohen and Sachs (1986); Krugman (1988); Sachs (1989); Cline (1995); Agénor and Montiel (1996); and Servén (1997). For a summary of the literature, see Patillo et al. (2002), as well as Loko et al. (2003).

[9] These adverse incentive effects are part of the motivation for donors and creditors to link aid flows increasingly to indicators of policy performance.

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14. **The above problems are exacerbated by certain characteristics of many low-income countries that adversely affect their ability to cope with high debt.** These include: (i) risks of misuse and mismanagement of resources, due to weak public institutions, poor governance, and generally low implementation capacity; (ii) returns on investment that frequently accrue only over the long term, and whose benefits (such as, from improved security and health care) may be diffuse and cannot be easily captured by governments in the form of higher taxes to repay debts; and (iii) narrow and highly volatile production and export bases that make these countries particularly vulnerable to exogenous shocks that can significantly worsen their debt dynamics. The more prevalent these factors are in a given country, the larger the risk that debt-service obligations, even on concessional terms, reach levels that undermine a government's ability to devote sufficient resources to areas of social and economic priority. This argues for a tailored approach to assessing debt sustainability in low-income countries that incorporates the extent to which countries are subject to such political, institutional, and structural risks.

15. **The corresponding risk to creditors from unsustainable debt burdens in low-income countries is that they may be forced into new lending or debt relief for the purpose of maintaining positive net transfers.** Such a policy implies that new loans today trigger the need for additional financing or debt forgiveness in the future, as the debt service may otherwise place an intolerable adjustment burden on the borrower. Since most official lending to low-income countries is concessional, a policy under which countries with high debt service systematically receive more new loans (or debt relief) is neither a fair nor transparent way of allocating scarce official resources. Within a given aid resource envelope, such an allocation mechanism, that effectively earmarks these resources to keep high debtors afloat, necessarily comes at the expense of other deserving countries, undermining efforts to direct funds in support of good policies.

16. **These risks highlight the importance of using the HIPC Initiative to break the cycle.** But the Initiative needs to be implemented successfully, and, in particular, countries that have not yet benefited from HIPC assistance need to adopt and maintain sound policies (Box 1). Beyond that, it is crucial that the ongoing implementation of the HIPC Initiative be accompanied by a new regime under which official lenders and donors allocate concessional resources on the basis of countries' policies and in support of the MDGs rather than on the basis of existing debt-service obligations arising from past borrowing decisions. The HIPC Initiative facilitates this regime change by limiting its support to those countries that are pursuing sound policies. But it can only be effective in the long run if lenders prove more successful than in the past in tailoring the provision of new loans to countries' future capacity to repay.

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Box 1: Implementing the HIPC Initiative

The HIPC Initiative was designed as a debt-reduction mechanism to end repeated debt reschedulings and defensive lending and thus provide a solid foundation to qualifying countries for achieving debt sustainability and accessing new resources for development finance. It constitutes a strong commitment of the international community to reduce substantially the external debt burden of heavily indebted poor countries that pursue prudent economic policies and implement agreed social and structural reforms, thus contributing to a process supporting growth and poverty reduction. Twenty-seven HIPCs, more than two-thirds of the 38 countries that potentially qualify for assistance under the Initiative, have reached the decision point, where the international community commits itself to providing sufficient assistance at the time of the completion point for these countries to achieve debt sustainability. The completion point is reached when the Executive Boards of the IMF and the World Bank decide that the country has met the agreed conditions for assistance under the Initiative. Debt relief committed to the 27 decision point countries accounts, in present value terms, for about 85 percent of the total expected relief for the 34 HIPCs for which data are available. Ten HIPCs have reached the completion point, most recently Nicaragua, in January 2004.

The Initiative has had a substantial impact in reducing debt stocks and debt service and reallocating the savings on debt-service payments to poverty-reducing expenditures. As a result of HIPC relief, debt stocks for the 27 HIPCs that have reached the decision point are projected to decline by about two-thirds in NPV terms; the debt-service-to-exports ratio declined from an average of 15.7 percent in 1998 and 1999 to 9.9 percent in 2002; annual debt service is projected to be about 30 percent lower during 2001-05 than in 1998 and 1999, freeing about US$1.0 billion in annual debt-service savings; and poverty-reducing expenditures increased from about US$6.1 billion in 1999 to US$8.4 billion in 2002 and are projected to increase to US$11.9 billion in 2005. Revised figures on debt relief and net aid flows also suggest that debt relief provided has been additional to other forms of external financing.

Eleven potentially eligible HIPCs face a substantial remaining challenge in reaching the decision point. Most of these countries are affected by conflict and several have protracted arrears. It is hoped that some of these countries could establish a policy performance record by the end of 2004 when the sunset clause of the Initiative takes effect. There may also be other countries, whose debt ratio has recently increased, that could be considered eligible for debt relief under the HIPC Initiative.

The process of reaching the completion point has generally taken longer than earlier envisaged. Delays have been experienced because of difficulties in maintaining satisfactory performance records in macroeconomic programs primarily due to fiscal policy slippages, as well as longer than previously anticipated time to prepare PRSPs. Currently, 10 of the 17 countries in the interim period (between decision and completion point) have satisfactory performance records in their macroeconomic programs.

Debt ratios in a few cases have deteriorated after completion point as a result of declines in commodity prices, under-delivery of debt relief by some creditors, higher-than-expected new borrowing, and a decline in discount rates. These were all factors in the case of Uganda, for example. In Mali, the debt ratio has been adversely affected by declines in world gold prices, while in Bolivia substantial new borrowing due to widening fiscal deficits and substantial financing for a large energy project have been important factors.

Overall creditor participation has been strong and is improving, but is not yet unanimous. All Paris Club bilateral creditors and multilateral creditors representing more than 99 percent of debt relief required from this group have agreed to participate in the HIPC Initiative. Among non-Paris Club creditors, countries representing more than 80 percent of the required NPV contributions have made some debt-relief commitments, but 24 members have not yet indicated their agreement to participate. Participation by commercial creditors has been limited. Their share of the outstanding debt stock has been substantially reduced through the Debt Reduction Facility for IDA-only countries. For the 27 Decision Point countries, commercial debt account for only 2.4 percent of HIPC assistance, in present value terms. Nevertheless, a recent survey indicated that of 28 HIPCs, nine were facing litigation on credits held by commercial creditors, and settlement of such claims could involve substantial costs for debtors.

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17. **Notwithstanding the strong arguments for keeping low-income countries' debt levels manageable, designing an optimal borrowing (and lending) strategy is far from straightforward.** While an overly conservative approach to new borrowing may unnecessarily constrain net inflows—hampering the efforts of low-income countries to attain their development goals—too permissive a framework risks sowing the seeds of future debt-servicing problems. Given that repayment obligations cover a time horizon of several decades, the uncertainties are large.

18. **These considerations suggest two key principles upon which a prudent financing strategy for low-income countries should be predicated:**

i. New lending should be geared to a country's capacity to carry debt—which in turn, depends on its ability to use these resources effectively for development and growth, and on its vulnerability to shocks.

ii. To the extent that additional resources, beyond a country's capacity to carry debt, may be productively employed to generate growth and achieve the MDGs—these resources should be provided in the form of grants rather than loans.

These principles assign a central role to country-specific debt sustainability assessments in determining the appropriate mix of loans and grants. The following section proposes an operational framework for undertaking such assessments and discusses some of the trade-offs and considerations involved.

III. An Operational Framework for Debt Sustainability Assessments

19. **A key consideration in designing an operational framework is the appropriate balance between rules and discretion.** A more standardized, rules-based approach generally implies greater transparency and promises to be more effective in disciplining future financing decisions. On the other hand, the heterogeneity of low-income countries argues for a more flexible approach that takes account of country-specific circumstances. Indeed, even a fairly standardized framework requires judgment at various stages of the analysis: projecting a country's debt burden and its debt-servicing ability; choosing the appropriate indicators to assess debt sustainability; and deciding what constitutes a debt level that signals distress by imposing an excessive burden on a country's existing or future resources. The following proposal seeks to balance these two dimensions, by establishing indicative thresholds for a range of debt-burden indicators that explicitly incorporate country-specific factors found to be most relevant for debt sustainability. These thresholds pertain to public and publicly guaranteed external debt which typically dominates low-income countries' total external and public sector debt, and is the portion most important to the official international community. However, the proposed framework recommends incorporating public domestic debt as well as private external debt, wherever relevant, into the analysis—although no thresholds are proposed for them. The approach does not eliminate the need for judgment in specific cases, but is intended to guide and discipline future financing decisions, since experience suggests

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that approaches based on judgment alone may be insufficient to prevent an excessive rise in debt.

A. General Considerations

20. **Analyses of debt sustainability are inherently forward-looking and probabilistic.** Whether a country—and specifically its government—will be able to service its debt depends on its existing debt burden as well as the prospective path of its deficits, the financing mix between loans and grants, and the evolution of its repayment capacity—namely (the foreign currency value of) GDP, exports, and government revenues. Projections of the debt dynamics provide a link between debt sustainability and macro-economic policies. At the same time, such projections are only as good as their underlying assumptions, and these assumptions have a particularly slender basis for the long time horizon implied by the average maturity of concessional loans. The scope for error is large—both on the upside and the downside—with past experience suggesting a systematic tendency toward excessive optimism.[10] Indeed, while the specifics differed across countries, a common theme behind the historical rise in low-income countries' debt ratios was that borrowing decisions were predicated on growth projections that never materialized. This experience points to the need for well-disciplined projections, including by laying bare the assumptions on which they are predicated and by subjecting them to rigorous stress tests that explicitly incorporate the impact of exogenous shocks.[11]

21. **Debt sustainability can be assessed on the basis of indicators of the debt stock or debt service relative to various measures of repayment capacity (typically GDP, exports, or government revenues).[12] Each of these indicators has its merits and its limitations, suggesting that they should be used in combination.[13]**

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[10] An analysis of projections made by Fund staff over the period 1990-2001 suggests a bias toward over-optimism of about 1 percentage point a year in forecasts of low-income country real GDP growth. The bias in projecting GDP growth in U.S. dollar terms, however, was considerably larger, at almost 5 percentage points a year.

[11] This is the approach in the Fund's framework for middle-income countries, where a baseline scenario depicts the likely evolution of the debt ratio, while standardized stress tests, calibrated on countries' historical performance, provide a probability-weighted indication of alternative debt outcomes.

[12] Conceptually, debt sustainability assessments should be based on a government's net worth, in present value terms, which is the difference between its debt and the present value of its future primary surpluses. However, given that such an assessment must rely on very long-term projections (theoretically covering an infinite horizon) they are less useful for practical purposes. Moreover such assessments do not identify potential liquidity problems.

(continued)

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➢ *Debt service* is the most obvious measure of the immediate burden that debt imposes on a country by crowding out other important uses of scarce resources by the borrower. Debt-service ratios provide the best indication of this claim on resources and the associated risk of payment difficulties and distress. In the same vein, low and stable debt-service ratios are the clearest indication that debt is likely to be sustainable. However, in light of the back-loaded repayment profiles typical of concessional debt, current debt-service ratios may understate the burden inherent in the existing debt stock. In principle, this problem can be avoided by examining the projections of debt-service ratios, but these projections are subject to very large uncertainties associated with making forecasts over periods as long as 40 years.

➢ *Debt stocks* provide a useful shorthand measure of the future debt service burden inherent in *existing* debt. This burden is best measured by the *present value of debt*, which—in contrast to its face value—captures the concessionality of outstanding obligations. Reliance on existing NPV-based indicators avoids the need for projections, but is not without problem, as such indicators compare future debt-service obligations with existing repayment capacity without taking account of countries' ability to grow. This is particularly relevant when maturity periods are long. Similarly, while the NPV-based indicators may signal debt-servicing difficulties some time in the future, they do not provide information on when these problems may become pressing. Moreover, NPVs are sensitive to the level of the discount rate and can be difficult to interpret when discount rates change with market conditions (see Box 2). The appropriate discount rate should ideally capture the long-term return on risk-free assets, suggesting an approach that filters out temporary fluctuations. For this reason, it is proposed that the discount rate for future NPV calculations outside the HIPC Initiative be set initially at 5 percent—the (rounded) current level of the U.S. dollar CIRR—and be adjusted by a full 100 basis points whenever market rates (measured by the 6-month average of the U.S. dollar CIRR) deviate from it by at least this amount for a consecutive period of six months. This proposal strikes a balance between the desire to keep the discount rate stable without de-linking it entirely from market conditions.

➢ Finally, the choice of the most relevant *denominator* depends on the constraints that are most binding in an individual country, with GDP capturing overall resource constraints, exports those on foreign exchange, and revenues those on the government's ability to generate fiscal resources. In general, it is useful to monitor external debt in relation to GDP and export earnings and public debt in relation to GDP and fiscal revenues. Similarly, external and public debt service are usefully expressed relative to exports and revenues, respectively.

The practical convention is therefore, to assess debt sustainability on the basis of the above mentioned indicators.

[13] See IMF (2003a), for a more extensive discussion of the pros and cons of individual indicators.

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Box 2. Methodology for NPV Calculations Under the Proposed Framework

The NPV of debt, which is derived by discounting the outstanding debt-service stream by an appropriate interest rate, provides a comparable measure of countries' effective debt-service burden. The idea is that the same nominal amount of debt in two countries, can imply a very different effective burden, depending on the interest rate charged and the repayment structure. By discounting the two debt-service streams by the *same* interest rate, the NPV captures this difference. It is therefore superior to the nominal debt stock in measuring the effective debt burden of countries on a comparable basis.

The key difficulty in deriving NPVs is the choice of the discount rate. An obvious choice is to use a risk-free, forward-looking "world market interest rate" as a common discount factor. The NPV can then be interpreted as the "commercial equivalent" of the debt stock, corresponding to the amount a country would have to put aside in reserves (i.e., invest risk-free) today, to cover its future debt-service obligations. Applying this notion in practice has led to the use of currency-specific commercial interest reference rates (CIRRs), which correspond to secondary market yields on government bonds in advanced economies with maturities of at least 5 years. CIRRs can, in theory, be interpreted as forward-looking, risk-free world market rates, and, at the same time, allow a market-based comparison of the "sacrifices" by different creditors (captured in the difference between the face value and the NPV of a loan).

Using CIRRs as discount rates, however, is not without problems.

- **First, it is not obvious how to interpret changes in NPVs due to movements in world interest rates.** Since the actual (nominal) debt-service payments on fixed-rate concessional debt do not change in response to movements in advanced economies' interest rates, one interpretation is that these changes simply reflect valuation adjustments without altering the borrowing countries' economic circumstances. An alternative interpretation is that to the extent that world interest rates embody information on expected future world inflation (consistent with the Fisher equation), lower (higher) interest rates would signal weaker (stronger) export earnings of borrowing countries in the future. In this wider interpretation of the NPV (that also embodies repayment-capacity considerations but is difficult to prove empirically) lower world interest rates are indicative of higher debt service-to-exports ratios, and thus, a higher risk of debt-servicing difficulties, in the future.

- **Second, in either interpretation, NPVs should only respond to lasting structural changes in world interest rates.** However, CIRRs fluctuate in response to temporary shifts in world-market conditions, and thus provide very noisy signals about long-term developments. While it is impossible to distinguish clearly cyclical from structural changes, a mechanism for filtering out some of the noise seems appropriate to guide long-term borrowing decisions.

- **Finally, the use of currency-specific CIRRs implicitly extends the exchange-rate assumptions embodied in interest differentials throughout the lifetime of a loan.** Since the underlying maturity of the bonds that determine the CIRRs is much shorter than the maturity of most concessional loans, discounting with CIRRs for different currencies exaggerates the exchange-rate movements justified by interest differentials. Using current U.S. dollar and yen CIRRs, for example, implicitly assumes an annual yen appreciation of nearly 3 percent vis-à-vis the dollar, which would translate into a cumulative appreciation of 200 percent over 40 years, to a rate of about 35 yen per dollar. On the other hand, using a common discount rate across currencies would ignore any exchange-rate information embodied in interest-rate differentials and potentially understate the cost of loans in low-interest currencies.

In balancing the above considerations toward a pragmatic operational solution, the following methodology is suggested for NPV calculations outside the HIPC-Initiative context: Debt-service data would be collected in the same currency as other balance of payments items (typically the U.S. dollar). In converting debt-service payments into a common currency, the authorities are advised to incorporate the information embedded in market-interest differentials over the relevant period (e.g. ten years). NPVs would then be derived on the basis of a common discount factor. The discount rate is proposed to be set initially at the (rounded) current level of the U.S. dollar CIRR of 5 percent, but will be adjusted by 100 basis points, whenever the U.S. dollar CIRR (6-month average) deviates from it by at least this amount for a consecutive period of 6 months. This proposal strikes a balance between the desire to insulate NPV calculations from temporary noise, without de-linking it entirely from long-term market trends.

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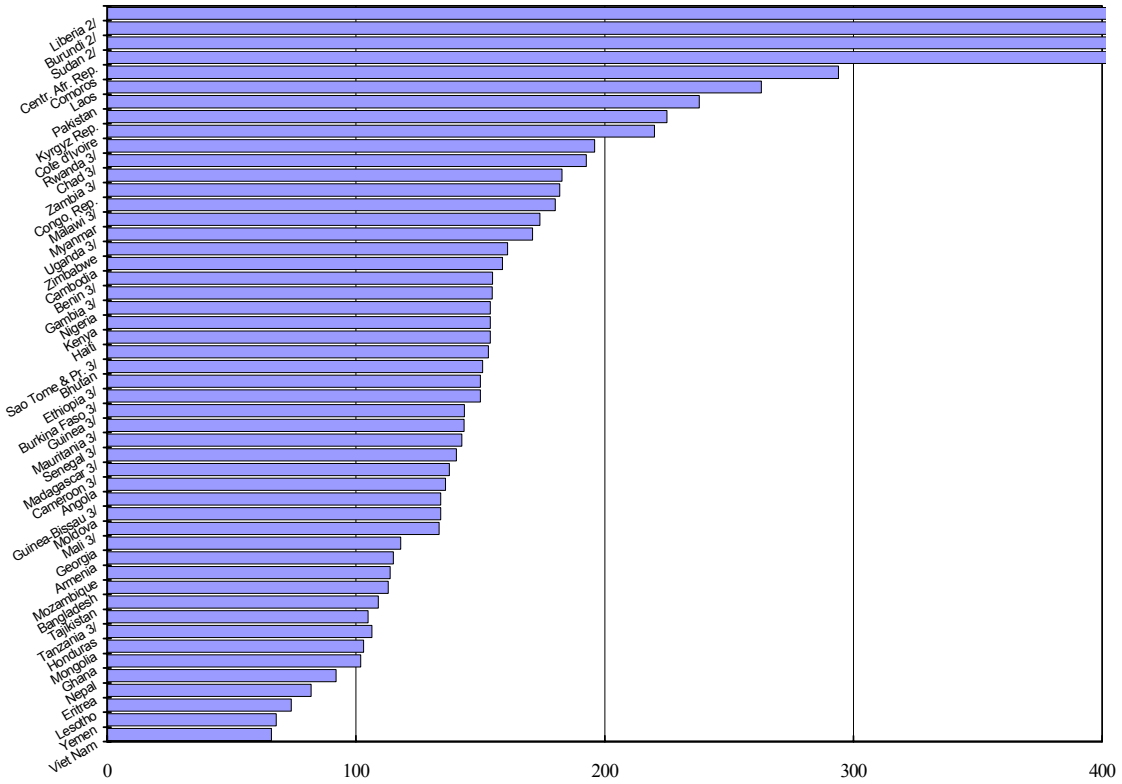
For these reasons, it is best to base debt sustainability analyses on a variety of indicators, acknowledging that each is important in signaling current or prospective constraints that a country may face in meeting its debt-service obligations. At the same time, some structure to assessing these indicators is desirable in an operational context. Accordingly, it is proposed that the framework will, in the first instance, focus on the debt stock in present value terms, as a summary indicator of the future obligations a country has already taken on, while the time path of debt-service indicators would be tracked to assess the likelihood and timing of liquidity problems. For illustration, Figure 2 shows the estimates of NPV debt stocks, relative to exports, for a selected group of low-income countries.

Figure 2. NPV of Debt-to-Exports Ratios in Selected Low-Income Countries, 2001 1/
(In percent)



Source: World Bank, Global Development Finance 2003; and official HIPC documents.
1/ NPV estimates incorporate the delivery of committed debt relief for those countries that had reached the decision point under the HIPC Initiative by end-2001 (see footnote 3). Exports reflect average exports of goods and services for 1999-2001.
2/ Liberia, Burundi and Sudan's NPV of debt-to-exports ratios were 1100, 1700, and 680 percent respectively; they have been truncated for scaling purposes.
3/ Denotes all HIPCs that reached the decision points by end-2001.

22. **Perhaps the most difficult judgment lies in choosing the appropriate threshold for assessing whether a country's current or projected debt burden is sustainable.** Clearly, this judgment needs to be informed by the experience of countries encountering debt-servicing problems at alternative levels of debt and with varying frequency. A growing body of empirical literature has examined episodes of "debt distress" in low-income

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countries (defined in terms of debt-servicing difficulties—arrears or Paris Club reschedulings—or the impact of debt burdens on growth), tracing these episodes to debt or debt-service indicators associated with a high probability of debt distress or adverse growth implications, sometimes contingent on other macroeconomic and institutional factors.[14] The specific results must of course be interpreted carefully, as the occurrence of debt distress, as measured, depends not only on an indebted country's difficulties in servicing debt but also on the response of creditors and donors—e.g., on whether to reschedule debt service or provide "new" financing. More generally, as the wider literature on early-warning systems has shown, there are inherent limits to the ability of such models to discriminate between cases in which countries will or will not run into difficulties. Countries experience debt-servicing problems for a variety of reasons specific to their circumstances, and only some of these can be captured in cross-country regressions. These caveats do not deny an important role for empirical thresholds in judging the sustainability of a country's debt dynamics, but warrant caution in using them too rigidly as binding constraints on new borrowing.

23. **In light of these considerations, the proposed methodology for assessing debt sustainability consists of two building blocks:** (i) the choice of appropriate threshold ranges for debt-burden indicators based on empirical findings and an explicit consideration of country-specific circumstances; and (ii) projection and interpretation of the debt-burden indicators under the policy baseline and under probable "stress scenarios" which incorporate a country's vulnerability to exogenous shocks. Both steps will require a significant element of judgment to create a balanced financing strategy for an individual country.

B. Empirical Thresholds

24. **As a first step, it is useful to explore the debt ratios at which low-income countries have run into—or managed to avoid—debt-servicing difficulties in the past**.[15] The upper panel of Figure 3 illustrates the frequency distribution for the NPV of debt-to-GDP ratios that were associated with debt-servicing difficulties, defined by significant arrears accumulation on official debt (equivalent to at least 5 percent of the total debt stock), while the lower panel shows the corresponding distribution for "non-distress" events (at least

[14] See, for example, Kraay and Nehru (2004) who find strong evidence for the importance of institutions and policies, as well as shocks, in determining the debt levels at which countries experience distress. Reinhart et al. (2003) explore the concept of "debt intolerance" in emerging market economies, which, they find, is related to these countries' repayment history, indebtedness level, and history of macroeconomic stability. Manasse, Roubini and Schimmelpfenning (2003) identify a range of solvency and liquidity factors that help predict debt crises—again applied to emerging markets.

[15] The frequency of debt distress and the associated debt-burden ratios depend on what definitions are used to signal debt distress, and on the sample included in the analysis. See Appendix I for a more in-depth discussion of this analysis.

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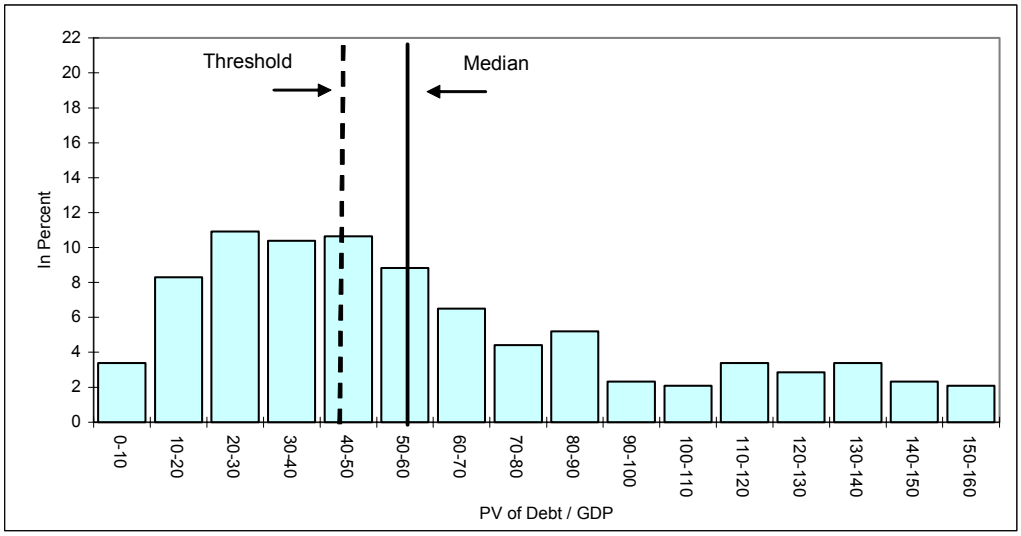
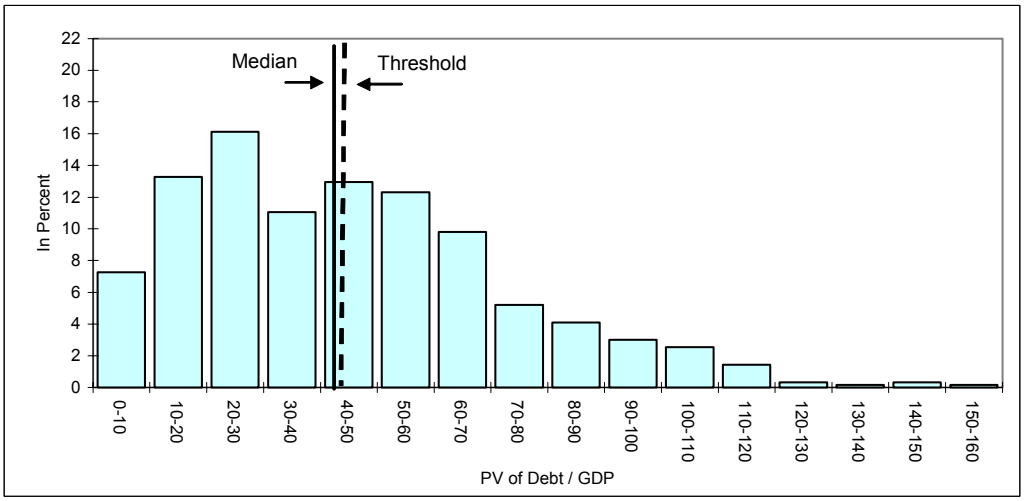
Figure 3. Frequency Distribution of the Present Value of Debt to GDP for Distress and Non-Distress Events

Debt Distress Episodes 1/



Non-Distress Episodes 1/



Source: Staff estimates.
1/ For the definition of distress and non-distress events, see Appendix I. The threshold is defined as the median PV of debt-to-GDP ratio in the year prior to distress.

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three consecutive years without significant arrears). A comparison of the two distributions, and of the median levels for the respective debt ratios, shows that "distress" episodes tended to be associated with a noticeably higher debt ratio. To derive debt sustainability thresholds from this analysis, it is useful to focus on the median debt ratio in the year prior to running into debt-servicing difficulties, which can be interpreted as a cutoff for distinguishing distress from non-distress events. This ratio, which is marked by the dotted line, is 43 percent of GDP, and is very similar to the thresholds derived under different methodologies in the empirical literature.[16] Accordingly, it appears to be a reasonable threshold at which an "average" country may be expected to run into problems. While useful as a first cut, such average threshold is nevertheless rather crude, since it disregards other factors that may have an impact on a country's debt-servicing ability, and thus does not discriminate well between distress and non-distress events. Indeed, the proportion of incidents in which countries either avoided debt-servicing problems at ratios above the threshold or, conversely, experienced difficulties at lower ratios—i.e., the magnitude of "type I" and "type II" errors—is large at about 36 percent each. The threshold analysis therefore needs to be refined by taking account of country-specific circumstances.

25. **Among the factors that influence the debt levels countries can sustain, the quality of policies and institutions turns out to be a key determinant.** Countries operating in a weaker institutional and policy environment are likely to experience debt distress at significantly lower debt ratios, as such countries tend to be more prone to misuse and mismanagement of funds and less capable of using their resources productively. This result, which is one of the key findings of Kraay and Nehru (2004), is corroborated by the Fund staff's empirical analysis in Appendix I, showing a very similar, and indeed large, impact of policies on the likelihood of distress. With the quality of policies measured by the Bank's Country Policy and Institutional Assessment (CPIA) index,[17] both studies come to the conclusion that countries operating in a weak policy environment (25th percentile of the CPIA) have the same risk of distress as countries with strong policies (75th percentile) at debt ratios that are lower by about 30 percent of GDP, 200 percent of exports, and 100 percent of revenues (including grants).

26. **As with any "early-warning" system, a crucial decision is which probability of debt distress one is willing to tolerate.** A higher probability allows for more debt, though

[16] See, for example, Cohen (1997) and Patillo et al. (2002), whose findings are discussed in Appendix I.

[17] The CPIA index groups 20 indicators into 4 broad categories: economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions. Countries are rated on their current status in each of these performance criteria, with scores from 1 (lowest) to 6 (highest). The index is updated annually. The country-specific ratings (in quintiles) for both the aggregate indicators and its main components are available at http://siteresources.worldbank.org/IDA/Resources/Quintiles2002CPIA.pdf.

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obviously at the greater risk of subsequent distress. One possibility, adopted by Kraay and Nehru, is to benchmark the probability on the average, or unconditional, likelihood of debt distress (which is 25 percent in their sample).[18] They therefore derive debt thresholds, contingent on the quality of a country's policies and institutions, such that the probability of

Table 1. Emprical Debt Sustainability Ranges (in percent) 1/

	Bank staff analysis 2/	Fund staff analysis 3/
NPV of debt-to-GDP	21-49	26-58
NPV of debt-to-exports	79-300	83-276
NPV of debt-to-revenue	142-235	138-264

Sources: Kraay and Nehru (2004); and Fund staff estimates (see Appendix I).
1/ Ranges correspond to CPIA policy ratings at the 25 and 75 percentile, respectively.
2/ Corresponds to a 25 percent distress probability.
3/ Corresponds to a 20 percent distress probability, consistent with an NPV of debt-to-GDP threshold for "average policies" of 43 percent (in line with the median in the year prior to distress).

debt distress at that debt level is 25 percent.[19] An alternative approach is to benchmark on the average (or unconditional) debt threshold at which countries have first run into debt-servicing difficulties. This is the approach followed by Fund staff in the analysis presented in Appendix I. By using the average threshold of 43 percent of GDP derived above, the probability of debt distress for a country with an average quality of policies and institutions turns out to be 20 percent.[20] Table 1 spells out the implied debt threshold ranges

[18] See Kraay and Nehru (2004).

[19] An unconditional distress probability of 25 percent means that there is a 75 percent chance that a given country in a given year will not experience any of the three indicators of distress used in the study for the next five years. Conversely, there is a 25 percent chance that at least one of the three incidents of distress will be observed in the next year, and will continue to be observed for at least three years.

[20] Four important explanations for the difference in the unconditional probabilities of debt distress are that the Fund staff study (i) focuses on low-income countries only, while Kraay and Nehru use a wider sample of developing countries; (ii) accommodates the smaller sample size by applying a less rigorous methodology to discriminate distress from non-distress events; (iii) applies a more restrictive definition of debt distress; and (iii) uses an NPV series

(continued)

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corresponding to the 25th and 75th percentiles of the CPIA index. While the results are very similar, it bears emphasizing that the implicit choice of distress probabilities remains a policy decision. The above ranges are guided by historical experience of debt distress, but higher or lower thresholds—and correspondingly higher or lower risk of debt distress—may be regarded appropriate in a forward-looking framework that attempts to balance the risk of debt distress with the need for new financing.

27. **Irrespective of what probability of debt distress is considered tolerable, the empirical evidence suggests that debt thresholds should be established in light of the quality of a country's policies and institutions.** Table 2 presents a translation of this notion into an operational matrix, by defining indicative policy-dependent debt limits, based on the (rounded) results of Bank and Fund staff's empirical analyses. As stressed above, while the

Table 2. Indicative Policy-Dependent Debt and Debt-Service Thresholds (in percent)

	Assessment of Institutional Strength and Quality of Policies		
	Poor	Medium	Strong
NPV of debt-to-GDP	30	45	60
NPV of debt-to-exports	100	200	300
NPV of debt-to-revenue	150	200	250
Debt service-to-exports	15	25	35
Debt service-to-revenue	20	30	40

Source: Staff calculations.

differences in debt thresholds between poor and strong policy performers are independent of the chosen probability, the absolute levels of these limits are a function of the probability for distress one is willing to tolerate. If the approach of centering the debt thresholds around the unconditional benchmark of about 45 percent of GDP is acceptable, these limits provide a useful basis to guide future borrowing (and lending) decisions—perhaps with a conservative bias, given that the underlying NPV data in the empirical analyses are derived on the basis of historical discount rates (either fixed average rates or variable CIRRs) that are higher than

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that is derived on the basis of a fixed discount rate of 7½ percent, while the NPVs in the Kraay and Nehru study are derived using (variable) CIRRs.

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current rates.[21] Finally, Table 2 also presents indicative thresholds for debt-service ratios based on the findings of Kraay and Nehru, and derived on the same basis as the debt-stock thresholds.[22] This would suggest that countries with strong policies and institutions may be able to sustain debt service of up to 35 percent of exports and 40 percent of revenues, while poor performers should limit these ratios to about half the size.

28. **The suggested approach implies that debt sustainability assessments incorporate an explicit evaluation of a country's institutions and policies.** While a number of historical indicators are available to help inform this assessment, it inevitably requires judgment. Besides the Bank's comprehensive CPIA index, which is published in quintiles and encompasses both objective macroeconomic criteria as well as subjective assessments by its staff, other historical indicators are available to complement the assessment. These include a governance index compiled by Bank staff along six dimensions,[23] other indices of transparency (such as Transparency International's country ratings) and of political risk and bureaucratic quality (such as the International Country Risk Guide), assessments of compliance with standards and codes undertaken in the context of FSAPs, and measures of the track record of policies under Bank- and Fund-supported programs. In addition, Fund staff has begun to explore ways in which to assess the quality of policies more systematically across member countries in the context of the forthcoming Global Monitoring Report. Beyond these historical indicators, the *prospective* quality of policies—which is the relevant concept—may also be influenced by new developments, such as emergence from conflict, changes in government, or recent reforms that are expected to have a significant bearing on future policy performance. Caution will need to be exercised, however, to prevent policy optimism from feeding into excessive levels of new borrowing before evidence of improvements becomes apparent.

29. **Besides the quality of policies and institutions, a country's susceptibility to shocks has been found to have a significant bearing on the debt levels it can sustain.**

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[21] Whether this introduces, indeed, a conservative bias to the framework depends on the interpretation of NPVs in response to discount-rate movements, as discussed in Box 2. Such a bias is less obvious if a lower discount rate is suggestive of a weaker prospective repayment capacity and consequently higher risk of debt distress for a given nominal debt-service profile.

[22] In the Fund staff analysis, the implicit debt-service thresholds are not very meaningful, because they are contaminated by the effect of arrears (consistent debt-service series are only available on a payment basis). Kraay and Nehru circumvent this problem by applying a more rigorous methodology to distinguish distress from non-distress events. Since this methodology effectively reduces the number of useable observations, however, it is not an option for the Fund staff analysis, which is based on a smaller sample of countries.

[23] See http://www.worldbank.org/wbi/governance/govdata2002/.

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Adverse movements in key macroeconomic variables can undermine a country's debt-servicing capacity and move debt ratios onto an explosive path. The variables that determine the vulnerability of a country's debt outlook include the volatility of its export earnings, output growth, and exchange rate path, as well as fluctuations in non-debt financing, including both grants and foreign direct investment. In a forward-looking framework, these factors are best captured through stress tests, calibrated to a country's historical volatility. It is proposed that the stress test results be interpreted in a manner such that a country's debt outlook should be robust (i.e., remain below its respective thresholds) not only in the baseline but also in the face of probable shocks.[24] While the specifics of this proposal—including the time horizon to which it applies—are elaborated in the following section, it should be stressed that this interpretation introduces a conservative bias to the framework; baseline ratios would have to be below the respective thresholds by a margin that corresponds to the impact of country-specific shocks. This conservative bias serves to counteract the empirical bias toward over-optimism in baseline projections of debt ratios.

30. **Finally, while other factors undoubtedly play a role in affecting an individual country's ability to carry debt, there are limits on the extent to which they can be captured systematically in the framework without making it too complex.** Such factors may include complementary indicators of a country's absorptive capacity and of a government's ability to devote its resources to servicing debt. In many instances, a useful proxy for this ability may be a country's per capita income level under the plausible assumption that poorer countries have more limited absorptive capacity and smaller cushions against shocks, while facing generally tighter constraints in diverting resources from low-priority areas toward debt service.[25] In addition, concerns about the denominators (GDP, exports, and fiscal revenues)—such as, measurement or coverage issues—may warrant caution in interpreting the debt-burden indicators. While the framework needs to have the flexibility to take account of such considerations, it is important that this does not undermine its overall purpose, which is to strike an appropriate balance between countries' short-term financing and longer-term sustainability concerns. It is therefore proposed that such factors that are considered important for an individual country's debt-servicing ability—and that are not captured already in the assessment of policies and macroeconomic volatility—be taken into account in the interpretation of the results of the debt sustainability analysis, discussed in the next section.

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[24] This provision would not be sufficient to deal with large, unforeseen shocks, which would require additional measures (see Section IV B).

[25] This argument is similar to the "tapering-in" proposal for aid flows, which suggests that new financing should grow in step with countries' administrative and absorptive capacity (see Collier and Dollar (2002), and Bulíř and Lane (2002) for a discussion). The notion that poorer countries tend to run into debt-servicing problems at lower debt levels is indeed supported by the staffs empirical analysis which incorporates per capita income as a statistically significant control variable in its probit regressions.

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31. **To summarize, cross-country empirical studies provide useful insights for assessing the sustainability of countries' current and projected indebtedness.** An important empirical finding is that there is significant *dispersion* in the debt ratios that countries can sustain, and that the quality of a country's macroeconomic policies and institutions has a crucial bearing on the levels associated with distress. The proposed framework builds on this finding, by making the quality of policies and institutions an explicit factor in setting indicative country-specific thresholds. Importantly, this approach implies that the established thresholds are inherently dynamic, as countries that advance and improve their policies and institutions will be able to sustain higher levels of debt. In contrast to the policy dimension, a country's susceptibility to shocks—while also of major importance for debt sustainability—will not be captured in the country-specific threshold but rather through stress-tests, by defining a prudent borrowing path that keeps debt ratios at sustainable levels also in the event of plausible shocks. Finally, a careful case-by-case judgment will be required to incorporate other considerations that are deemed to have a significant bearing on the debt and debt-service ratios countries can sustain.

C. Analysis of Current and Projected Debt Indicators

32. **Once indicative thresholds have been established, the second step consists of assessing and interpreting a country's current and prospective debt-burden indicators under the baseline and in the event of probable shocks.** The purpose of this second step is to examine the implications of current policies and possible shocks which may take debt to risky levels in the future. The proposed analysis consists of two elements: (i) projections and stress testing of the five relevant debt-burden indicators in a standardized format; and (ii) analysis and interpretation of the main debt-sustainability concerns.

Long-Term Projections and Stress Testing

Projections and stress-test results would be presented in standardized templates for public and external debt dynamics that lay bare the assumptions on which they are predicated. The proposed approach is an adaptation of the debt sustainability framework that has been applied in the Fund to countries with significant access to financial markets, including industrial and emerging market economies.[26] The suggested low-income country templates for external and public sector debt—to be used for debt-sustainability analyses outside the context of the HIPC Initiative which is governed by its own specific rules—are discussed in more detail in Appendix II, on the basis of two hypothetical country cases, and their interpretation is summarized in Box 3. The templates derive the path of the five main indicators—both under the policy baseline and under stress—and make explicit the key

[26] See IMF (2002) and IMF (2003b). For those low-income countries that rely strongly on private financing and hold only a small share of debt on concessional terms, it may be more appropriate to conduct the analysis on the basis of the framework for "market-access countries".

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Box 3: Debt Sustainability Analysis—Illustration of the Proposed Approach

This box summarizes the key features of the proposed approach for external and public debt-sustainability assessments which is illustrated, in more detail, in Appendix II, on the basis of two hypothetical country cases. In general, the sustainability of both external and public sector debt should be assessed separately, unless domestic debt of the public sector (external debt of the private sector) is negligible, in which case a single analysis of external (public) debt would be deemed sufficient. Moreover, in those low-income countries that have access to private international capital markets and hold relatively small amounts of concessional debt, the Fund's existing template for countries with "significant market access" may be a more suitable analytical tool to assess debt sustainability.

The results of the external debt sustainability analysis are summarized in the left-hand panels of Figure 4 for the hypothetical country A. Based on an assessment of Country A's policies and institutions, debt-burden thresholds of **40 percent of GDP** and **180 percent of exports** are deemed appropriate upper benchmarks for the NPV of its public and publicly guaranteed (PPG) debt, with a corresponding PPG debt-service threshold of about **20 percent of exports**. A comparison of the projected debt-burden ratios with these thresholds suggests that Country A's debt situation, while projected to improve in the long run, is tight over the medium term, with little room for borrowing beyond what is projected in the baseline.

Stress tests confirm this preliminary conclusion. The analyzed stress tests include a "historical scenario" where key variables are assumed to be at their historical averages, an "adverse financing scenario", simulated as a consistently higher interest rate on new borrowing, and so-called "bound tests" that model the implication of temporary adverse deviations in key parameters from the baseline projections—with the size of the deviations informed by Country A's historical experience, measured by averages and volatility. The interpretation of the bound tests is linked to projections 10 years ahead, at which point they correspond roughly to an average probability of 25 percent. Country A's historical scenario produces a considerable deterioration in the debt-burden indicators over time. The reason for the deviation from the baseline is the gap between current account deficits and FDI inflows, which is projected to shrink over time. Thus, a convincing case for the favorable outlook for FDI flows and the current account would have to made, in this specific case, to justify the baseline projections. Moreover, four of the six bound tests result in NPV of debt-to-GDP ratios that exceed the indicative threshold by 4-7 percentage points after 10 years. The analysis therefore suggests that country A should try to seek higher concessionality in its new financing or keep its borrowing levels below those envisaged under the baseline to create more room for maneuver in the event of adverse shocks. A revision of borrowing plans would seem warranted, in particular, if FDI inflows over the coming years fall short of expectations.

The analysis of public debt sustainability in Country B is summarized in the right-hand panels of Figure 4. Country B's government has considerable domestic obligations of 20 percent of GDP, which are included in the NPV simulations at their face value. However, due to HIPC assistance, the external component of Country B's public sector debt is below its assumed indicative thresholds of **45 percent of GDP** and **200 percent of revenues, including grants**, in present value terms. Both overall and external public debt are projected to improve considerably over time, on account of strong GDP growth (relative to Country B's history) and front-loaded fiscal adjustment. Total debt service, which absorbs more than 30 percent of revenues in the near term, is projected to fall rapidly, as expensive domestic debt is being reduced.

The stress tests, which are applied to total public debt, suggest that Country B's debt dynamics are particularly vulnerable to a weaker growth outlook. While the "historical scenario", as well as a "no-reform scenario" (akin to an unchanged primary balance) would imply a favorable debt outlook—though less optimistic than under the baseline—slower long-term growth would keep debt ratios high. Vulnerability to weaker growth is also confirmed by the "bound tests". Reflecting country B's poor and volatile historical growth record, the standard two-period shock to growth would be sufficient to keep the NPV of overall public debt high after ten years, at about 55 percent of GDP and 245 percent of revenues. With projected domestic debt of less than 7 percent of GDP and 30 percent of revenues, the implied ratios for PPG external debt would be slightly above their respective thresholds. Although total debt service would remain below 20 percent of revenues, Country B's borrowing strategy would have to be revisited, if the optimistic growth assumptions fail to materialize in the coming years. More generally, an adjustment strategy focused more strongly on raising revenues rather than relying on spending cuts, would appear more viable to protect priority expenditure in the event of adverse macroeconomic developments.

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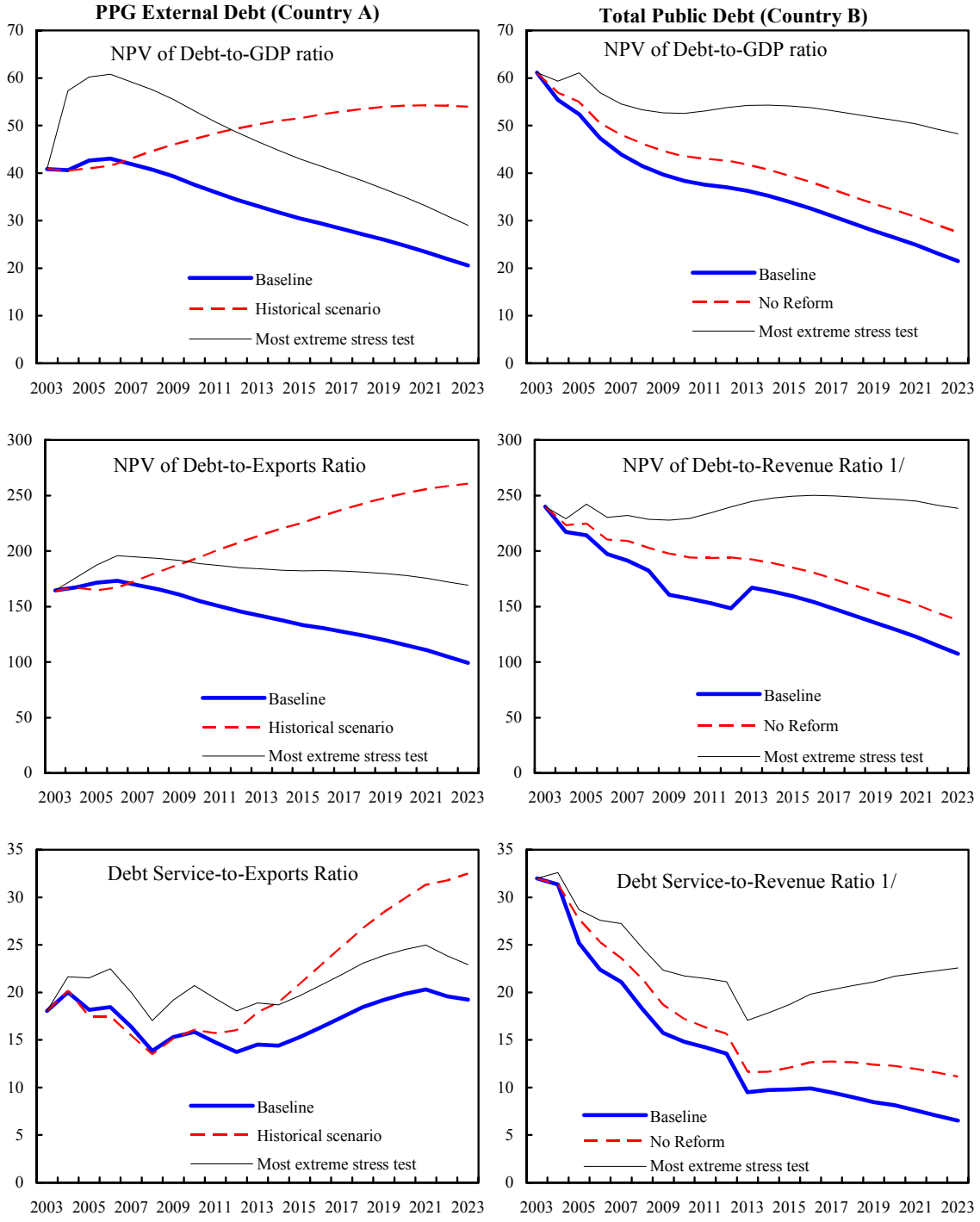
Figure 4. Simulations of Debt-Burden Indicators Under Alternative Scenarios, 2003-2023
(In percent)



Source: Staff simulations.
1/ Revenues are defined inclusive of grants.

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underlying assumptions and how they compare with a country's own history. The fiscal template derives the NPV of public external and domestic debt (the latter approximated by its face value) in percent of GDP and revenues, together with the public debt service-to-revenue ratio. The external template determines the NPV of public and private external debt (the latter, again, approximated by its face value), as a share of GDP and exports, as well as the external debt service-to-exports ratio. Both templates also provide explicit projections of the NPV of public and publicly guaranteed external debt, relative to the relevant denominators, to allow a comparison with the indicative thresholds. In light of the generally long maturity and grace periods, the projection horizon covers 20 years, which still implies that a sizeable part of the back-loaded debt-service obligations on new loans contracted on IDA, or other highly concessional, terms, will not be captured in the debt-service projections—though they are captured in the NPV of debt.

33. **The design of stress tests is adapted from the template applied in the Fund for countries with significant market access, to reflect the circumstances of low-income countries and the specific features of the proposed framework.** The role of the stress-testing exercise is twofold:

- As in the case of "market-access countries," the stress tests help discipline macroeconomic projections, including by comparing the underlying assumptions to the country's historical record. This is captured in the "historical scenario" that derives the debt indicators under the assumption that the key variables are at their historical 10-year averages. To the extent that debt dynamics in the program baseline scenario appear significantly more benign than would be implied by the country's previous record, careful justification for the more optimistic outlook would be required. In addition, the analysis also includes scenarios that depict the debt indicators in the event of less favorable terms on new financing (external debt template) or in the absence of fiscal-policy reform (public debt template).

- A second function of the stress tests—captured in the "bound tests"—is to examine the implications of shocks for the projected debt and debt-service path, based on a country's historical volatility. The link to a country's historical volatility implies that the deterioration in the debt-burden indicators relative to the baseline will be greater in those countries that have been more susceptible to shocks. Under the presumption that a country's projected borrowing path should be robust to "likely" shocks, the results of the stress-testing exercise would feed directly into the overall design of an appropriate financing strategy. In other words, even if the debt indicators under the *baseline* are below the thresholds deemed prudent for the country, the financing strategy should be reconsidered if they exceed the thresholds under the *shock scenarios,* specified at an appropriate point in time.[27] To avoid an unduly

[27] The time dimension is important, as the shocks are modeled to occur at the beginning of the projection period, implying more extreme (and less probable) deviations from the baseline in earlier years.

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conservative approach to new borrowing, the stress tests are designed to mimic relatively plausible shocks—corresponding to an average 25 percent probability over a 10-year horizon.[28] The trade-off is that this ex ante approach to volatility cannot deal with large exogenous shocks with a probability below 25 percent. Thus, low-income countries would still require contingency instruments to mitigate the impact of such shocks ex post (see Section IV. B).

Analysis of the Main Debt Sustainability Concerns

34. **The first step of the analysis consists of a comparison of the projected debt-burden indicators with the indicative country-specific thresholds established before.** The general presumption would be that the debt-burden indicators should remain below the thresholds in both the baseline and the stress scenarios. But even if this is the case, rapid changes in debt-burden indicators from low levels should be monitored closely, as they may signal an unsustainable policy path. When debt-burden indicators are above the thresholds, a careful interpretation is required to draw balanced conclusions about the sustainability of the debt outlook. Here, four principal situations can be distinguished: (i) most indicators are above the relevant empirical benchmarks; (ii) only one of the debt ratios is above its benchmark; (iii) the results of the public and external debt sustainability analyses differ significantly; and (iv) debt-stock and debt-flow ratios paint a different picture.

35. **In cases in which most indicators are above the relevant empirical benchmarks (either under the stress tests or already in the baseline), a country's debt situation would be considered a matter of concern.** The appropriate policy response will depend on the specific country circumstances but would generally involve some combination of policy adjustment to reduce the overall level of borrowing, and—where possible—a higher share of grant financing or increased concessionality on planned borrowing.[29] In practice, for countries with Fund- and Bank-supported programs such an outcome would generally trigger an iterative process, at the end of which the agreed policies and the amount and terms of new financing would result in debt dynamics that are deemed sustainable. For countries that already start off with debt ratios in excess of the indicative thresholds—perhaps as a result of a severe shock or weak policies in the past—debt ratios would be expected gradually to approach their indicative threshold levels, as some new borrowing may be required to avoid an unduly harsh policy adjustment should sufficient grants not be forthcoming.

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[28] Appendix III describes the calibration of the stress tests. The deviations from the baseline for shorter horizons are more extreme, corresponding to a considerably lower probability (e.g., less than 4 percent in the first year), which must be taken into account when the stress test results are interpreted.

[29] Obviously, for countries that are eligible but have not yet received assistance under the HIPC Initiative, the latter would be the first course of action to reduce debt ratios to sustainable levels, once policies are on track.

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36. **A careful interpretation is required when only one of the debt ratios exceeds its respective benchmark.** In this case, debt sustainability concerns may arise mainly from weaknesses in the specific variables used to measure debt-servicing capacity. Here, judgment will be needed to determine whether there is in fact a debt problem or some other kind of issue—for instance, statistical biases in measuring GDP, or particular weaknesses in revenue collection. A diagnosis of the latter may call for a different policy response—respectively, measures to improve the quality of data, or to strengthen revenue administration and widen the tax base—although in many cases these measures would need to be accompanied by cautious borrowing policies until they bear fruit. A careful interpretation of the results would also need to take account of other factors that influence a country's effective repayment capacity, such as high workers' remittances or significant re-exports (with a large import component) which would tend to ease or tighten a country's foreign-exchange constraint, respectively. Interpreting weaknesses in any of the denominators and identifying the appropriate response is a difficult but crucial part of the analysis.

37. **Careful judgment is also needed in cases in which the assessment of public and external debt differ significantly.** A large deviation between public and external debt ratios reflects either high public domestic or high private external debt.[30] The latter is unlikely to be an issue in most low-income countries and is also potentially less troublesome—unless the private sector is over-borrowing, which raises issues of contingent liabilities. The assessment of whether private sector debt is excessive and poses a significant risk for public debt sustainability must be made in the context of country-specific analysis, and dealing with such a problem would require a tailored policy response that addresses its specific origins.[31] Thus, while the external debt-sustainability template projects the total external debt ratio (including private obligations) as one important indicator, its central focus (including for the stress tests) is on public and publicly-guaranteed external debt—consistent with the empirical threshold analysis.

38. **High domestic debt of the public sector, on the other hand, has become a serious issue in a number of low-income countries and needs to be factored into the analysis.** While there are no empirical thresholds available to assess the appropriateness of total public debt in low-income countries, the inclusion of domestic obligations in the public debt-sustainability analysis is, nonetheless important. Domestic debt service—just like its

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[30] The appropriate coverage of the public sector is not always straightforward. For a discussion of the main considerations to guide this decision, see IMF (2003a).

[31] Excessive external borrowing by the private sector may be related to explicit or implicit government guarantees, including on the level of the exchange rate, and may be alleviated by improved prudential regulations on the banking sector. Ultimately, large external borrowing may require a correction of the current account via a sharp depreciation of the exchange rate which would directly affect the domestic-currency value of the government's foreign debt, in addition to its contingent liabilities.

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external counterpart—presents a drain on public resources that raises the risk of debt distress. Issuance of domestic debt instruments occurs for different reasons, making domestic debt measures more difficult to interpret (Box 4). For example, in a small number of strongly-performing countries, domestic debt has been accumulated in response to large external aid inflows.[32] In these countries, a key issue is the appropriate use and phasing of aid flows to ensure that they do not lead to excessive appreciation pressures on the domestic currency. In many instances, issuance of domestic debt reflects the explicit objective of promoting the development of domestic financial markets, which also serves governments' long-term goal of eventually issuing debt at reasonable cost in domestic currency. Whatever the reasons, the benefits of domestic debt must be carefully weighed against the potentially heavy burden it imposes on the budget, as for most low-income countries, it is currently a costlier form of financing compared with highly concessional external funds—even after exchange-rate risks are taken into account.[33] This implies, however, that the appropriate policy response would be to combine prudent external borrowing policies, informed by the indicative thresholds, with a strategy that contains domestic debt at "reasonable" levels. What level of domestic debt is reasonable, is a difficult question that does not lend itself easily to empirical analysis, as it depends on a variety of country-specific factors, including its purpose, cost, and coverage.[34] In short, while there are no empirical thresholds available to assess the appropriate level of domestic debt, it needs to be monitored and carefully interpreted. This is the reason why domestic debt is included in the proposed public sector debt-sustainability analysis, recognizing that its implications for an appropriate forward-looking financing strategy must be judged on a case-by-case basis.

39. **Finally, the analysis needs to distinguish between stock and flow problems, which tend to have different implications for an appropriate financing strategy.** A high debt-service ratio in the near term combined with a relatively low debt stock is indicative of liquidity needs that could be alleviated by additional (appropriately concessional) financing or conventional Paris Club flow reschedulings (if a significant amount of debt service is due

[32] In these countries, sizeable amounts of domestic debt have been issued to sterilize the expansionary monetary impact of foreign-exchange interventions, which were aimed at limiting the appreciation of the domestic currency in response to large aid inflows. For a theoretical analysis and discussion of three case studies (Uganda, Tanzania, and Mozambique) see Buffie et al. (2003).

[33] Very few low-income country governments (India's is an example) have been able to pay low interest rates on domestic debt. In this case, the above considerations must be modified.

[34] One important factor is, for example, whether pension liabilities are included in the debt statistics or not.

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Box 4: Domestic Debt in Low-Income Countries

For a long time, in the context of debt sustainability analyses, it was commonly assumed that different degrees of coverage of public debt were applicable to middle-income and low-income countries. Focusing on the external public debt burden was considered adequate for the latter, since their domestic debt levels were low. Domestic financial markets were relatively less developed and were not a significant source of financing.

In reality, however, the perception that domestic debt does not play an important role in low-income countries may have been partly the result of weak data availability. Indeed, although external debt remains the dominant source of public financing, for some low-income countries domestic debt is far from negligible. At end-2000—the latest date for which consistent information is available—6 out of 20 low-income countries with available data had a ratio of domestic debt to GDP greater than 25 percent (see table). Moreover, the table may understate the overall domestic debt burden of the respective governments. Not only is data often unavailable, in most cases the available data covers central government debt only, and excludes debt contracted by local governments and public enterprises[1].

Domestic Debt in Selected Low-Income Countries

2000	Domestic Debt as % of GDP	Interest Payments on Domestic Debt as % of GDP	Interest Payments on Domestic Debt as % of Revenues
Benin	5.8	0.1	0.6
Burkina Faso	18.0	0.2	1.6
Burundi	13.3	1.4	7.0
Cameroon a/	18.7	0.4	2.1
Cote d'Ivoire	20.4	0.4	2.3
Ethiopia a/	42.2	1.4	7.6
Gambia, The	31.4	3.5	18.8
Ghana	28.9	5.3	30.1
Guayana b/	36.9	2.1	11.8
India a/	67.5	n/a	n/a
Kenya a/	22.2	2.9	12.4
Liberia c/	57.0	1.0	7.8
Nicaragua	42.2	1.0	4.0
Niger	18.5	0.2	1.8
Nigeria	21.0	2.4	5.4
Pakistan a/	46.4	6.3	54.7
Rwanda	11.7	0.3	1.8
Senegal	6.7	0.2	1.0
Togo	24.2	n/a	n/a
Uganda	4.9	0.3	2.9
Yemen d/	11.1	1.9	4.8
Zambia	19.3	1.4	7.2
Average	25.8	1.6	9.3

Source: IMF Statistical Appendices; Central Banks and staff estimates.
Note: Data covers central government debt only, except for India, where the coverage is for the public sector, including the central government, state governments, and major public enterprises.
a/ 1999/00; b/ June 2000; c/ September 2002; d/ 1999.

Domestic financing often fulfils a buffer role, which may result in sudden increases in domestic debt stocks:

i. Domestic debt may surge because the government has to sterilize significant foreign inflows.
ii. The government may also issue domestic debt to mop up liquidity that has been created by supporting public sector banks in financial difficulties or to recapitalize insolvent private banks, as recently done in Nicaragua.
iii. Domestic debt may also rise as governments intentionally attempt to foster the development of the country's domestic financial market.

Domestic debt complicates the assessment of debt sustainability*:*

i. Domestic debt tends to be issued at shorter maturities and is therefore more vulnerable to roll-over risks.
ii. In the domestic market, unlike in the market for external debt, the government may be able to influence the cost of borrowing through its implementation of interest and monetary policies.
iii. Unlike external debt, domestic debt is usually issued at market interest rates and is therefore much more vulnerable to changes in the macroeconomic environment, and generally more costly in low-income countries.

[1] For example, in Ghana the central government's domestic debt stood at about 27 percent of GDP in 2001, but the ratio including local governments' and SOEs' was twice as high. (IMF, Ghana: Selected Issues, May 2003).

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to bilateral creditors). A high debt-stock with low current debt-service ratios is indicative of debt-servicing difficulties in the future. While long grace and maturity periods provide room for a gradual response to the debt-stock problem—acknowledging the opportunities for countries to grow out of excessive indebtedness before its implications, in terms of debt service, are felt—many of these countries' own history is a sobering reminder of the significant downside risks. Thus, a high debt stock generally calls for primary reliance on grant financing and only limited new borrowing on highly concessional terms—which is also more feasible as the low debt service contains overall gross financing needs. A combined debt-service and stock problem calls for more urgent measures, as the country will need financing to ease its liquidity constraints, without further undermining debt sustainability. In this situation, policies to alleviate the debt problem, including a prioritized and well-specified expenditure program and the mobilization of grant resources will need to be a major focus of any program.

40. **In sum, debt sustainability analyses for low-income countries should consist of two elements:** (i) indicative country-specific debt-burden thresholds that depend on the quality of individual country's policies and institutional environment; and (ii) an analysis and careful interpretation of actual and projected debt-burden indicators under the baseline and in the face of plausible shocks. These two pillars, in combination with other relevant country-specific considerations, provide an informed basis for the design of an appropriate country-specific borrowing strategy under which policies and the amount and terms of new financing would generate a debt and debt-service outlook that is deemed consistent with a country's prospective repayment capacity and supportive of its eventual graduation from official aid flows. In a number of cases, the application of this framework will likely generate the need for a significant increase in grant financing over the coming years to enable these countries to achieve their development objectives on a durable basis—i.e., without creating debt-service problems in the future. The policy implications for the global community are discussed next.

IV. Policy Implications for The Global Community

41. **The framework for debt sustainability has important implications for the level and terms of external financial assistance to low-income countries.** First, creditors would need to review current lending policies to ensure that they appropriately reflect countries' risk of debt distress. The tailoring of new lending decisions to the risk of debt distress would almost certainly require an increase in the concessionality of financing to low-income countries, and consequently, a higher volume of grants, to avoid a reduction in net transfers. Moreover, the explicit recognition of macroeconomic volatility in determining a country's borrowing capacity, combined with a reasonable degree of domestic adjustment should economic conditions weaken, would guard countries against normal volatility, but would not provide adequate protection against large unforeseen shocks. Therefore, creditors may wish to consider new contingent lending instruments and modify existing instruments to mitigate the adverse effects of exogenous shocks.

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A. Incorporating Debt Sustainability Considerations Into External Financing Policies

42. **To reduce the likelihood of future debt crises in low-income countries, it is important that creditors and donors provide new financing at levels and on terms that limit a country's risk of debt distress**. The appropriate amount of new loans, in present value terms, would need to be assessed on the basis of the debt-sustainability framework presented in Section III, and derived in the context of the country's macroeconomic framework. This would allow new borrowing (lending) volumes and terms to be consistent with long-term economic prospects and the risk of debt distress, but may, in some cases, require additional grants to prevent disruption to development programs. The provision of additional grants should consider a country's needs and its ability to use resources effectively and should reward countries following sound policies.

43. **Under this framework, countries with sound policies would receive a mix of loans and grants that would be consistent with their policy performance and their risk of debt distress.** Provided a country's policies are considered appropriate, the legacy of a high debt burden or vulnerability to shocks would not be a justification for denying it resources. Instead, the overall allocation of grant resources (including those embedded in the concessionality of new loans) would need to be based on policies and other relevant criteria. Thus, a country would neither be "rewarded" nor "punished" for a high debt level, in terms of the effective grant resources it receives—which is an important provision to avoid moral hazard. A country with low risk of debt distress, however, should be in a position to obtain more of its resources in the form of loans, implying higher nominal transfers for a given grant-equivalent. Box 5 examines two country examples to show what such a framework, if adopted in the past, would have implied for debt levels and the volume of grants required.

Implications for New Lending

44. **Given a country's macroeconomic projections, the framework described in Section III would yield the present value of new borrowing that would be consistent with debt sustainability.** Within the overall borrowing envelope, expressed in present value terms, a country would have greater scope to borrow, the higher the grant element of its new financing; at the same time, it would maintain flexibility to borrow at different terms from different creditors.

45. **There could be instances where creditors' willingness to lend to a country exceeds the level of borrowing compatible with debt sustainability.** With creditors continuing to base lending decisions on their priorities, objectives, and risk-bearing capacity, there may be situations in which they can make a convincing argument for lending levels that exceed those suggested by the standardized framework—for example a high-return project, or the likelihood that certain reforms could result in a distinct improvement in growth. In these (presumably) exceptional circumstances, the country authorities, supported by their creditors, would need to make a clear case for exceeding the indicative debt thresholds, and progress would need to be monitored carefully to ensure that higher levels of

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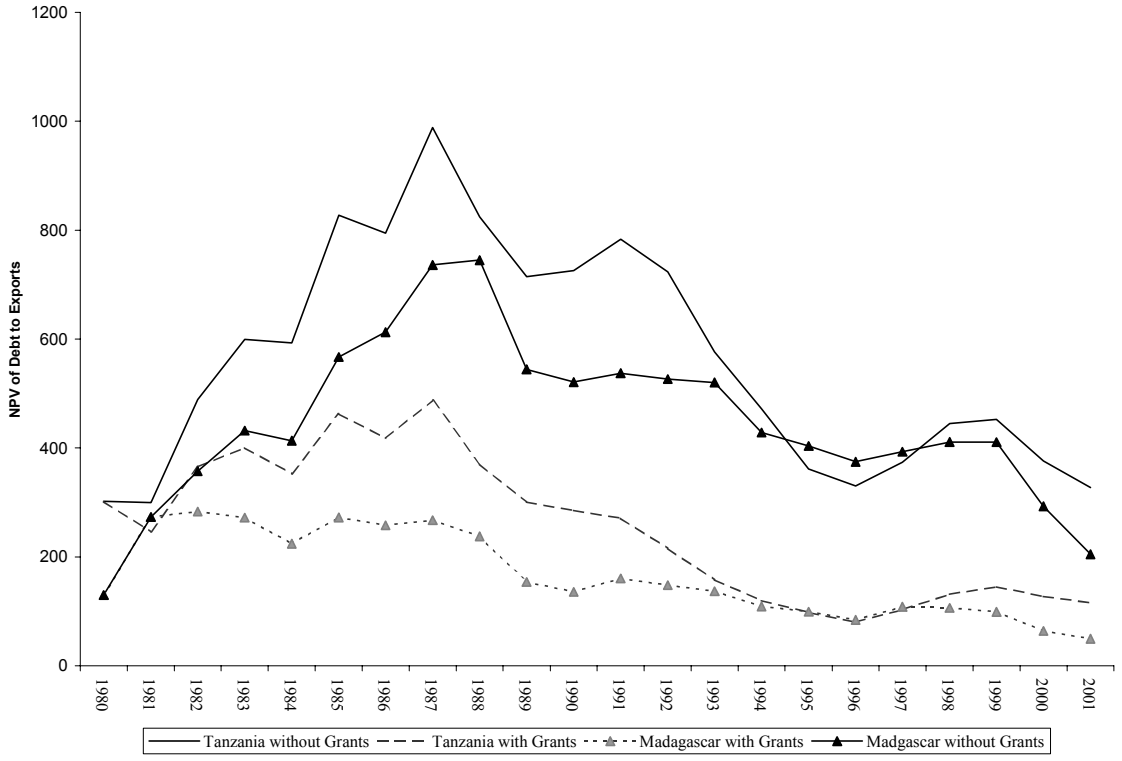
Box 5. Adopting An Ex-Ante Framework for New Lending

This box illustrates the possible impact of an ex-ante framework that links the concessionality of new financing to debt-burden indicators, using historical simulations for Tanzania and Madagascar, HIPC countries which are past completion point and decision point respectively. Both countries have received substantial debt relief under the HIPC Initiative (due to the Initiative, Tanzania's debt burden was reduced by about $1.9 billion at completion point and Madagascar's by about $1 billion at decision point, in 2001 NPV terms). The historical evolution of Tanzania and Madagascar's nominal debt-to-exports ratios from 1980 to 2001 are simulated under the stylized assumption that whenever debt reaches certain threshold ratios, the following year's disbursements are in the form of grants rather than loans (see figure). The assumed threshold triggers are an NPV of debt-to-exports of 200 percent; an NPV of debt-to-GDP of 45 percent; and an NPV of debt-to-fiscal revenue of 200 percent (corresponding to indicative triggers for a "medium-performer" in Table 2). For Tanzania, these triggers would have necessitated switching from loans to grants from 1981 to 1994, as well as in 1996. Consequently, Tanzania's NPV of debt-to-exports ratio in 2001 would have been 116 percent under the simulations compared with an actual ratio of about 330 percent. The annual value of grants that would have been required to prevent a fall in net flows (i.e. the value of loan disbursements withheld) if this ex-ante framework had been in place would have amounted to about $175 million in nominal terms. Similarly, a simulation for Madagascar over the same period reveals that about 70 percent of all disbursements would have had to be made in the form of grants, implying average grant flows of about $135 million per year between 1980 and 2001. Madagascar's simulated debt-to-exports ratio at end-2001 would have been equivalent to 50 percent, compared with an actual ratio of more than 200 percent.



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lending are achieving the envisaged results. Creditors would also be expected to increase the concessionality of these additional loans to the extent possible (Table 3).

46. **Similarly, there will likely be cases in which disbursements from the pipeline of concessional loans that are deemed consistent with a country's prospective repayment capacity fall short of its needs for implementing its development agenda**. In these circumstances, the first course of action would be to mobilize additional grant resources from donors, in the context of consultative group meetings. Should adequate grant resources not be available, creditors could examine all means possible to further increase the concessionality in their lending terms so that resource flows could rise without raising the risk of debt distress. While there may be scope in individual development institutions for increasing their loan concessionality , the Fund, as a monetary institution, would not be expected to follow suit. Indeed, given that the concessionality of PRGF loans is comparatively low, the provision of new loans from the Fund would presumably be limited in these cases—though the framework is sufficiently flexible to accommodate some lending. Even after exploring these options, some countries may still be left with a gap between financing needs and appropriately concessional aid resources. In these circumstances, the Government would need to adapt its borrowing strategy to prioritize the use of scarce resources in close collaboration with creditors and donors, while simultaneously improving the conditions for strengthening its borrowing capacity, particularly through improved policies and institutional reforms. In most instances, the terms of the assistance available would play an important role in determining the financing priorities; but it is conceivable that other considerations (for example, whether the use of funds is earmarked for specific purposes, or if it requires domestic co-financing) could also apply.

47. **Ultimately, the extent to which countries will face dilemmas between financing needs and long-term debt sustainability depends to a large extent on the international community's willingness to provide additional grants.** Unless donors and creditors can significantly increase their pool of resources, a higher share of grant funding to some countries would have to come at the expense of reduced nominal transfers available to all. This would result in fierce competition for these resources. Increased competition may have the positive side effect of encouraging better policy performance, to the extent that strong performers are able to attract more resources (both grants and loans), thereby improving their chances of meeting the MDGs. But the reduction in aggregate new financing that would be required for a shift from loans to grants within a given aid envelope, would simultaneously lower the chances to advance for other countries with below-average policies. Thus, to reward strong performers without closing the door on others to catch up, the international community will need to combine an improved aid-allocation mechanism guided by policy performance with an overall increase in available resources.

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Table 3. Concessionality of Loans by Selected Creditors 1/

Creditor	Grace Period	Maturity	Interest Rate	Fees	Service Charges	Commitment Charge 4/	Repayments per year	Repayment Profile	Currency	Grant Element: Current IMF Method 2/	Grant Element: CIRR 2003 3/
IDA40	10	40	0.75%	0%	0%	0.5%	2	IDA40 6/	SDR and USD	82.0%	63.2%
IDA35	10	35	0.75%	0%	0%	0.5%	2	IDA35 7/	SDR and USD	77.8%	58.1%
IaDB 5/	10	40	1% & 2% 8/	0%	0%	0.0%	2	EQUIP	Multiple	76.3%	57.0%
IMF	5.5	10	0.5%	0%	0%	0.0%	2	EQUIP	SDR	27.1%	23.0%
African Dev Fund	10	50	0.0%	0%	0.75%	0.5%	2	Specific 12/	Multiple	84.4%	67.5%
Nordic Development Fund	10	40	0.0%	0%	0.75%	0.5%	2	EQUIP	SDR	72.0%	49.6%
IFAD1	10	50	1.0%	0%	0%	0.0%	2	EQUIP	SDR	72.6%	50.0%
OPEC	5	20	0.5%	0%	0%	0.0%	2	EQUIP	USD	56.6%	35.8%
JBIC	10	40	0.75%	0%	0%	0.0%	*2*	*EQUIP*	Yen	49.4%	33.9%
EU	10	40	0.75% 9/	0%	0%	0.0%	2	Specific	EUR	73.0%	54.6%
BADEA	10	30	1.0% 10/	0%	0%	0.0%	2	EQUIP	USD	67.5%	42.9%
EIB	10	50	1.0% 10/	0%	0%	0.0%	2	Specific	EUR	73.6%	55.2%
Asian Development Fund	8	32	1% & 1.5%	0%	0%	0.0%	2	EQUIP	USD	71.9%	51.8%
Islamic Dev. Bank	10	30	0.0%	0%	0% 11/	0.0%	2	EQUIP	SDR	74.5%	54.0%

Source: Staff estimates, based on publicly available information for each Institution.

1. For some creditors, lending terms vary depending on the borrower country and/or the project financed. For simplicity, those conditions which represented the "softest" loan terms were used to calculate the grant element.
2. Refers to concessionality calculations for debt ceilings in Fund-supported programs, which use 6-month (10-year) averages of CIRRs as discount rates, plus a spread subject to the maturity period, for loans with maturity of less than (at least) 15 years
3. This method of calculating concessionality uses the 6-month average currency-specific CIRR, and is consistent with the HIPC framework.
4. Levied on undisbursed amounts. For the purpose of this exercise, it was assumed that the loan is disbursed in one observation.
5. IaDB lends in multiple currencies, in this case the discount rate used was the USD CIRR.
6. 20 percent of the loan is repaid during the first 10 years after grace period. The rest is paid afterwards.
7. Principal repayable at 2.5 percent per annum during the first 10 years after the grace period and 5 percent per annum afterwards.
8. 1 percent during the grace period, 2 percent afterwards.
9. Current rate ranges from 0.75 percent up to 4 percent.
10. Current rate ranges from 1 percent up to 4 percent.
11. Current rate ranges from 0 percent up to 2.5 percent.
12. 10 percent of the loan is repaid in the 10 years following the grace period and the remaining 90% over 30 years.

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Prospects for Increasing Aid Flows

48. **Since achievement of the MDGs depends not only on adequate financing but, most importantly, on strong policies in the countries concerned, any estimate of the additional grant requirements is contingent on assumptions about the policy performance in individual countries.** Using a country-based approach, a recent paper prepared by Bank staff for the Development Committee found that with continued policy and institutional reforms, developing countries could productively use additional flows of about $30 billion annually. This estimate is conservative for several reasons: (i) it does not reflect the costs of meeting all the MDGs in all countries (which would require a more optimistic policy scenario but also more financing); (ii) it reflects gaps in data and analysis at the country level, such that certain financing requirements, particularly with regard to infrastructure and capacity enhancement, are not included; and (iii) it does not consider the costs of meeting global and regional public goods, including measures to combat HIV/AIDS or achievement of broad environmental sustainability.[35] Importantly, the study finds that the implications for the volume and phasing of additional aid varies across countries, depending on their specific circumstances, such as prospects for improving policies and the volume of current aid flows. Nevertheless, it concludes that early commitment of additional aid is crucial to help promote reforms and build up countries' capacity to use larger amounts of aid productively over time.

49. **Aid flows would therefore have to increase significantly in comparison to their historical trend.** Official Development Assistance (ODA) provided to developing (and low-income) countries has remained about the same in nominal US dollar terms since 1991 (Figure 5)—and thus, has actually fallen as a share of developed countries' GDP, from 0.34 percent on average in 1990 to 0.23 percent in 2002. At the International Conference on Financing for Development, in Monterrey, Mexico in March, 2002, donors committed to a substantial increase in ODA to meet the MDGs. If these promises are fulfilled, ODA would rise by 31 percent in real terms (or US$ 16 billion) by 2006,[36] but this is well short of the estimated amounts required to finance the MDGs. Some donor pledges have been translated into programs, such as the US's Millennium Challenge Account, which envisages providing

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[35] World Bank and IMF, *Supporting Sound Policies with Adequate and Appropriate Financing*, Development Committee Report No. DC2003-0016, September 13, 2003. The study focuses mainly on a sample of 18 well-performing low-income countries. Extrapolating from these countries and taking account of absorptive capacities in low-income countries under stress (LICUS) and the effect of aid in middle-income countries, it estimates an incremental amount of $30 billion annually as a conservative estimate of additional aid requirements.

[36] See World Bank and IMF (2003).

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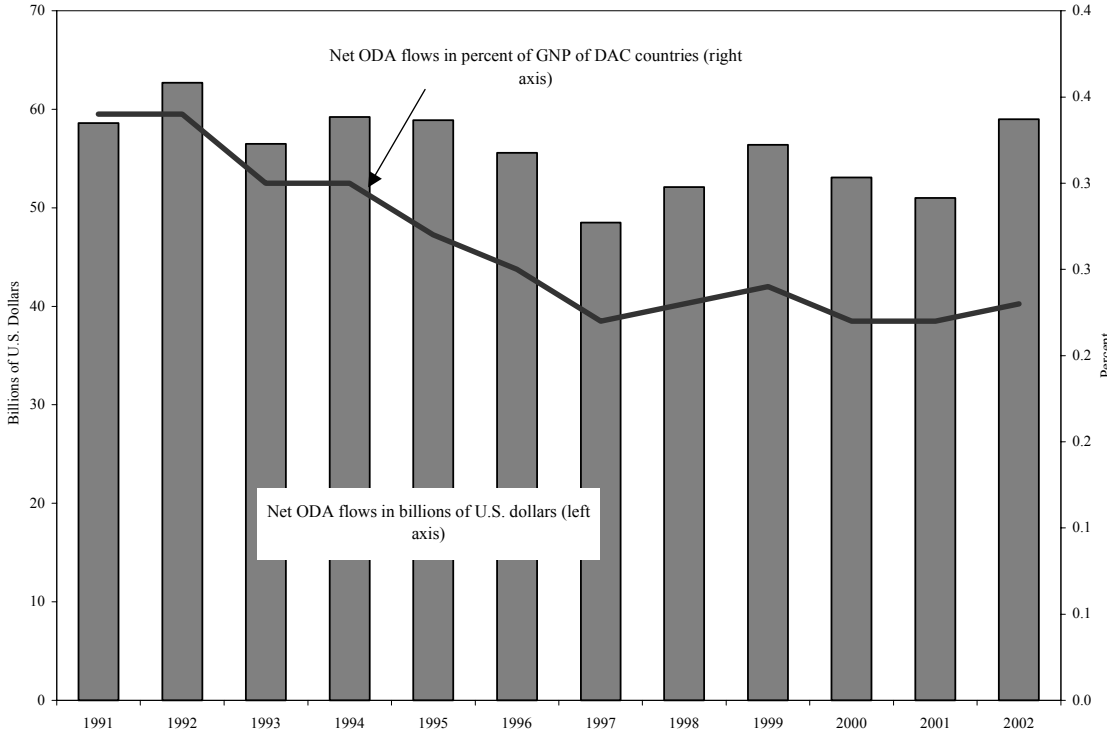
Figure 5. Trends in ODA Flows, 1991-2002 1/



Source: OECD DAC

US$ 5 billion in new grants annually, the Global Fund for AIDS, TB and Malaria, the US's Emergency Plan for Aids Relief, and the UK's proposal for global bonds (the International Finance Facility).

50. **Thus, the required increase in the availability of resources to low-income countries calls for increased aid allocation and broad participation among donors.** Currently, approximately 75 percent of grants are provided directly by bilateral donors in the context of their bilateral aid programs. Among multilateral creditors, IDA, special IDA-administered facilities, the European Union, UN agencies, and some other multilateral organizations have facilities that provide grant financing. In addition, a small but growing share of grants is provided by NGOs, foundations, and other private sources (at end- 2001, private grants to ODA recipients totaled $7.3 billion, equivalent to 14 percent of ODA that year). Donors could increase the volumes of these flows either directly or by channeling additional grants through multilateral institutions.

51. **Concessionality of new financing could also be increased by innovative financing instruments.** An innovative financing instrument that is already available to donors for this purpose is the credit-buydown mechanism (CBM). Under a CBM, instead of receiving principal and interest payments from a borrower, the creditor receives the present value of these flows from a donor, effectively turning the loan into a grant for the borrowing

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country. The CBM uses donor resources to increase the grant element of, and reduce payments on, already contracted multilateral debt. It is conceivable that this and other instruments would be used on a wider scale in the future.

52. **Besides increasing the level of aid flows, there is also room to strengthen its effectiveness and improve the delivery and allocation process.** Development assistance needs to be better aligned with the recipient country's priorities and processes, as set out in its development and poverty reduction strategy. One aspect of improved alignment is for those providing aid to coordinate their support better and to harmonize their policies and procedures around the recipient country's own systems while ensuring that this does not come at the expense of fiduciary standards. The approach agreed at the Rome Harmonization Forum is promising and needs to be linked at the country level to the PRSP approach.[37] A greater proportion of aid should also be provided in forms that can help meet the incremental costs of financing the MDGs. For example, 30 percent of grants continue to be provided as technical co-operation (Figure 6). But where budgetary and financial management systems are adequate—and technical assistance can play an important role in helping countries achieve this—aid should be provided in the most productive ways to finance the higher recurrent costs associated with meeting the MDGs, namely through budget support or well-targeted sectoral programs. Finally, aid flows need to be predictable, timely, and counter-cyclical. The delivery of aid to low-income countries can be greatly improved by: (i) ensuring that year-to-year fluctuations in allocations are minimized and that aid budgets are protected from short-term pressures;[38] and (ii) providing quick-disbursing funds to mitigate the economic and social impact of external shocks.

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[37] In February, 2003, heads of multilateral and bilateral development institutions and other financial institutions and partner countries deliberated on the international effort to harmonize the operational policies, procedures, and practices of such institutions with those of partner country systems to improve the effectiveness of development assistance and thereby contribute to meeting the MDGs. See "Rome Declaration on Harmonization", February 25, 2003, http://www1.worldbank.org/harmonization/romehlf/Documents/RomeDeclaration.pdf. The OECD DAC set up a Working Party on Aid Effectiveness and Donor Practices in May 2003. Through its Task Teams and Joint Ventures, which include the MDBs and the IMF, this Working Party will identify specific ways of improving the delivery of aid, including implementation of the Rome Declaration on harmonization and alignment, enhancing the predictability of aid, and addressing issues related to budget support.

[38] Empirical analysis demonstrates that aid flows can be, on average, two to three times as volatile as the recipient country's output, as well as highly pro-cyclical, especially in sub-Saharan Africa. See Pallage and Robe (2001).

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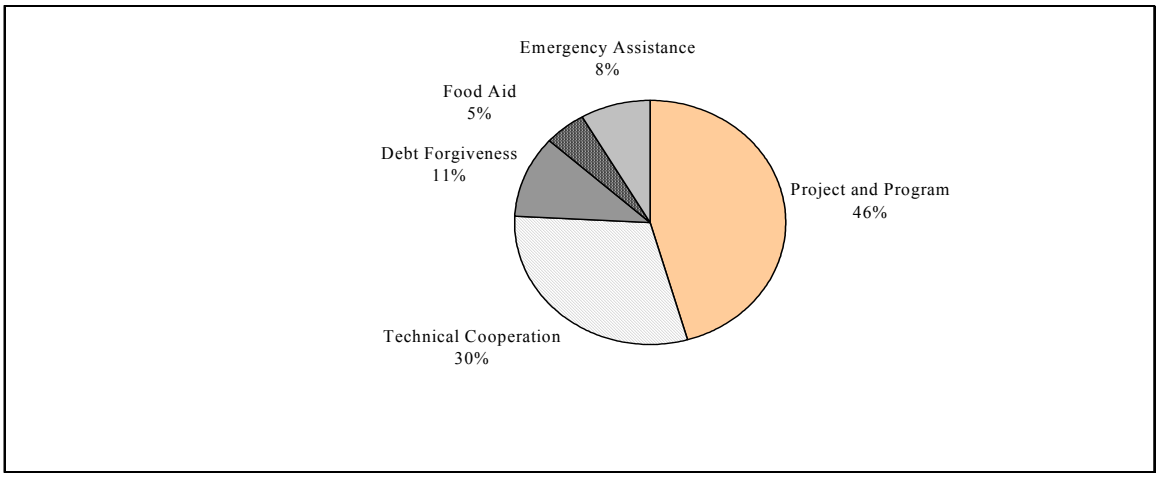
Figure 6. Composition of Grant Funding (end-2001)
(In percent)



Source: OECD DAC.

B. Designing Instruments That Mitigate the Impact of Exogenous Shocks

53. **Debt distress in low-income countries is often caused by exogenous shocks that cause liquidity problems and require exceptional financing**. As illustrated in Figure 7, changes in debt-burden indicators have largely reflected swings in export earnings and GDP, often caused by exogenous shocks.[39] Adverse shocks can be defined as unanticipated events beyond the control of authorities that can have a significant negative impact on an economy. They can arise for many reasons, including natural disasters (such as droughts), changes in relative prices (for example, commodity price shocks), political instability or civil strife (even in neighboring countries), and sudden changes in capital flows (such as the withdrawal of donor support). Commodity price shocks have often been persistent,[40] and evidence shows that they tend to be more severe in low-income countries than in other developing countries (Figure 8), and more frequent.[41] For example, between 1992-2001, the average size of a

[39] See Easterly (1993).

[40] See Cashin et al. (2000). The paper finds that for the majority of the 44 commodity price indices included in the sample it took more than five years, on average, for a shock to dissipate to half its original magnitude. For ten of the commodities studied, including cocoa, coffee (robusta), gold, and tobacco, price shocks were permanent, defined as never dissipating to half their original magnitude.

[41] IMF, *Fund Assistance for Countries Facing Exogenous Shocks* (SM/03/288, 8/11/03). The report also documents that low-income countries have a higher incidence of natural disasters

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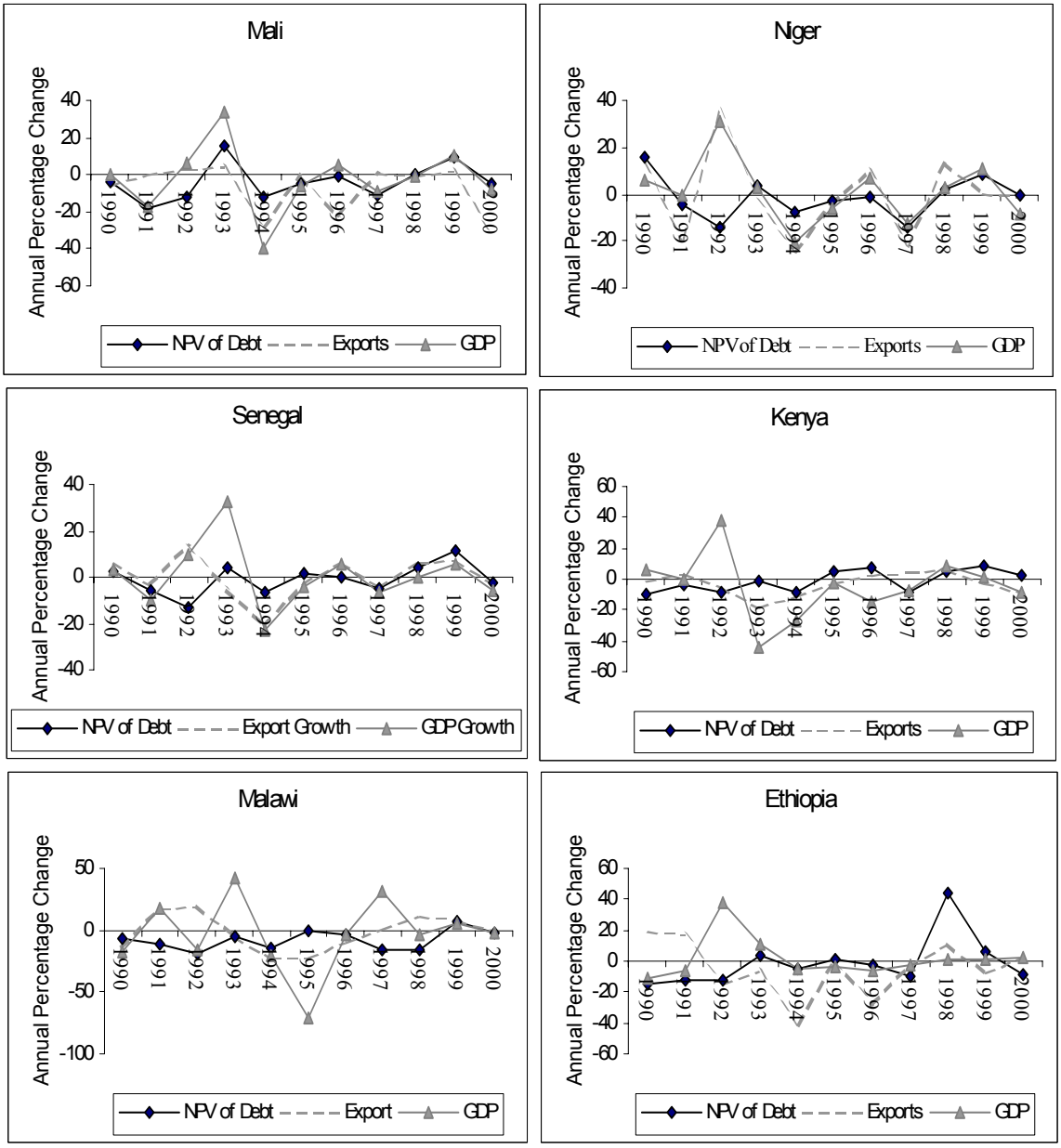
Figure 7. NPV of Debt, Exports and Output Volatility
Annual percent change, 1980-2001



compared with other developing countries and tend to suffer larger damages (which averaged 5.8 percent of GNP between 1997-2001) when shocks occur.

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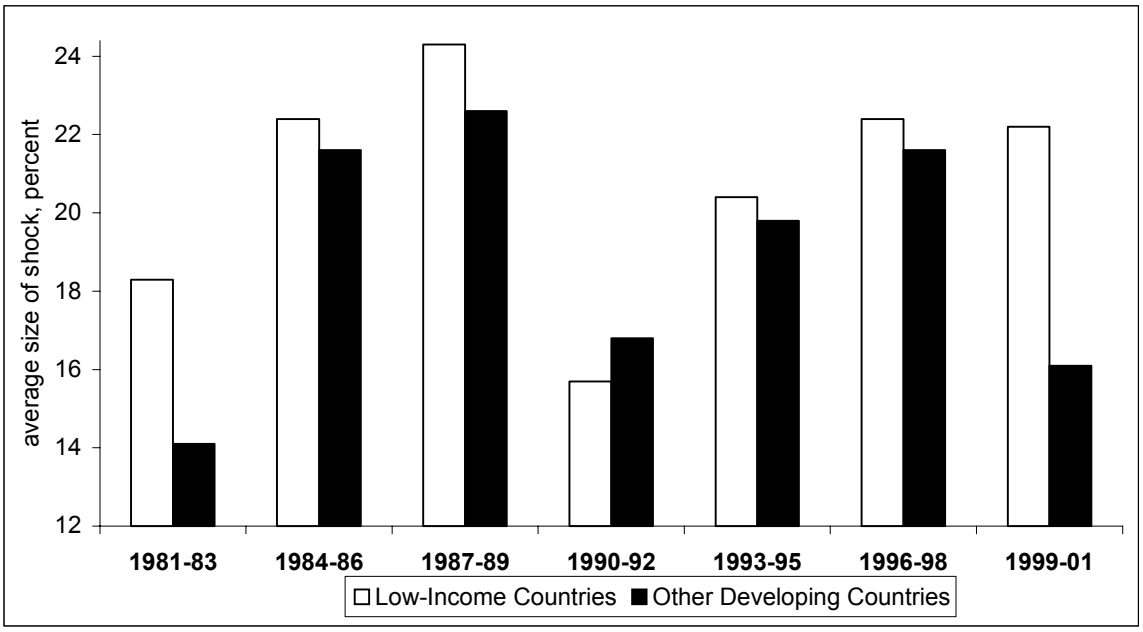
negative commodity price shock (measured by the decline in real prices from the previous year's level) was 22 percent for low-income countries and 16 percent for other developing countries. Low-income countries experienced commodity price shocks every 3.3 years on average, while other developing countries experienced them, on average, every 4.4 years.[42]

Figure 8. Developing Countries' Vulnerability to Exogenous Shocks 1/ 2/
(Average size of negative shocks in real prices of export commodities)



Source: IMF (2003c)
1/ A shock is defined as at least 10 percent decline in the real price of the commodity from its previous year.
2/ Data covers 52 developing countries, of which 30 are low-income. Oil exporting countries are excluded.

54. **While shocks may be caused by a variety of factors, their impact is usually a contraction in broad macroeconomic variables, such as GDP growth and exports, and a substantial loss in welfare.** Income losses from shocks tend to be higher in low-income countries than in other developing countries. For a sample of low-income countries, the direct income loss from negative export price shocks averaged 6.8 percent in the year of the shock, and over a four-year period, the income loss amounted to 14 percent of initial output, with associated consumption volatility leading to substantial welfare losses.[43] In many low-income countries, estimated welfare gains from eliminating volatility exceed those of an

[42] IMF (2003c). A shock is defined as an at least 10 percent decline in real prices from the previous year's level.

[43] Collier and Dehn (2001).

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additional point of growth forever.[44] Low-income countries also experience high and persistent volatility in the real exchange rate caused, in large part, by their vulnerability to terms of trade shocks. Since contractions in GDP resulting from shocks are often accompanied by a significant depreciation in the currency, the overall burden of servicing foreign-currency debt can be particularly onerous in the period following a shock.[45]

55. **The impact of exogenous shocks on the debt dynamics can be addressed both *ex ante* and *ex post*.** An *ex ante* approach would be to incorporate volatility into the baseline projections and conduct stress tests to model the consequences of possible shocks, and then translate these into prudent lending and borrowing decisions. This is the basic approach embedded in the proposed framework in Section III. It is akin to an "*ex ante* adjustment" that would allow countries to face "likely" shocks without experiencing debt distress. An *ex post* approach would be to apply insurance mechanisms that can provide effective relief once a shock is experienced. This relief could be in the form of additional financing or reduced debt service. In practice, a combination of both *ex ante* and *ex post* approaches could be considered to deal with the consequences of large shocks, for example by complementing the proposed framework with mechanisms that provide insurance-like *ex post* relief for shocks that substantially increase the risk of debt distress. Such a combined approach would offer the most effective protection against the possibility that large shocks undermine a country's chances of meeting the MDGs in the event that grant resources may not be forthcoming.

56. **The appropriate *ex post* response to exogenous shocks is typically a combination of some additional appropriately concessional financing (or reduced debt service) with adjustment in expenditures in relation to income**. In principle, it is optimal to finance temporary shocks but adjust to permanent ones; however, this prescription is difficult to interpret and apply. First, it is often impossible to determine at the outset whether a shock will be permanent or temporary. Second, research indicates that even in the case of permanent shocks, foreign assistance can be very effective in dealing with its consequences, as long as it is available quickly, and is provided in a way that includes incentives for policy adjustments and measures to reduce vulnerability to future shocks.[46] Therefore, even if shocks are permanent, adjustment is less painful if it is stretched out over time and combined with upfront additional financing. Additional financing for exogenous shocks should be provided on terms that reflect a country's risk of debt distress, with highly debt-distressed countries receiving financing in the form of grants; the importance of appropriate financing terms is underscored by cases in which new loans provided in response to shocks have

[44] Pallage and Robe (2003).

[45] Hausmann and Rigobon (2003).

[46] IMF (2003c).

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created debt-servicing problems for countries where debt levels were high to begin with and where the effects of the shocks lasted for a long time.[47]

57. **Experience with existing schemes to help countries cope with shocks is mixed and work on designing new instruments is at a preliminary stage (Box 6)**. Stabilization schemes such as the EU's Stabex and the IMF's Compensatory Financing Facility (CFF) tried to smooth earnings in response to terms of trade shocks, but were limited in their success partly because commodity price shocks were so persistent. More recently, research on new instruments has focused on reducing the burden of debt service in the aftermath of shocks, for example, by linking debt service obligations to variables associated with volatility in export earnings or GDP growth, such as commodity prices and the real exchange rate. Work on designing new instruments for low-income countries is going on both at the World Bank and the IMF, and the Boards will be informed about progress periodically. What makes these instruments particularly difficult to design is that they need to deliver significant relief to countries experiencing a shock, but at the same time, like all insurance schemes, they need to remain financially viable over the long term.

V. Policy Implications for Low-Income Countries

58. **While donors and creditors can play an important role in helping low-income countries achieve debt sustainability, the primary responsibility lies with low-income countries themselves.** Decisions related to new borrowing are typically made in an environment of great uncertainty. Countries face difficult choices: should they continue borrowing to meet development objectives, even if debt levels rise beyond certain thresholds, or should they be more prudent, potentially foregoing opportunities for growth-enhancing investments? Clearly, countries need to be mindful of the risks of accumulating debt against the mere prospect of an acceleration of growth in the future. As such, borrowing should be in step with, and supportive of, progress in strengthening the capacity to repay through better policies and institutions to accelerate growth; prudent debt management to keep debt to reasonably low levels and ensure new borrowing in the right amounts and on appropriate terms; and measures to increase resilience to exogenous shocks. While these issues are essential elements of the core development strategy in most low-income countries, they are only discussed briefly below, given this paper's primary focus on the development of a debt sustainability framework.

A. Improving Policies and Institutions

59. **The importance of policies and institutions for higher and more sustained growth lies at the core of the development agenda in low-income countries**.[48] Good

[47] See Brooks et al. (1998). An analysis of debt dynamics in Uganda shows that an 11 percent decline in export earnings in 1999/2000 added 20 percentage points to Uganda's NPV of debt-to-exports ratio that year; see IMF (2003a).

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Box 6: Ex-Post Mechanisms for Mitigating Exogenous Shocks

In the past, mechanisms for mitigating exogenous shocks comprised mainly of stabilization schemes such as the EU's Stabex and the IMF's Compensatory Financing Facility (CFF). These failed to provide effective counter-cyclical assistance to countries affected by shocks, partly due to disbursement delays that resulted from a high degree of complexity in terms of coverage, eligibility, and evaluation methods.[1] Past experience with these schemes, and empirical work analyzing their effectiveness suggest that on balance, schemes to smooth export earnings in the face of terms of trade shocks have not been very successful or have proven financially unviable.

The impact of exogenous shocks may also be mitigated ex-post by developing mechanisms that reduce the burden of debt-service obligations in the aftermath of shocks. This would reduce the need for reliance on ad-hoc mechanisms, such as the Paris Club's willingness, demonstrated in several past cases, to defer debt-service payments of countries affected by severe shocks (e. g., Hurricane Mitch in Honduras and Nicaragua). This can be done by indexing debt service to GDP growth or to variables associated with volatility in export earnings, such as commodity prices or the real exchange rate. Preliminary research on linking debt-service obligations in low-income countries to commodity prices through swap arrangements showed that these arrangements would provide limited relief in debt service-obligations—equivalent to less than 5 percent of total payments, in the event of adverse shocks.[2]

Linking a country's debt-service obligations either to GDP growth or to local currency units, indexed to inflation, appears, in preliminary analysis, to be more promising—though not without potential implementation problems.[3] Both arrangement would mitigate the effects of adverse shocks that manifest themselves in lower GDP growth or real exchange-rate depreciations, respectively. The latter is important because most of low-income countries' debt is contracted in foreign currency. As a result, real depreciations in response to exogenous shocks—akin to falling GDP growth—make debt service more burdensome, just at a time when it is more difficult to pay, with the opposite effect in case of positive shocks. Denominating debt service in inflation-indexed local currency units, or linking it to GDP growth, would avoid these effects in both directions.[4] Indeed, inflation-linked bonds have proved beneficial to emerging markets, especially in Latin America. Some MDBs, such as the World Bank and the EIB have facilities to lend in local currency, but in the case of the World Bank, the facility is limited to IBRD borrowers.

Finally, donors and creditors could earmark funds or frontload resources and/or backload debt service in order to provide prompt counter-cyclical assistance to deal with large, unanticipated, exogenous shocks. The EU, for example, has funds (the EU's "B" envelope under the Cotonou Agreement) which are earmarked to address shocks.[5] The IMF also has the flexibility to support countries through (augmented) PRGF arrangements in response to exogenous shocks, but PRGF loans have relatively short maturities (10 years), implying a comparatively low grant element. Similarly, IDA has the flexibility to provide supplemental credits for countries facing exogenous shocks where there is an ongoing adjustment operation in place. To the extent that grant allocations are available and unused in a given year, this supplemental financing could also take the form of a grant in IDA13.[6] IDA13 also provides a grant facility to help countries manage natural disasters.

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[1] The EU responded to the unsatisfactory operation of Stabex and Sysmin by launching the FLEX scheme (July 2002), which is based on overall export earnings as opposed to the commodity-by commodity operation of the previous schemes.
[2] See Gilbert and Tabova (2003) .The World Bank (IBRD) can provide commodity swaps to middle-income countries, but no countries have requested it so far.
[3] See Borensztein and Mauro, forthcoming, and Hausman and Rigobon (2003), respectively.
[4] Hausman and Rigobon (2003) suggest that IDA, due to its well-diversified lending portfolio, is well positioned to offer insurance against the negative effects of exogenous shocks by linking repayments on IDA credits to inflation-indexed local currency units.
[5] The Cotonou Agreement–General Overview, European Commission, June 2000.
[6] A supplemental grant of this type was approved in for Mali in early December 2003 to help fund the additional gap that emerged due to the persistence of the civil strife in Cote d'Ivoire.

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[48] See, for example World Bank (1998).

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policies and institutions are critical, at the microeconomic level, to reduce corruption and strengthen property rights, the rule of law, and the quality of civil service, all of which have been shown to positively impact long-term growth—including by improving the climate for entrepreneurship and foreign investment.[49] Policies that support macroeconomic stability are also key. Sound fiscal policies can enhance domestic resource mobilization, reducing the need for external financial assistance, while trade policy reforms that lower trade barriers in low-income countries and expand their access to industrial country markets are essential to facilitate export growth.

60. **Apart from supporting growth, good policies are also likely to attract higher aid flows and eventually move countries along a virtuous circle of creditworthiness and growth to an eventual graduation from donor dependence.** To the extent that creditors and donors precondition new financing on the quality of policies, increased concessional lending flows will be highly dependent on improved policy performance. While few low-income countries can be considered creditworthy in the true sense of the term (that is, they have access to private international capital), success stories such as Thailand, Korea and Botswana[50] demonstrate that with the right mix of policies, institutions and financial assistance, countries can attract private capital in significant amounts and become emerging markets within the foreseeable future.

B. Strengthening Debt Management

61. **Many low-income countries still have a long way to go in strengthening their capacity to pro-actively manage the maturity structure and currency composition of their debt**. Debt management in low-income countries tends to involve a choice between long-term concessional external borrowing in foreign currency and short-term domestic borrowing at market rates which often reflect significant inflation and liquidity risk premia within shallow markets.[51] Sometimes governments may be tempted to reduce interest costs by borrowing domestically in foreign currency—though at the expense of incurring exchange-rate risk. Stronger and deeper domestic debt markets would help low-income

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[49] Knack and Keefer (1995), Mauro (1995).

[50] All these countries were considered low-income and relatively uncreditworthy in the mid-1960s. Since then, however fast growth and good progress on policy reforms have helped these countries move to middle-income status.

[51] The PRGF arrangements for many HIPCs and post-HIPCs contain performance criteria on not contracting new non-concessional external debt. Borrowing in the domestic market allows governments to issue domestic-currency denominated debt which has the advantage of eliminating exchange-rate risks altogether. However, because domestic debt markets tend to be underdeveloped, governments often have to resort to short-term or indexed debt or borrow from domestic banks at high cost.

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countries issue a larger share of their debt in longer-term, fixed-rate, domestic-currency-denominated securities, thus reducing the overall risks in the debt portfolio. But many low-income countries often do not have the luxury of such a choice. The high premia they pay on domestic financing makes it advantageous to rely almost exclusively on official development assistance from abroad.

62. **Notwithstanding these constraints on actively managing risks, low-income countries can take various steps to improve their debt management.** Most importantly, governments need to be in a position to track debt-service obligations effectively to avoid costly penalties, and to make well-informed and transparent decisions about the amounts and terms of new public borrowing, consistent with the broader macroeconomic framework. This requires: (i) improving the monitoring of public and publicly-guaranteed debt on a broad definition (i.e., including debt of public enterprises, and local authorities, as well as claims on the private sector that are guaranteed by public entities) to obtain a better assessment of contingent liabilities; (ii) co-ordinating debt management closely with fiscal and monetary policies; (iii) providing debt-management agencies with a clear legal mandate and an effective disclosure policy; and (iv) recruiting staff to public debt-management offices that have good financial market, public policy, and technical skills, including for undertaking debt-sustainability analyses, so that they can provide the necessary support to policymakers.[52]

63. **A number of institutions currently provide assistance to low-income countries in building capacity for debt management.** The Commonwealth Secretariat and UNCTAD-DMFAS are involved in the provision of a computer-based data management system for data recording and analysis. UNITAR offers training programs on debt and financial management with a focus on legal aspects. DRI, a non-profit organization, runs a program for capacity building in HIPCs. The World Bank has provided assistance mainly through its support for regional organizations.[53] Additionally, the World Bank has provided assistance related to risk analysis, strategy formulation and domestic debt-market development at the country level.[54] The Fund and Bank have collaborated on a pilot project

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[52] See IMF and World Bank, "Guidelines for Public Debt Management", March 21, 2001.

[53] Important regional organizations that provide technical assistance on issues of debt management to low-income countries are the Macroeconomic & Financial Management Institute of Eastern and Southern Africa (MEFMI), Pole Dette (Regional Debt Management Training Center of Central and Western Africa), the West African Institute for Financial and Economic Management (WAIFEM), and the Center For Latin American Monetary Studies (CEMLA).

[54] The Banking and Debt Management Group of the Treasury of the World Bank has been one of the key suppliers of technical support in the area of debt management. Recently, hands-on training courses on risk modeling for government debt portfolios have been offered. Additionally, case studies on debt management, cash management and domestic

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involving a series of Country Program Assessments (CPAs). The main objective is to design, in co-operation with government officials, a program of reforms and capacity building to improve a country's capacity to manage sovereign debt. The program also provides assistance on the development and maintenance of domestic debt markets. Among low-income countries, Indonesia, Kenya and Nicaragua are participating in the program so far.

C. Increasing Resilience to Exogenous Shocks

64. **Low-income countries can also take measures to increase their resilience to exogenous shocks.** First, an adequate level of foreign reserves provides an obvious cushion against shocks. In addition, countries may take preventive measures that are targeted at more specific shocks. In the past, some countries, for example, have attempted to stabilize commodity prices through domestic microeconomic risk-management schemes. Like their international counterparts, however, these have only been marginally effective. More recently, a number of countries have had some success with using market-based instruments to hedge themselves against falls in export prices and revenues. In the long term, export diversification is the most effective mechanism to increase resilience to exogenous shocks. While diversification presents a number of challenges, there are some success stories which show that it is feasible over a longer horizon. Finally, the reduction of budget rigidities, combined with a well-designed tax system and social safety net, can help governments cope with the implications of external shocks.

65. **A number of domestic mechanisms intended to stabilize export earnings, such as marketing boards, buffer funds, and variable taxation were used widely in the past, but have proved costly and ineffective, mostly because of the failure of governments to segregate the stabilization functions of these schemes from the provision of implicit subsidies**.[55] These micro-level risk-management schemes were set up to mitigate the impact of price declines on the incomes of those hardest hit by the shock.[56] Contrary to expectations, however, domestic stabilization schemes often created large contingent liabilities for the government. Although stabilization was their official aim, once established, these schemes were quickly depleted as they invested their surpluses poorly and diverted stabilization funds to other purposes. The persistence of commodity price shocks meant that price stabilization

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debt-market development have been carried out for Tanzania and Malawi, which laid out preliminary action plans for reform programs.

[55] Gilbert (1993) and Knudsen and Nash (1990).

[56] In theory, they could contribute to macro-level stabilization in two ways. First, they could accord protection at the macro level by minimizing the diversion of scarce government resources to deal with the adverse impacts of exogenous shocks. Second, sectoral stability could lead to macro stability if the sector (coffee, cocoa, cotton) was a large contributor to fiscal revenues, and was an important driver of export and overall economic activity.

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schemes needed to accumulate large balances during peaks to support an uncertain low price period, which often proved unfeasible. These schemes are gradually being eliminated, though they continue to be prominent in Ghana, Mali and Burkina Faso, among others.

66. **Some countries also had partial success using markets to reduce exposure to volatile export prices and revenues.** The most widely used instruments are forward, futures, and swap contracts (Box 7). The ability of derivatives to provide effective macro-level protection against commodity price shocks is limited, however. First, it is difficult to scale-up the use of derivatives to cover a significant share of total export earnings, mainly because of lack of financial resources and the limited depth of theses markets. Second, the majority of exporters in low-income countries have limited access to these derivative markets, with insufficient expertise in using them, and inadequate funds to cover costs of buying derivative instruments (though for exchange-traded commodity futures, the upfront cost is fairly small). Thirdly, derivative markets for agricultural commodities are mainly short-term (while adverse price shocks are often long-term), and extending them beyond one year becomes very expensive, although strategies exist for a rolling hedge that offers partial protection against adverse price movements.[57]

Box 7. Official Uses of Commodity Derivative Markets

Derivatives have been used extensively by commodity market boards (most notably the Ghanaian cocoa marketing board, Cocobod) and stabilization funds (such as the Ivorian Caisstab, which has recently been abolished) which have typically contracted forward a proportion of the crop up to 18 months ahead through the broker-merchant market, enabling these institutions to set a producer price in advance of a new crop year. This form of contracting has declined with the general abolition of the boards and stabilization schemes. In metals, state-owned mining companies have locked in prices by establishing short futures positions on recognized exchanges or on an "over-the-counter" basis. Examples include Zambia (copper), Chile (copper), and Mexico (silver).[1] The gold market has seen a significant proportion of investment financed by gold loans in which companies have bought gold spot and sold forward to raise funds at an advantageous rate while simultaneously hedging revenues. There is an active swaps market in oil and major metals. The World Bank is currently providing technical assistance, capacity building and training for producer organizations and local financial institutions on commodity price risk management instruments. So far, assistance has been provided to Honduras, Nicaragua, Tanzania and Uganda.[2]

[1] IMF (2003c).
[2] World Bank (2003). Agriculture and Rural Development Department, "Dealing with Commodity Shocks: Experience and Options". Paper prepared for the G-8 nations.

67. **Overall, export diversification is likely to be the most effective protection against commodity-price shocks, though country experiences suggest that this is not an**

[57] See Cohen and Portes (2003).

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easy objective for governments to achieve. Encouraging export diversification in a way that is consistent with comparative advantage requires not only a coherent strategy but also a conducive environment for private entrepreneurs to embark on new activities and take risks. Such an environment is typically characterized by government policies devoted to macroeconomic stabilization including a realistic exchange rate, structural reforms, and growth, and supported by trade liberalization with increased market access, flexible labor markets, high quality of human capital and physical and financial infrastructure, and an investment climate that is attractive to foreign direct investment.[58] While a number of success stories, such as China, Chile, Costa Rica, Korea, Malaysia, and Thailand illustrate the potential for diversification, for most low-income countries the development of a well-diversified export base is likely to remain a long-term goal.

VI. CONCLUSIONS

68. **Debt sustainability is an essential condition for economic stability and growth in low-income countries.** Irrespective of whether debt-service obligations are expected to be financed by a country's own resources or by additional aid inflows or debt relief, excessive debt levels create adverse incentives for private investors or governments to engage in activities that spur long-term growth. In addition, while market rollover risks are limited in most low-income countries, those that are heavily indebted are particularly vulnerable to interruptions in aid flows in response to changing priorities of official creditors and donors. These problems are aggravated by various political, institutional, and structural risk factors, that tend to reduce returns on investment in low-income countries and, more generally, constrain their governments' ability to service debt. The corresponding risk to official creditors is that they may be forced to maintain positive net transfers to a country or to provide debt relief to ease the constraints that excessive debt service would otherwise impose on the use of countries' scarce resources. This would curtail the limited resources available to support sound policies in other deserving countries and generally undermine the efficient and transparent allocation of official aid flows.

69. **The proposed operational debt-sustainability framework for low-income countries aims at preventing excessive debt accumulation, by linking a country's borrowing potential to its current and prospective ability to service debt.** In recognition of the diversity across low-income countries, the framework incorporates empirical evidence on the factors that influence countries' debt-servicing capacity and risk of debt distress, by establishing dynamic, policy-dependent thresholds for a range of relevant debt-burden indicators. These thresholds are proposed to be used to inform judgments on debt sustainability, by providing indicative benchmarks for projected debt-burden indicators—namely, the present value of public and publicly guaranteed debt and debt service in relation to alternative measures of a country's repayment capacity—both under the baseline and in

[58] Amin Gutiérrez de Piñeres and Ferrantino (1995). The World Bank (2003). Zambia: The Challenge of Competitiveness and Diversification. Report No 25388-ZA.

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the event of likely shocks. Based on a careful interpretation of the results and consideration of other relevant factors that influence an individual country's ability to carry debt, the proposed approach provides an informed basis for designing a sustainable country-specific borrowing (and lending) strategy.

70. **The proposed framework has important operational implications for creditors, donors, and low-income borrowers.** Creditors and donors would need to provide new financing at levels and on terms that limit low-income countries' risk of debt distress. This would imply an increase in the overall level of grants to low-income countries. Creditors and donors would also need to explore ways of helping countries deal with the impact of adverse exogenous shocks, which have proven to be a major contributor to deteriorating debt dynamics in low-income countries. The proposed framework protects the debt dynamics against "likely" shocks, by subjecting the long-term debt projections to stress tests which influence the judgment on appropriate levels of new borrowing. This precautionary ex-ante approach, however, will need to be complemented by ex-post mechanisms that provide additional financing or effective debt-service relief in the aftermath of more severe shocks. Finally, low-income countries also need to take important steps to bolster their own resilience to debt distress, such as improving policies and institutions, enhancing debt-management capacity, and implementing domestic policies that reduce their vulnerability to exogenous shocks.

71. **Next Steps.** Subject to Directors' approval of the proposed approach, the staffs of the two institutions will separately prepare detailed operational guidelines for Bank and Fund operations, consistent with the framework.

VII. Issues for Discussion

72. Directors have stressed the need for an operational framework to assess debt sustainability in low-income countries. Do they agree that the operational framework proposed in this paper can provide an informed basis for determining sustainable borrowing and lending policies in these countries? More specifically:

- Does the framework strike the right balance between rules and discretion, by establishing policy-dependent indicative benchmarks for debt indicators, subjecting long-term debt projections to extensive stress testing, and allowing room for judgment in the interpretation of the results in light of other country-specific considerations?

- Is the choice of the specific thresholds ranges, based on historical experience of debt distress, appropriate, or would Directors prefer a more or less conservative approach to guide new lending decisions?

- Does the proposed framework assign appropriate roles to the various debt-burden indicators, by focusing, in the first instance, on the debt stock in present value terms, as a summary indicator of future obligations already taken on, while tracking debt-service indicators to assess the likelihood and timing of potential liquidity problems?

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➢ Is the choice and magnitude of stress tests, and their suggested interpretation as presenting "likely" shocks, appropriate for the purpose of the framework?

73. Directors may wish to express their views on the implications for lenders and donors, in particular, with regard to the need to tailor the terms of new financing to countries' risk of debt distress. Do they agree with the conclusion that overall grant resources to low-income countries need to be increased and, if so, do they see scope for a sizeable increase? What options do Directors see, if grants are not sufficient to ensure that a country can obtain the financing required to meet the MDGs while maintaining debt sustainability?

74. Directors may wish to comment on the problem of shocks and the possible approaches for dealing with their impact. Do they see scope for applying ex-post mechanisms for dealing with shocks on a wider basis and would they support further research in this direction?

75. Directors may wish to comment on how low-income countries could increase their resilience to debt distress. In this regard, do they view the proposed framework as providing appropriate incentives for countries to strengthen their policies?

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EMPIRICAL ANALYSIS

1. Central to operationalizing the debt-sustainability framework is determining at what point debt becomes unsustainable, i.e., at what point debt indicators reach "danger levels". The HIPC Initiative, in order to determine debt relief for HIPC countries, uses a present value (PV) of debt-to-exports ratio of 150 percent as a sustainability threshold. However, this ratio is considered to be conservative—implying that the "danger level" is higher—and makes no allowance for country-specific differences. Since the HIPC Initiative encompasses a diverse group of creditors to agree on the required amount of debt relief, the choice of a single debt-sustainability threshold as opposed to country-specific thresholds has the advantage of simplifying the implementation of the Initiative. The primary purpose of the low-income debt-sustainability framework, however, is not the facilitation of debt relief but informing new borrowing and lending decisions. Given that countries are likely to differ in their ability to sustain a given debt level, debt-sustainability thresholds that serve as the basis for lending or borrowing decisions would need to take those country-specific differences into account. It needs to be emphasized, though, that this is not an exact science and assessing prudent debt levels will necessarily involve a large degree of judgment.

2. The World Bank (Kraay and Nehru, 2004) empirically examined the determinants of "debt distress", which was defined as periods in which countries resorted to exceptional financing in any of three forms: (i) significant arrears on external debt, (ii) Paris Club rescheduling, and (iii) non-concessional balance-of-payments support from the IMF. Using probit regressions, the analysis found that three factors explained a substantial fraction of the cross-country and time-series variation in the incidence of debt distress: the debt burden, the quality of policies and institutions, and shocks. They showed that these results were robust to a variety of alternative specifications, and that the core specifications had substantial out-of-sample predictive power.

3. Drawing partly on work by Gottschalk and Loko (2003), Fund staff have replicated the analysis in Kraay and Nehru with three modifications: (i) the dataset was limited to low-income countries; (ii) debt distress was defined purely by the occurrence of significant arrears to official creditors; and (iii) a different dataset was used for NPV of debt calculations.[59] This appendix presents the results of this analysis, which broadly corroborate the World Bank's findings. The appendix also surveys some of the existing empirical literature on debt-sustainability thresholds and factors influencing them.

A. A First Look At The Data

4. The most simple approach towards assessing debt-sustainability thresholds is considering the average debt level in countries that have been experiencing a debt-distress

[59] Details of this approach are discussed below.

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episode. This approach does not take country-specific factors into account, but provides a first glimpse at unconditioned average debt-sustainability thresholds.

5. The Fund staff analysis defines debt-distress episodes as situations marked by significant arrears accumulation (in excess of five percent of total debt) on obligations to official creditors.[60] This is a broad definition of debt distress, in the sense that it encompasses episodes of severe distress, where countries accumulate arrears continuously over a long period of time, and less severe episodes, where countries accumulate arrears in some but not all years. Focusing on arrears to official (as opposed to all) creditors, on the other hand, is meant to narrow the definition to relatively acute episodes of debt distress, assuming that countries would otherwise not take the risk of jeopardizing their primary, and most likely future, source of finance. Non-distress episodes are defined as at least three consecutive years in which the stock of arrears to official creditors is smaller than five percent of the total debt stock. All other episodes are defined as debt-distress episodes.

6. The first row in Figure 1 plots the distribution of the PV of debt-to-GDP ratio for both debt-distress and non-distress episodes. Visual inspection suggests that the distribution for the distress episodes is skewed towards the right, which means debt ratios tend to be higher for countries experiencing debt distress. This is also borne out by the summary statistics presented in the upper panel of Table 1, which show that the median of the PV of debt-to-GDP ratio for the debt-distress episodes is indeed noticeably higher than the corresponding median for the non-distress episodes. A similar relationship is found for the other debt-stock variables.[61] Although the observation that debt-distress episodes are accompanied by high debt ratios does not prove that high debt is a cause for debt distress, it does show that the data is consistent with such a hypothesis.

7. For calculating debt-sustainability thresholds, the Fund staff analysis focuses on the debt situation that prevailed on average in the year prior to the beginning of a debt-distress episode. If countries accumulate debt over time until the debt burden becomes unsustainable, the year prior to debt distress could be interpreted as representing the "tipping point" where any further increase in debt will lead to distress. This approach yields a threshold value for the PV of debt-to-GDP ratio of around 43 percent, 192 percent for the PV of debt-to-exports ratio, and 288 percent for the PV of debt-to-revenue ratio.

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[60] The threshold of five percent is intended to prevent 'de minimis' arrears from signaling debt distress and is consistent with the debt-distress definition chosen by Kraay and Nehru.

[61] For the debt-service ratios this relationship is not visible, since these ratios are based on debt service *paid*, and not debt service *due*. Reliable data is available only for the former. Debt service paid does not include the accumulation of arrears, and therefore captures only part of the debt-service burden a country would face if it were to service its external obligations in full.

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8. To assess how well these threshold values discriminate between debt-distress and non-distress observations, the 43 percent threshold value for the PV of debt-to-GDP ratio is indicated as a dotted line in Figure 1. From the first panel it is apparent that approximately 36 percent of non-distress events occurred at debt ratios higher than the threshold, and approximately 36 percent of the debt-distress episodes are characterized by debt ratios below the threshold. This illustrates that using a threshold value that does not take country-specific differences into account can lead to substantial type I and type II errors by wrongly classifying non-distress episodes as debt-distress episodes and vice versa.

9. In exploring the factors that determine a country's ability to sustain a given level of debt, Fund staff's empirical findings corroborate the result of the Bank staff analysis (Kraay and Nehru) on the strong role of policies; countries with strong policies can sustain a higher debt burden than those with weak policies. To provide a visual illustration of this result, the two lower panels in Figure 1 split the sample into observations corresponding to strong and weak policies, and show for these two groups the relative distribution of the PV of debt-to-GDP ratio for debt-distress and non-distress episodes.[62] Comparing the distribution for non-distress episodes, the median for the strong policy observations turns out to be substantially higher than that of weak policy observations. A similar result is found for the debt-distress episodes. This supports the hypothesis that countries with strong policies can sustain higher debt levels than countries with weak policies without experiencing debt distress. By focusing again on the debt situation in the year prior to debt distress it is possible to derive debt-sustainability thresholds that differentiate between strong and weak policy, which is a first step towards country specific thresholds (Table 1). However, this approach is still relatively crude in that it distinguishes only between strong and weak policies and it also does not control for the role of shocks, which are another important cause of debt-distress episodes. This suggests to turn to more sophisticated econometric techniques to overcome these limitations.

B. Empirical Results on the Link Between Debt Distress, Debt, and Policy

10. The aforementioned study by Kraay and Nehru uses a probit regression model to investigate the effect of debt and policy on the probability of debt distress using developing country data. Debt-distress episodes are defined as periods where countries have either a large arrears stock relative to the total debt stock[63], receive debt relief in the form of Paris Club rescheduling, or receive exceptional from the IMF. The study focuses on severe debt-distress episodes by eliminating all seemingly temporary distress episodes that are less than

[62] Following Kraay and Nehru, the quality of policy is measured on the basis of the World Bank's CPIA index. Strong policy is defined as observations in the lower two quintiles, and weak policy corresponds to observations in the upper two quintiles.

[63] Arrears—which refer to arrears to all creditors (official and private) on long-term debt outstanding—are defined as large if they exceed 5 percent of total debt outstanding.

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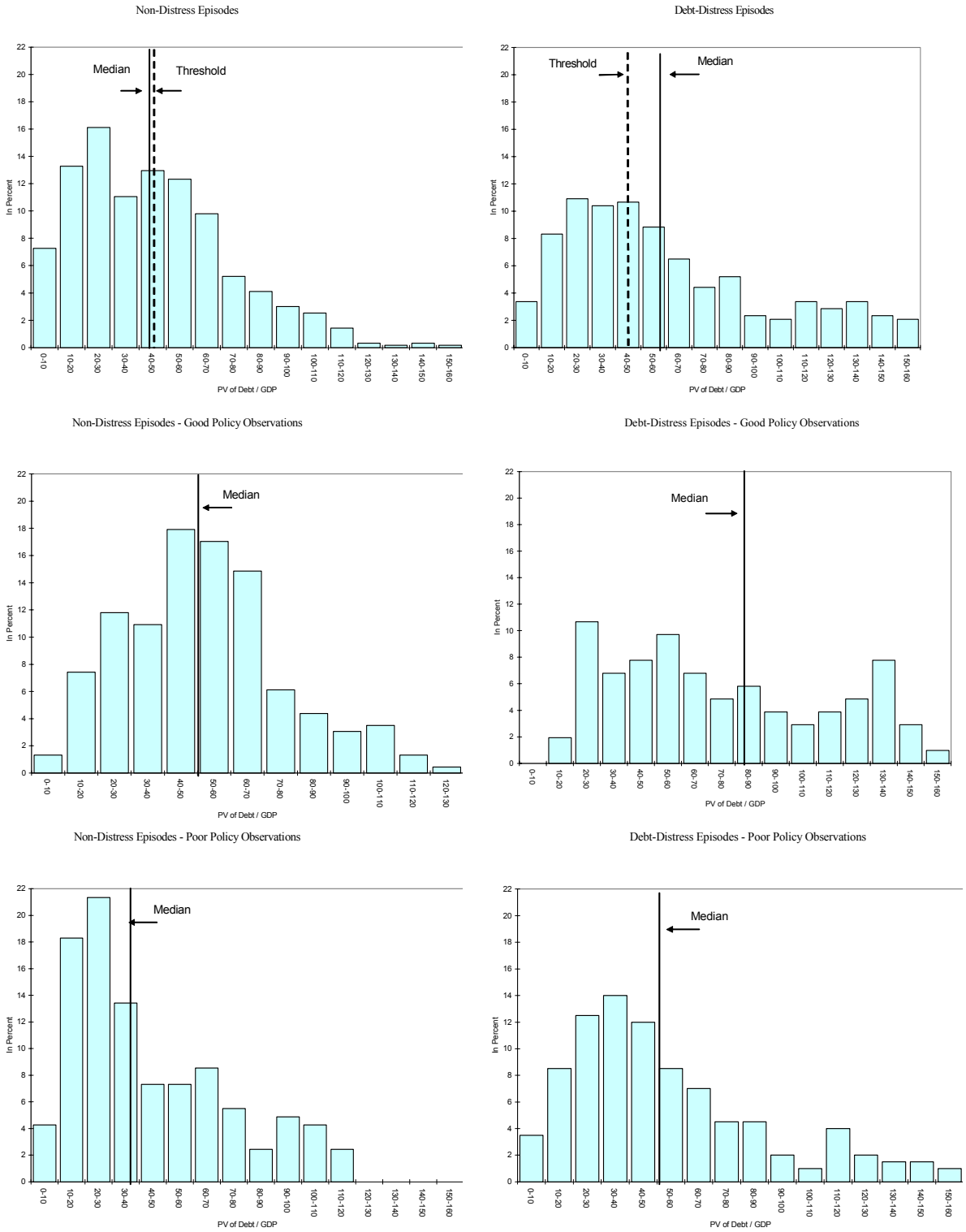
Figure 1. Relative Frequency Distribution of the PV of Debt-to-GDP Ratio



Source: Fund staff estimates.

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Table 1. Median Debt Ratios During Debt Distress and Non-Distress Episodes 1/
(In percent)

	All Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	41	58	43
PV of debt/exports	190	268	192
PV of debt/revenue	225	340	288
Debt service paid/exports	15	14	15
Debt service paid/revenue	18	15	13
	Good Policy Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	50	81	60
PV of debt/exports	212	325	249
PV of debt/revenue	242	374	389
Debt service paid/exports	19	20	21
Debt service paid/revenue	24	17	20
	Poor Policy Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	35	50	47
PV of debt/exports	195	239	213
PV of debt/revenue	250	333	305
Debt service paid/exports	14	10	15
Debt service paid/revenue	18	14	18

Source: Fund staff estimates.
1/ Since the CPIA index is not available for all years and all countries, the sample for "All Observations" is larger than a combined sample of "Good Policy Observations"and "Poor Policy Observations". As a result, the median debt ratios for "All Observations" is not always between the corresponding ratios for good and poor policy observations, respectively.

three years long. Non-distress episodes are defined as non-overlapping periods of five consecutive years in which none of the three debt-distress indicators are observed. Explanatory variables are measured in the first year of non-distress and the year prior to the beginning of debt-distress episodes respectively, a methodology that controls for endogeneity in the effects of distress on debt ratios and the other right-hand side variables. A probit model

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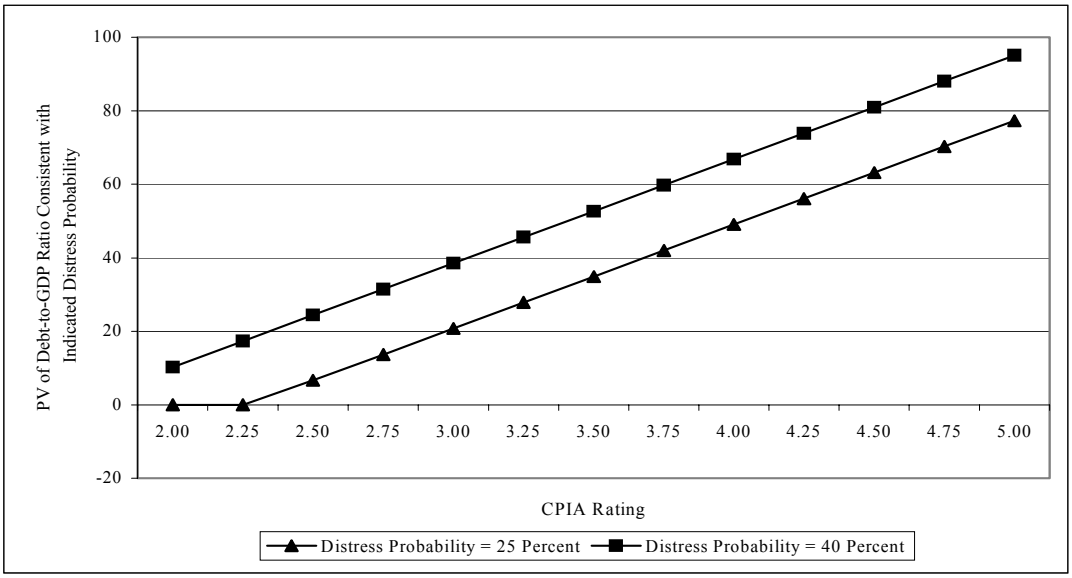
is then used to estimate the probability of debt-distress episodes as a function of debt variables, the CPIA index as an indicator for the quality of policy, and real GDP growth as a measure of shocks that countries experience. Using this specification, the authors find that debt levels, policy variables, and GDP growth are highly significant in determining the probability of debt distress.

11. An important implication of Kraay and Nehru's results is that there is a strong tradeoff between debt indicators and policy variables. This is illustrated in Figure 2, which plots the NPV of debt-to-GDP ratio that is consistent with a fixed probability of debt distress

Figure 2. Sustainable Debt Level as a Function of Policies and Debt Distress Probabilities



Source: Kraay and Nehru (2004).

and a given quality of policy. Figure 2 shows, for example, that given a debt-distress probability of 25 percent, countries with a CPIA index of 4 (in a range of 1-6, with 1 marking the worst and 6 the best performance) can sustain a PV of debt-to-GDP ratio of 50 percent, whereas for countries with a CPIA index of 3, the corresponding debt ratio is at 20 percent.[64] For a given probability of debt distress, these results can be interpreted as providing a range for debt-sustainability thresholds, where the individual position of a country within the range depends on the quality of its policies.[65]

[64] These results have been computed under the assumption that real GDP growth is at its average, which is equivalent to a no-shock assumption.

[65] The corresponding ranges for the other debt variables are reported in Table 1 of the main text for a 25 percent probability of distress.

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12. The reliability of these threshold ranges depends critically on the ability of the model to effectively discriminate between debt-distress and non-distress episodes. An evaluation of the out-of-sample predictive power of the model shows that most specifications correctly predict 70 percent or more of the distress episodes. The authors find some variation in the prediction success regarding non-distress episodes; for the best specification they report a misclassification rate of 13 percent. In contrast, the misclassification rate of non-distress episodes jumps to over 50 percent if only the debt but not the policy variable is used. This mirrors the results from Figure 1, which also pointed to a large misclassification problem if debt thresholds do not take the policy dimension into account.

13. An important question is whether Kraay and Nehru's results can be reproduced for other policy variables. Manasse, Roubini and Schimmelpfennig (2003) use a similar methodological approach as Kraay and Nehru for the purpose of developing an early warning model of sovereign debt crises for emerging market economies. They find that macroeconomic variables reflecting solvency and liquidity factors can predict a debt crisis episode one year in advance. More specifically, they report that low GDP growth, current account imbalances, tight liquidity and monetary conditions in the G7 area, low trade openness, exchange rate overvaluation and volatility, monetary mismanagement (in the form of high inflation), policy uncertainty (in the form of high volatility of inflation), and political uncertainty matter for predicting debt crises.[66] It is possible that a number of these variables could also be important for explaining debt-distress episodes in low-income countries.

14. To explore this hypothesis for low-income countries, probit regressions similar to Kraay and Nehru's basic specification are estimated using other policy variables in place of the CPIA indicator. Following Kraay and Nehru, the estimated probit model explains the probability of debt distress as a function of debt, policy, and shocks. The latter are approximated with the growth rate of real GDP. However, since in contrast to Kraay and Nehru's results the GDP growth rate variable was often insignificant if used in isolation, the set of control variables was expanded to include the natural logarithm of GDP per capita (Atlas method) and a dummy variable for African countries. The GDP per capita variable serves as a measure of a country's capacity to cope with external shocks, based on the assumption that poorer countries may lack a well diversified economy or institutional capacity to weather such shocks. The dummy variable for African countries is intended to capture the high vulnerability of many African countries to commodity price shocks because of their dependence on commodity exports. Table 2 shows that all control variables are jointly significant at the 5 percent level. The definition of debt distress and non-distress episodes is the same that has been used for Figure 1 and Table 1. All variables have been lagged by one period to control for endogeneity.

15. This consideration of alternative policy variables allows a multidimensional analysis of the effect of policy on debt distress and hence acts as a robustness check of the result that

[66] Interestingly, they do not find a role for fiscal policy variables.

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policy matters. Following Manasse et al., the policy variables considered are current account imbalances, trade openness, two alternative measures of exchange rate overvaluation, exchange rate volatility, inflation, and volatility of inflation. The current account variable serves as a measure of external financing requirements and is defined as the ratio of the current account balance to international reserves. Trade openness is defined as the sum of exports and imports over GDP. Exchange rate overvaluation is measured using an overvaluation index based on Dollar (1992) and alternately as the deviation of the real effective exchange rate from the preceding three-year average. Inflation is measured as the annual change in the consumer price index and inflation volatility as the deviation of the inflation rate from the preceding three-year average. Following Kraay and Nehru, real GDP growth is interpreted as a measure of shocks and not as a policy variable. A measure of monetary tightness in G7 countries, which is found by Manasse et al. to be an important determinant of debt distress in emerging markets, is omitted here since low-income countries typically do not borrow on commercial terms. In addition, the International Country Risk Guide (ICRG) indices on political risk and the quality of bureaucracy are used as measures of political risk and of institutional quality.

Table 2. Determinants of Distress 1/

	CPIA			Openness			Real Exchange Rate Deviation			Overvaluation		
	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue
Debt ratio	0.015**	0.002**	0.003**	0.016**	0.003**	0.003**	0.009**	0.002**	0.003**	0.016**	0.003**	0.004**
Policy	-0.519**	-0.415**	-0.404**	-0.006**	0.001	0.001	0.006*	0.006	0.008**	0.000	0.001	0.002*
P-Value of Test of Controls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.290	0.000	0.000	0.000
Implied Thresholds 2/ 3/												
Bad Policy	26	83	138	28			27		161			234
Average Policy	43	186	205	37			34		189			261
Good Policy	58	276	264	45			38		202			296

	Exchange Rate Volatility			Inflation			ICRG Bureaucracy Index			ICRG Political Risk Index		
	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue
Debt ratio	0.014**	0.002**	0.003**	0.015**	0.003**	0.003**	0.012**	0.002**	0.002**	0.012**	0.002**	0.002**
Policy	0.411**	0.429**	0.322**	0.001**	0.001**	0.002**	-0.312**	-0.233**	-0.272**	-0.016*	0.001	-0.007
P-Value of Test of Controls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Implied Thresholds 2/ 3/												
Bad Policy	15	44	127	36	137	206	3	...	...	16		
Average Policy	23	103	156	39	154	241	7	...	17	26		
Good Policy	33	174	191	40	160	252	29	48	131	34		

Source: Fund staff estimates.

1/ * and ** denotes significance at the 5% and 1% level respectively.
2/ Debt ratios are in present value terms using constant discount rates.
3/ Missing value indicates that the relevant policy variable is found to be insignificant. "..." denotes negative thresholds.

16. Table 2 reports the results from this analysis and the implied policy-dependent debt-sustainability thresholds where the respective policy variables are significant, at least at the

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five percent level. The implied debt thresholds have been calculated for the mean of the debt-ratios and control variables, and the 25th , 50th and 75th quartiles of the CPIA which correspond to strong, average and weak policies respectively. The 20 percent probability of distress used in these calculations was chosen such that the PV of debt-to-GDP for average policy countries corresponds to the threshold of 43 percent found in the unconditioned sample depicted in Figure 1. The first set of columns in Table 2 shows the results for the CPIA index as the policy variable. A comparison with Kraay and Nehru's results reported in Table 1 of the main text indicates that both empirical models agree on the relative effect of policies on debt thresholds. Both models find a threshold range between strong and weak policies of approximately 30 percentage points for the PV of debt-to-GDP ratio, 200 percentage points for the PV of debt-to-export ratio, and 100 percentage points for the PV of debt-to-revenue ratio. However, the absolute levels of the implied thresholds are higher for the model estimated here when the same probability of distress is assumed. The unconditional probability of distress used in Kraay and Nehru's analysis is 25 percent which, when applied to the specification here, generates absolute thresholds levels that are higher by approximately 10, 85, and 55 percentage points for the debt-to-GDP, debt-to-exports, and debt-to-revenue ratios respectively.[67]

17. The divergence in threshold levels for identical distress probabilities may partly reflect sample differences, differences in the definition of variables, or differences in methodology between Kraay and Nehru's analysis and the approach here: (i) whereas Kraay and Nehru use a sample of developing countries, the analysis here uses low-income countries only (see Table 3 for the list of countries included); (ii) the PV values used here (from Easterly's dataset) are based on a fixed discount rates of 7.5 percent, whereas the PV values in Kraay and Nehru's study are based on variable currency-specific commercial interest reference rates (CIRRs) as discount rates; and (iii) there are differences in defining debt-distress episodes as already noted. Nevertheless, even though these differences probably account for a significant part of the divergence in threshold levels, it is also clear that the absolute threshold levels depend strongly on the somewhat arbitrary choice of the probability of distress. The Kraay and Nehru paper and the analysis above suggest two useful approaches to determine the suitable choice of probability; alternative methodologies applied in other studies are discussed in the next section.

18. For policy variables other than the CPIA index, Table 2 shows that many of those considered here are highly significant and have the expected sign. That is, these results confirm that countries with strong policies can sustain higher debt ratios than those with weak policies, and this conclusion holds for many dimensions of policy. The absolute level and the range of the implied thresholds are typically considerably smaller than those found for the CPIA index. This may be the result of a significant omitted variable bias, since Table

[67] For example, the PV debt-to-GDP thresholds increase from 26, 43, and 58 percent to 37, 54, and 69 percent for weak, average and strong policies respectively when the probability of distress is increased from 20 to 25 percent in our analysis.

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Table 3. List of Countries Covered in Empirical Analysis

Angola	Haiti	People's Democratic Republic of Lao
Armenia	India	Republic of Congo
Azerbaijan	Indonesia	Republic of Yemen
Bangladesh	Kenya	Rwanda
Benin	Kyrgyz Republic	Senegal
Bhutan	Lesotho	Sierra Leone
Burkina Faso	Liberia	Solomon Islands
Burundi	Madagascar	Sudan
Cambodia	Malawi	São Tomé & Príncipe
Cameroon	Mali	Tajikistan
Central African Republic	Mauritania	Tanzania
Chad	Moldova	The Gambia
Comoros	Mongolia	Togo
Côte d'Ivoire	Mozambique	Uganda
Democratic Republic of Congo	Myanmar	Ukraine
Ethiopia	Nepal	Uzbekistan
Georgia	Nicaragua	Vietnam
Ghana	Niger	Zambia
Guinea	Nigeria	Zimbabwe
Guinea-Bissau	Pakistan	

practically all regressions in Table 2 cover only one dimension of policy and omit other dimensions that also matter for debt distress.[68] Estimates using the CPIA index as policy variable are probably less affected by this problem, since the CPIA is itself a fairly comprehensive policy indicator. This suggests that threshold estimates using a broad based index like the CPIA are likely to be more reliable, even though the result that policy matters holds more generally.

C. The Relationship Between Debt and Growth

19. An important consideration in the above calculations of debt thresholds is determining the appropriate value for the risk of crisis. The approach followed above was to apply the risk of distress associated with historical experience, measured by the average debt

[68] In the case of inflation, the estimated coefficients are highly significant but quantitatively so small that inflation practically has no effect on the probability of debt distress. In addition to the omitted variable bias, the inflation variable may suffer to a particular large degree from an endogeneity bias in the sense that debt distress often leads to large increases in inflation, which would bias the regression results downwards.

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ratio prior to distress events in the unconditioned sample of observations (i.e. the 43 percent PV debt-to-GDP threshold). Kraay and Nehru use a probability of distress of 25 percent which is equal to the historical unconditional average of debt distress in their sample. Alternatively, the 'target' probability of debt distress could be chosen by taking into account the negative effects of debt crises on the country's macroeconomic performance at different probabilities of distress. Such an approach is followed by Cohen (1997). He calculates the growth impact of a debt crisis at various probabilities to identify the probability of debt distress that has the largest negative effect on growth. With this probability, and the result from a probit regression that explains debt distress as a function of debt levels, he computes the implied debt thresholds. He finds that a 60 percent probability of distress has the maximum effect on growth, and finds threshold values of 50 percent for the PV of debt-to-GDP ratio, 200 percent for the PV of debt-to-exports ratio, and 290 percent for the PV of debt-to-tax ratio, which correspond closely to the unconditional threshold estimates presented above.

20. Pattillo, Poirson, and Ricci (2002) pursue an alternative approach that searches for non-linearities in the relationship between debt and growth. In particular, they argue on theoretical grounds that at low debt ratios the impact on growth is positive, whereas at high debt ratios the impact is negative, and examine this hypothesis for a group of developing countries between 1968-1998. Estimating quadratic and spline specifications using a large panel dataset, they find debt to have a nonlinear impact on growth even when investment is controlled for. In particular, the average impact of debt on per capita growth becomes negative for PV of debt levels above 160-170 percent of export and 35-40 percent of GDP.[69] If policy aims at ensuring a positive average impact of debt on growth, these results could also be interpreted as threshold values.

[69] The marginal effect of external debt on growth in this study is found to become negative at NPV of debt-to-GDP ratios of 9-14 percent. Using a sample for low-income countries only, a recent study by Clements et al. (2003) finds that in this group, negative marginal effects on growth begin to occur at levels of public and publicly guaranteed external debt of 20-25 percent of GDP.

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ILLUSTRATION OF PROPOSED DEBT-SUSTAINABILITY FRAMEWORK

1. **This Appendix illustrates the proposed framework for debt-sustainability analyses in low-income countries.** The output generated by the two templates for the assessment of external and public debt sustainability is presented on the basis of two hypothetical country cases. In general, both parts of the analysis would be conducted for each low-income country—consistent with the approach adopted in the Fund for emerging markets and industrialized countries—unless domestic debt of the public sector (external debt of the private sector) is negligible. In this case, a single analysis of external (public) debt would generally be sufficient. Moreover, for those low-income countries that have access to private international capital markets and hold relatively small amounts of concessional debt, the Fund's "emerging-market template" may be a more suitable analytical tool for debt-sustainability assessments.

A. External Debt Sustainability Analysis

2. **The first step of the analysis consists of determining appropriate indicative thresholds for the relevant debt-burden indicators, namely the NPV of public and publicly guaranteed (PPG) external debt, in percent of GDP and export, and the debt service-to-exports ratio.** It is assumed that the quality of policies and institutions in the hypothetical country (Country A) is close to average, though slightly on the weak side, suggesting indicative debt-burden thresholds that are somewhat below the ratios established in Table 2 of the main text for medium policies. Thus, indicative ratios of **40 percent of GDP** and **180 percent of exports** would appear to be appropriate upper benchmarks for the NPV of PPG external debt in this country, with a corresponding PPG debt-service threshold of about **20 percent of exports**.

3. **In a second step, the external template is applied to project the debt dynamics under the baseline (Table 1).** Starting from the evolution of total (nominal) external debt, as a share of GDP, and the breakdown of the factors that determine the debt dynamics (namely, the non-interest current account, non-debt creating capital inflows (FDI), and the endogenous debt dynamics), Table 1 derives the NPV of external debt and its public and publicly guaranteed component—with the NPV of private sector debt approximated by its face value. In Country A, private sector debt is low at less than 5 percent of GDP and projected to rise only gradually to about 15 percent of GDP by the end of the 20-year projection period. The NPV of PPG external debt, however, at 41 percent of GDP, is slightly above the indicative threshold—though some 15 percentage points below the export-based threshold. Thus, GDP would, at present, constitute the more binding denominator constraint, while the export-based ratio is high enough to suggest that elevated debt ratios are not driven by denominator (i.e., measurement) problems. Over the medium term, both ratios are projected to rise slightly to a maximum of 43 percent of GDP and 173 percent of exports, respectively, but to return to their initial levels by 2008. With broadly stable PPG debt-service ratios of somewhat less than 20 percent of exports, the situation would, on balance, appear manageable but tight with little room for additional borrowing beyond the baseline projections. Some comfort would

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Table 1. Country A: External Debt Sustainability Framework, Baseline Scenario, 2000-2023 1/
(In percent of GDP, unless otherwise indicated)

	Actual			Historical Average 6/	Standard Deviation 6/	Estimate	Projections						
	2000	2001	2002			2003	2004	2005	2006	2007	2008	2003-08 Average	2013
External debt (nominal) 1/	**59.5**	**62.5**	**63.5**			**64.5**	**65.7**	**69.3**	**70.3**	**67.9**	**65.6**		**54.3**
o/w public and publicly guaranteed (PPG)	55.6	58.2	59.1			60.0	61.2	64.7	65.7	62.9	60.1		45.8
Change in external debt	-0.8	3.0	1.0			1.0	1.2	3.6	1.0	-2.3	-2.4		-1.9
Identified net debt-creating flows	-1.3	2.6	1.0			2.2	3.0	2.6	2.0	-1.1	-1.0		-0.7
Non-interest current account deficit	**6.2**	**6.4**	**6.5**	**8.2**	**2.4**	**11.3**	**12.2**	**12.4**	**12.2**	**8.8**	**8.6**		**7.3**
Deficit in balance of goods and services	17.5	15.9	14.7			15.8	16.8	17.0	16.8	16.7	16.4		14.7
Exports	26.6	26.0	24.8			24.9	24.3	24.9	24.9	24.8	24.6		23.4
Imports	44.1	41.8	39.5			40.7	41.0	41.8	41.6	41.5	41.0		38.1
Net current transfers (negative = inflow)	-3.9	-5.0	-3.9	-5.6	1.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6		-4.6
Other current account flows (negative = net inflow)	-7.4	-4.5	-4.3			0.1	0.1	0.1	0.1	-3.3	-3.2		-2.7
Net FDI (negative = inflow)	**-5.0**	**-2.5**	**-3.9**	**-3.7**	**2.2**	**-6.9**	**-7.4**	**-7.9**	**-8.6**	**-8.0**	**-7.9**		**-6.7**
Endogenous debt dynamics 2/	**-2.5**	**-1.3**	**-1.7**			**-2.2**	**-1.8**	**-1.9**	**-1.7**	**-1.8**	**-1.8**		**-1.2**
Contribution from nominal interest rate	1.8	1.5	1.5			1.6	1.7	1.5	1.6	1.5	1.4		1.4
Contribution from real GDP growth	-2.3	-2.1	-3.0			-3.8	-3.5	-3.5	-3.3	-3.3	-3.2		-2.6
Contribution from price and exchange rate changes	-2.0	-0.7	-0.2			…	…	…	…	…	…		…
Residual (3-4) 3/	**0.5**	**0.4**	**0.1**			**-1.2**	**-1.8**	**1.0**	**-1.0**	**-1.2**	**-1.3**		**-1.2**
o/w exceptional financing	-2.2	-1.3	-0.9			0.0	0.0	0.0	0.0	0.0	0.0		0.0
NPV of external debt 4/	...	...	45.8			45.4	45.1	47.3	47.7	46.9	46.2		41.7
In percent of exports	...	...	184.9			182.5	185.9	190.1	191.8	189.5	187.8		178.0
NPV of PPG external debt	**...**	**...**	**41.3**			**40.9**	**40.6**	**42.7**	**43.1**	**41.9**	**40.7**		**33.1**
In percent of exports	...	...	166.8			164.4	167.3	171.5	173.3	169.2	165.5		141.3
Debt service-to-exports ratio (in percent)	15.2	22.6	25.5			22.5	24.6	22.9	23.2	21.1	19.0		23.0
PPG debt service-to-exports ratio (in percent)	11.2	18.6	21.1			18.1	20.0	18.2	18.5	16.4	13.9		14.5
Total gross financing need (billions of U.S. dollars)	0.2	0.3	0.3			0.4	0.4	0.4	0.4	0.3	0.3		0.5
Non-interest current account deficit that stabilizes debt ratio	7.0	3.4	5.5			10.3	11.0	8.9	11.2	11.1	11.0		9.2
Key macroeconomic assumptions													
Real GDP growth (in percent)	4.1	3.8	5.1	5.9	15.6	6.5	6.0	5.5	5.0	5.0	5.0	5.5	5.0
GDP deflator in US dollar terms (change in percent)	3.4	1.2	0.3	2.3	14.9	2.0	2.9	-1.5	1.5	1.8	2.0	1.4	2.2
Effective interest rate (percent) 5/	3.2	2.7	2.6	2.8	0.2	2.8	2.9	2.4	2.4	2.2	2.2	2.5	2.6
Growth of exports of G&S (US dollar terms, in percent)	9.7	2.5	0.5	8.4	9.9	9.1	6.4	6.6	6.5	6.5	6.5	6.9	6.0
Growth of imports of G&S (US dollar terms, in percent)	6.6	-0.4	-0.6	9.1	22.5	12.0	10.0	6.0	6.0	6.5	6.0	7.8	5.6
Grant element of new public sector borrowing (in percent)	...	...	...	...	...	44.5	40.9	36.8	37.7	26.8	29.1	36.0	27.3
Memorandym item:													
Nominal GDP (billions of US dollars)	3.0	3.2	3.4			3.7	4.0	4.1	4.4	4.7	5.1		7.2

Source: Staff simulations.

1/ Includes both public and private sector external debt.
2/ Derived as $[r - g - \rho(1+g)]/(1+g+\rho+g\rho)$ times previous period debt ratio, with r = nominal interest rate; g = real GDP growth rate, and ρ = growth rate of GDP deflator in U.S. dollar terms.
3/ Includes exceptional financing (i.e., changes in arrears and debt relief); changes in gross foreign assets; and valuation adjustments. For projections also includes contribution from price and exchange rate changes.
4/ Assumes that NPV of private sector debt is equivalent to its face value.
5/ Current-year interest payments devided by previous period debt stock.
6/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

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arise from a per capita income level that is assumed to be at the upper end of the low-income country spectrum. Over the long term PPG debt ratios are projected to improve, on account of falling current account deficits and sizeable FDI inflows, while the endogenous debt dynamics would deteriorate somewhat. The debt-service ratio would continue to hover around 20 percent, as financing is increasingly obtained from commercial sources.

4. **The third step of the analysis consists of an interpretation of the stress-test results.** The stress tests are conducted for the NPV of PPG external debt and distinguish between "alternative scenarios," which are designed as permanent modifications of key baseline assumptions, and "bound tests," representing temporary deviations—though some with permanent level effects. The alternative scenarios include a "historical scenario" in which the main parameters that determine the debt dynamics (namely, real GDP growth; inflation, measured by changes in the GDP deflator, in U.S. dollar terms; the non-interest current account in percent of GDP; and non-debt creating flows in percent of GDP) are assumed to remain at their historical averages, generally derived over a ten-year period. This scenario is intended to provide a "reality check" for the baseline projections against the country's own history. The second alternative scenario is a "financing scenario" in which new borrowing is assumed to be on less favorable terms (a 2 percentage point higher interest rate) throughout the projection period. The bound tests, include isolated two-period one-standard deviation shocks to the key variables (including export growth in addition to the above-mentioned parameters), a combined shock of half the size, and a one-time 30 percent depreciation.[70] The size of the shocks has been chosen to present, on average, a 25 percent probability of occurring over a 10-year period, as derived in Appendix III and discussed in the main text. The implications for the key debt-burden indicators, presented in Table 2—and illustrated in Figure 1 for the baseline, the historical scenario, and the most extreme bound test—suggest the following interpretations:

- The simulation of the long-term debt dynamics under historical trends (scenario A1) produces a considerable deterioration over time in both debt and debt-service indicators, despite historically more favorable growth and inflation developments. The reason for the negative deviation from the baseline is the gap between current account deficits and FDI inflows, which is projected to shrink over time under the baseline. A justification of the baseline projections, in this specific case, would therefore need to focus on convincing arguments in support of the relatively favorable outlook for FDI and current account developments. Over the medium term, the stability of the debt outlook is also contingent on obtaining the assumed concessional financing, as two percentage points higher interest

[70] To be precise, the shocked variables under the bound tests (except for the depreciation scenario) are assumed to be equivalent to their historical averages plus/minus two (one) standard deviations over the following two years, before returning to their levels under the baseline (see footnotes to Table 2).

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Table 2. Country A: Sensitivity Analyses for Key Indicators of Public and Publicly Guaranteed External Debt, 2003-23
(In percent)

	Estimate	Projections						
	2003	2004	2005	2006	2007	2008	**2013**	2023
NPV of Debt-to-GDP Ratio								
Baseline	41	41	43	43	42	41	**33**	21
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	41	41	41	42	43	45	**50**	54
A2. New public sector loans on less favorable terms in 2004-23 2/	41	43	47	49	48	48	**43**	35
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	41	48	58	59	57	56	**45**	28
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	41	42	47	48	46	45	**36**	21
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	41	48	57	57	56	54	**44**	27
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	41	46	54	54	53	52	**40**	22
B5. Combination of B1-B4 using one-half standard deviation shocks	41	49	60	60	59	57	**46**	27
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	41	57	60	61	59	58	**47**	29
NPV of Debt-to-Exports Ratio								
Baseline	164	167	172	173	169	165	**141**	99
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	164	167	165	167	174	181	**215**	261
A2. New public sector loans on less favorable terms in 2004-23 2/	164	176	187	196	195	193	**184**	169
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	164	167	172	173	169	165	**141**	99
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	164	187	221	223	218	214	**179**	118
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	164	167	172	173	169	165	**141**	99
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	164	190	217	218	214	210	**170**	104
B5. Combination of B1-B4 using one-half standard deviation shocks	164	176	194	196	192	188	**158**	107
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	164	167	172	173	169	165	**141**	99
Debt Service-to-Exports Ratio								
Baseline	18	20	18	18	16	14	**15**	19
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	18	20	17	17	15	13	**18**	33
A2. New public sector loans on less favorable terms in 2004-23 2/	18	20	18	19	18	15	**15**	26
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	18	20	18	18	16	14	**15**	19
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	18	22	22	22	20	17	**19**	23
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	18	20	18	18	16	14	**15**	19
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	18	20	19	20	18	16	**19**	20
B5. Combination of B1-B4 using one-half standard deviation shocks	18	21	19	20	18	15	**17**	21
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	18	20	18	18	16	14	**15**	19
Memorandum item:								
Grant element assumed on residual financing (i.e., financing required above baseline) 6/	16	16	16	16	16	16	**16**	16

Source: Staff projections and simulations.

1/ Variables include real GDP growth, growth of GDP deflator (in U.S. dollar terms), non-interest current account in percent of GDP, and non-debt creating flows.
2/ Assumes that the interest rate on new borrowing is by 2 percentage points higher than in the baseline, while grace and maturity periods are the same as in the baseline.
3/ Exports values are assumed to remain permanently at the lower level, but the current account as a share of GDP is assumed to return to its baseline level after the shock (implicitly assuming an offsetting adjustment in import levels).
4/ Includes official and private transfers and FDI.
5/ Depreciation is defined as percentage decline in dollar/local currency rate, such that it never exceeds 100 percent.

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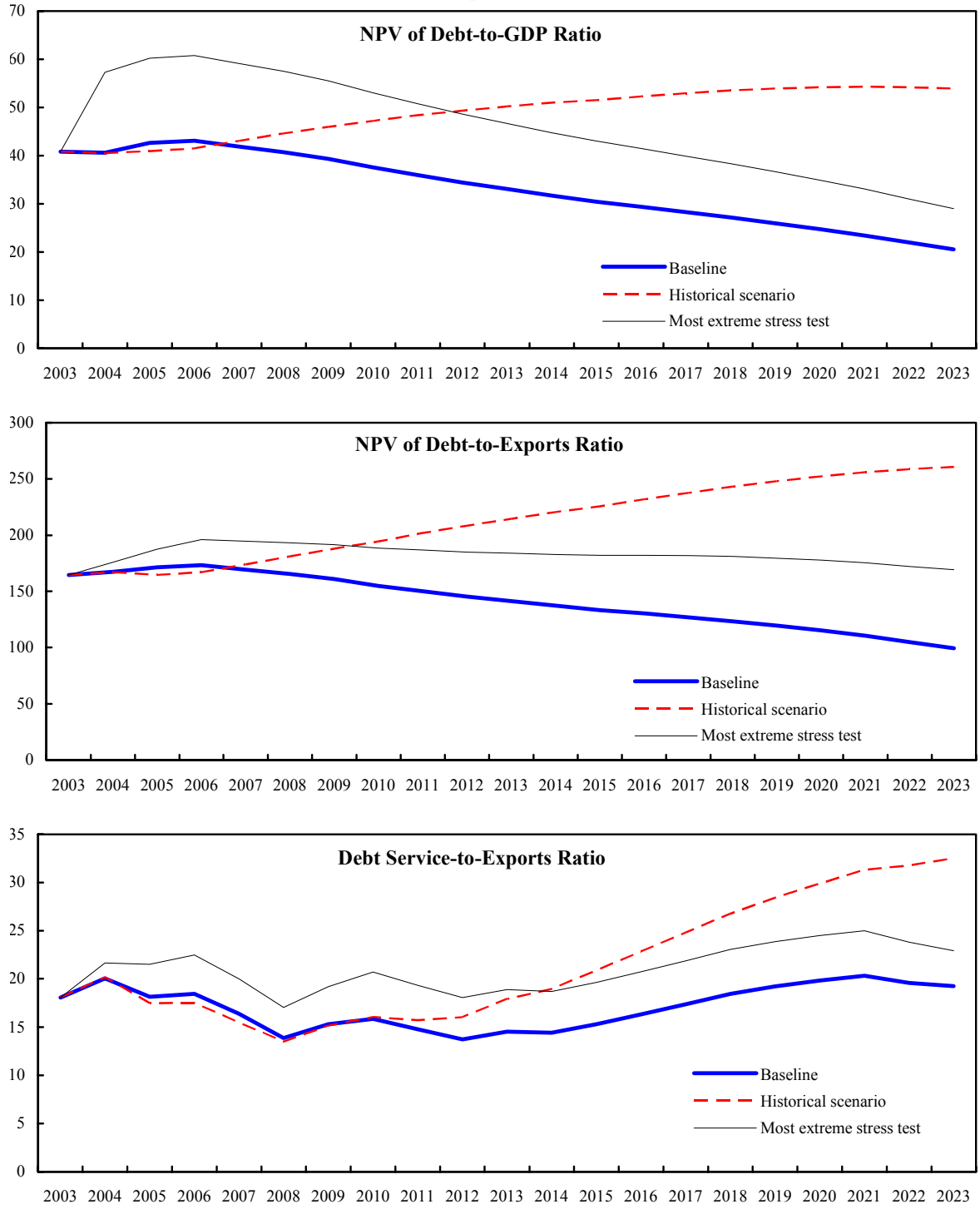
Figure 1. Country A: Indicators of Public and Publicly Guaranteed External Debt
Under Alternative Scenarios, 2003-2023
(In percent)



Source: Staff simulations.

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rates would raise the debt ratio to some 48 percent of GDP (scenario A2)—considerably higher than the indicative threshold.

- The worst scenario among the bound tests is a one-time 30 percent exchange-rate depreciation, which results in an NPV of debt-to-GDP ratio of 47 percent after 10 years—7 percentage points above the indicative threshold and some 14 percentage points above the baseline projection. Similar effects—with NPV of debt-to-GDP ratios of around 45 percent after 10 years—arise from the GDP growth shock, the deflator shock, and the combined shock. The NPV of debt-to-exports ratio and the debt service ratio, one the other hand, would remain below their indicative threshold levels.

- In conclusion, while the short-term borrowing profile for 2004 appears appropriate, over the medium term, country A would be advised to seek higher concessionality in its new financing or keep its borrowing levels below those envisaged under the baseline to create more room for maneuver in the event of adverse shocks. A revision of borrowing plans would appear particularly warranted, if FDI inflows fell short of expectations.

B. Public Sector Debt Sustainability Analysis

5. **The structure of the public debt-sustainability template mirrors that for external debt.** The debt dynamics, however, are now driven by the primary fiscal balance, as opposed to the non-interest current account, and by "above-the-line" items specific to the fiscal accounts, while exchange-rate movements only affect the foreign-currency denominated part of the debt stock. The NPV of public debt is derived by including domestic liabilities at their face value, and the external component, both relative to GDP and revenues (including grants) is identified separately, to provide a basis for comparisons with the indicative threshold ratios.

6. **The baseline projections are presented in Table 3.** The hypothetical low-income country (Country B) is assumed to have received debt relief under the HIPC Initiative in 2003, which reduced the NPV of public sector external debt by more than one-third to about 42 percent of GDP and 164 percent of revenues. Under the assumption that the quality of Country B's policies and institutions is about average, and that no other factors (such as, per capita income) suggest particular weakness or strength, both ratios would be below the indicative thresholds of **45 percent of GDP** and **200 percent of revenues**.[71] However, Country B's government has sizeable domestic obligations, equivalent to about 20 percent of GDP, which add considerably to the government's debt-service burden, indicated by near-

[71] Care needs to be taken in interpreting the debt-burden ratios relative to the indicative thresholds, as the coverage of the public sector in the template, following country-specific conventions, may differ from the concept of PPG external debt (for example, by not including private sector debt that is publicly guaranteed).

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Table 3. Country B: Public Sector Debt Sustainability Framework, Baseline Scenario, 2000-2023
(In percent of GDP, unless otherwise indicated)

	Actual					Estimate					Projections		
	2000	2001	2002	Historical Average 5/	Standard Deviation 5/	2003	2004	2005	2006	2007	2008	2003-08 Average	2013
Public sector debt 1/	222.2	171.1	171.9			125.3	113.6	105.6	97.9	92.2	87.4		72.6
o/w foreign-currency denominated	217.1	150.2	152.9			105.9	97.8	91.8	85.5	80.8	77.1		66.2
Change in public sector debt	39.3	-51.1	0.9			-46.6	-11.7	-8.1	-7.7	-5.8	-4.7		-2.4
Identified debt-creating flows	35.7	-52.6	2.4			-45.6	-10.4	-7.2	-5.7	-5.8	-5.3		-3.8
Primary deficit	**2.8**	**4.7**	**1.6**	**-1.1**	**3.9**	**0.5**	**-1.5**	**-1.0**	**-0.4**	**-0.9**	**-0.5**	**-0.7**	**0.4**
Revenue and grants	25.1	24.8	26.3			25.5	25.5	24.5	24.0	23.0	22.8		21.7
of which : grants	5.7	5.7	8.3			7.1	7.4	6.3	5.9	4.8	4.7		3.6
Primary (noninterest) expenditure	27.9	29.5	27.8			25.9	24.0	23.5	23.6	22.0	22.3		22.1
Endogenous debt dynamics	**40.7**	**-69.8**	**0.9**			**-12.9**	**-9.0**	**-6.2**	**-5.2**	**-4.9**	**-4.7**		**-4.2**
Contribution from interest rate/growth differential	-7.5	-13.4	-5.8			-7.6	-4.8	-5.3	-5.3	-4.6	-4.4		-3.9
of which : contribution from average real interest rate	-1.1	-3.0	-0.8			-0.2	0.6	0.1	-0.2	-0.4	-0.4		-0.6
of which : contribution from real GDP growth	-6.3	-10.4	-5.0			-7.4	-5.4	-5.4	-5.0	-4.2	-4.0		-3.2
Contribution from real exchange rate depreciation	48.2	-56.4	6.7			-5.4	-4.1	-0.8	0.1	-0.3	-0.3		-0.3
Other identified debt-creating flows	**-7.9**	**12.5**	**0.0**			**-33.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**0.0**
Privatization receipts (negative)	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Recognition of implicit or contingent liabilities	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Debt relief (HIPC and other)	-7.9	0.0	0.0			-33.1	0.0	0.0	0.0	0.0	0.0		0.0
Bank recapitalization	0.0	12.5	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Residual, including asset changes	**3.6**	**1.4**	**-1.6**			**-1.0**	**-1.3**	**-0.9**	**-2.0**	**0.1**	**0.5**		**1.4**
NPV of public sector debt	**140.2**	**115.0**	**123.1**			**61.1**	**55.4**	**52.4**	**47.3**	**43.9**	**41.5**		**36.3**
o/w external	**135.1**	**94.1**	**104.0**			**41.7**	**39.5**	**38.7**	**34.9**	**32.6**	**31.2**		**29.8**
Gross financing need 2/	7.0	8.0	6.4			8.6	6.5	5.2	4.9	3.9	3.6		2.5
NPV of public sector debt-to-revenue ratio (in percent) 3/	558.8	463.2	468.2			240.0	217.1	214.4	197.3	191.4	182.3		167.0
o/w external	538.5	378.9	395.8			163.6	155.0	158.2	145.5	142.1	137.0		137.1
Debt service-to-revenue ratio (in percent) 3/ 4/	12.1	10.1	15.5			32.0	31.4	25.2	22.4	21.1	18.3		9.5
Primary deficit that stabilizes the debt-to-GDP ratio	-36.5	55.8	0.7			47.1	10.2	7.1	7.2	4.8	4.2		2.8
Key macroeconomic and fiscal assumptions													
Real GDP growth (in percent)	3.6	4.9	3.0	0.6	5.6	4.5	4.5	5.0	5.0	4.5	4.5	4.7	4.5
Average nominal interest rate on forex debt (in percent)	1.0	0.6	0.6	0.7	0.3	1.1	1.1	1.0	0.9	0.9	0.8	1.0	0.5
Average real interest rate on domestic currency debt (in percent)	16.3	12.8	0.1	9.8	8.5	1.6	3.3	4.6	5.5	5.4	5.1	4.3	5.0
Real exchange rate depreciation (in percent, + indicates depreciation)	24.0	-24.1	4.6	-2.3	24.2	-3.6	-3.9	-0.9	0.1	-0.4	-0.4	-1.5	-0.5
Inflation rate (GDP deflator, in percent)	30.0	24.3	19.7	43.7	44.2	19.9	13.7	7.9	5.2	5.0	5.0	9.5	5.0
Growth of real primary spending (deflated by GDP deflator, in percent)	9.2	10.9	-2.9	3.9	17.0	-2.7	-3.2	2.6	5.4	-2.2	5.5	0.9	5.3
Grant element of new external borrowing (in percent)	62.3	62.3	62.3	88.7	18.2	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3

Sources: Country authorities; and Fund staff estimates and projections.

1/ [Indicate coverage of public sector, e.g., general government or nonfinancial public sector. Also whether net or gross debt is used.]

2/ Gross financing need is defined as the primary deficit, plus debt service, plus the stock of short-term debt at the end of the previous period.

3/ Revenues including grants.

4/ Debt service is defined as the sum of interest and amortization on medium and long-term debt of the public sector.

5/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

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term debt service-to-revenue ratios of more than 30 percent—which is also the indicative threshold for medium policies (though not strictly comparable as the latter is derived on the basis of external PPG debt, only).

7. **The baseline projections anticipated a considerable improvement in the debt-burden indicators over the longer-term.** During the next ten years, total public sector debt is projected to fall to 36 percent, in present value terms, and to 22 percent by 2023, with domestic debt dropping gradually to negligible levels. The projected reduction in debt stocks is accompanied by a rapid improvement in the debt-service ratio to 20 percent over the medium term and less than 10 percent in the long run. These projections assume relatively high GDP growth and tight fiscal policy. Real GDP growth is projected at around 4½ percent, on average, over 2003-2023; this optimistic forecast contrasts with the recent historical experience (½ percent per annum), but may be plausible under a scenario in which good policies are implemented. A gradual fiscal adjustment, mostly driven by cuts in primary expenditure, transforms the 2002 primary deficit of 1½ percent of GDP into a modest surplus during the simulation period. With real primary spending growing at only 1 percent a year during the adjustment period (2003-08) and about 4 percent (the historical average growth rate) thereafter, there is little room for poverty-reducing spending, unless this is created by a reallocation of the budget for these programs.

8. **The stress test results are presented in Table 4 and Figure2.** In recognition of the importance of domestic debt, and to avoid duplication from the external debt sustainability analysis, the public-debt template conducts stress tests for total public sector debt and debt service—which cannot be directly compared with the indicative thresholds, and needs to be interpreted with care. In addition to the historical scenario (applied to real GDP growth and the primary balance), the second alternative scenario simulates the debt-burden indicators under unchanged primary balances, akin to a “no-reform” scenario, and the third scenario assumes permanently lower GDP growth, with the deviation from the baseline linked to historical volatility. While the first two scenario would simply curb the decline in the debt ratio, without alter the trend, the weaker growth scenario would keep the debt-burden indicators high throughout, with the NPV of debt-to-revenue ratio rising to 300 percent by the end of the projection period, and the debt-service ratio moving back up to about 30 percent.

9. **The bound tests are similar to the ones simulated in the external-debt template.** In addition, they include a one-off 10 percent of GDP increase in other debt-creating flows, due for example to the unexpected realization of contingent liabilities. The stress tests suggest that Country B’s debt outlook is particularly vulnerable to a GDP growth shock, which would keep the NPV of debt-to-GDP ratio above 50 percent after ten years. Under the assumption that the residual borrowing needs are met from external sources—such that domestic debt would fall as in the baseline—the external component of public debt would amount to 48 percent of GDP and 215 percent of revenues, in present value terms—both exceeding their indicative threshold values. However, debt-service (on total public debt) would remain considerably below the current level of 30 percent of revenues.

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Table 4. Country B: Sensitivity Analyses for Key Indicators of Public Sector Debt , 2003-2023

	Estimate	Projections						
	2003	2004	2005	2006	2007	2008	**2013**	2023
NPV of Debt-to-GDP Ratio								
Baseline	61	55	52	47	44	42	**36**	22
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	61	58	57	53	51	50	**48**	30
A2. Primary balance is unchanged from 2003	61	57	55	50	48	46	**42**	28
A3. Permanently lower GDP growth 1/	61	56	54	50	48	47	**50**	61
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	61	59	61	57	55	53	**54**	48
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	61	58	58	53	49	47	**41**	25
B3. Combination of 2-3 using one half standard deviation shocks	61	58	58	53	49	46	**39**	22
B4. One time 30 percent real depreciation in 2004	61	81	77	70	65	61	**50**	29
B5. 10 percent of GDP increase in other debt-creating flows in 2004	61	63	60	54	51	48	**42**	26
NPV of Debt-to-Revenue Ratio 2/								
Baseline	240	217	214	197	191	182	**167**	107
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	240	224	229	216	216	211	**206**	130
A2. Primary balance is unchanged from 2003	240	223	225	210	209	203	**192**	138
A3. Permanently lower GDP growth 1/	240	220	220	207	206	202	**226**	298
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	240	229	242	230	232	229	**245**	238
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	240	229	238	220	215	205	**189**	123
B3. Combination of 2-3 using one half standard deviation shocks	240	228	236	216	210	200	**180**	111
B4. One time 30 percent real depreciation in 2004	240	318	316	294	284	269	**228**	145
B5. 10 percent of GDP increase in other debt-creating flows in 2004	240	248	244	226	221	211	**195**	127
Debt Service-to-Revenue Ratio 2/								
Baseline	32	31	25	22	21	18	**10**	7
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	32	32	27	25	23	21	**10**	4
A2. Primary balance is unchanged from 2003	32	31	28	25	24	21	**12**	11
A3. Permanently lower GDP growth 1/	32	32	26	24	23	21	**16**	28
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	32	33	29	28	27	25	**17**	23
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	32	31	30	29	24	20	**11**	9
B3. Combination of 2-3 using one half standard deviation shocks	32	32	29	27	23	20	**10**	7
B4. One time 30 percent real depreciation in 2004	32	33	28	25	24	21	**11**	9
B5. 10 percent of GDP increase in other debt-creating flows in 2004	32	31	38	27	24	20	**11**	10

Sources: Country authorities; and Fund staff estimates and projections.
1/ Assumes that real GDP growth is at baseline minus one standard deviation divided by the square root of 20 (i.e., the length of the projection period).
2/ Revenues are defined inclusive of grants.

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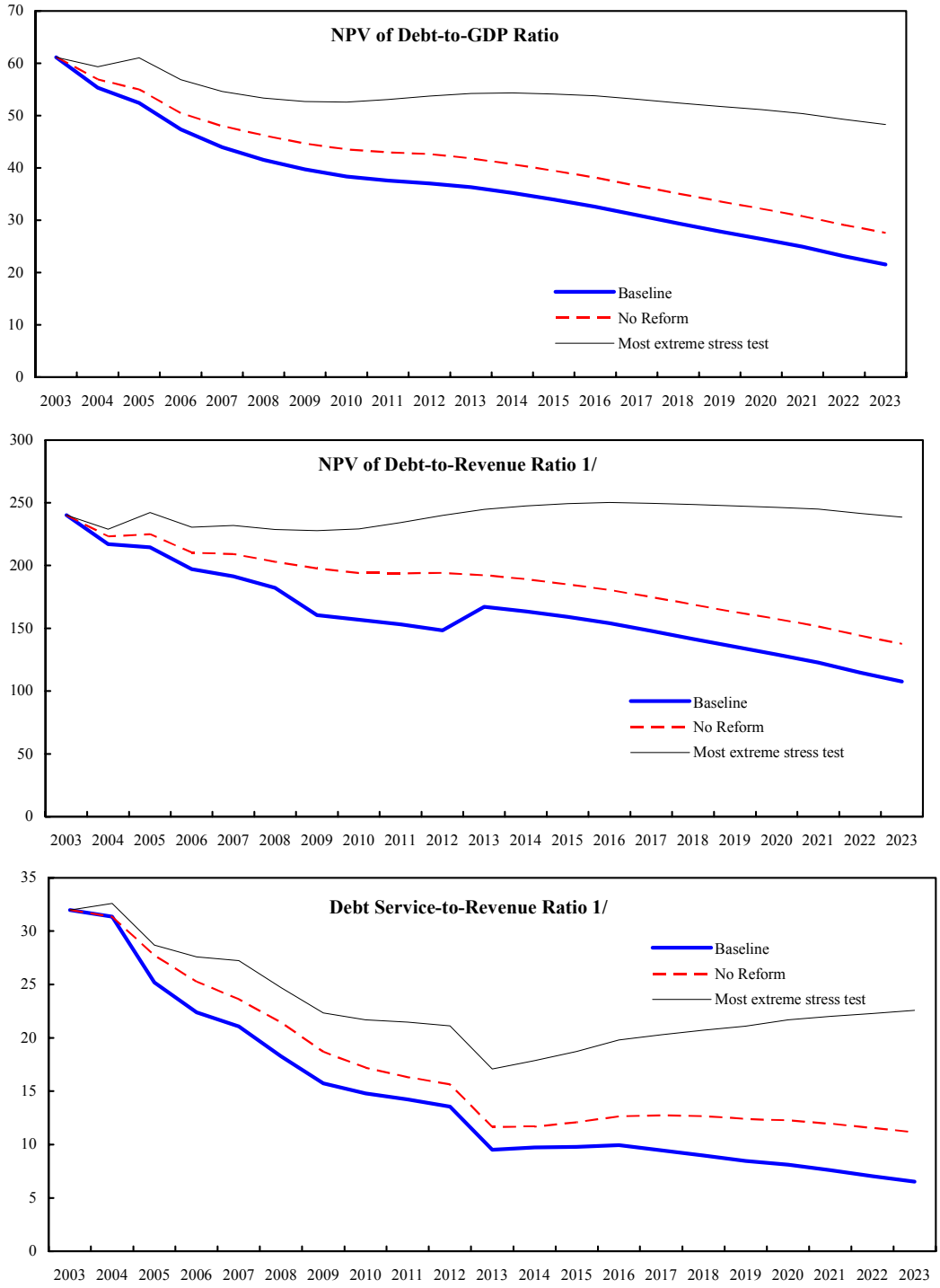
Figure 2. Country B: Indicators of Total Public Debt Under Alternative Scenarios, 2003-2023
(In percent)



Source: Staff simulations.
1/ Revenues are defined inclusive of grants.

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10. **In conclusion, while the debt-burden indicators are projected to improve considerably under the baseline, the positive outlook is contingent on fairly optimistic assumptions about growth and policy adjustments.** Based on its historical record, Country B is highly vulnerable to output shocks that could endanger debt sustainability. Furthermore, the success of the adjustment is predicated on cuts in spending (relative to GDP), which will pose a challenge, as the government simultaneously attempts to reallocate the budget toward poverty-reducing activities. In this context, an adjustment strategy that relies on raising the revenue effort might be politically more viable. The borrowing strategy under the baseline would need to be revised if the optimistic assumptions on growth, in particular, fail to materialize during the coming years. In these circumstances, higher grants would greatly help alleviate the pressure to cut spending.

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STOCHASTIC SIMULATION OF EXTERNAL DEBT RATIO

1. As noted in the text, a key element of the proposed framework is adequate stress testing of the debt dynamics in the baseline scenario. Calibrating the stress tests, however, is not straightforward. The stress tests should be sufficiently demanding to capture the main risks facing the country's debt sustainability, yet not so extreme that they model events whose likelihood is so small that they are irrelevant. A reasonable choice might be to calibrate the stress tests so that the implied outcome for the long-term debt ratio (say, at a 10-year horizon) has a roughly 25 percent likelihood of occurring.[72] This appendix explains how stochastic simulations can be used to calibrate the stress tests accordingly.

2. The first step consists of deriving the probability distribution of the debt ratio at various horizons using stochastic simulations. To account for potential correlations among the forcing variables of external debt dynamics—namely, real GDP growth (*g*), interest rate (*i*), rate of change in the U.S. dollar value of the GDP deflator (ρ), non-interest current account balance (*cb*) and net FDI flows in percent of GDP (*ndf*)—an autoregressive data-generating process is assumed for these variables. Specifically, denoting the vector of forcing variables by $z = (g, i, \rho, cb, ndf)'$, the data-generating process is modeled as:

$$(1)\quad z_t = \beta_0 + \sum_{k=1}^{K} \beta_k z_{t-k} + \varepsilon_t$$

where $\varepsilon \sim N(0, \Sigma)$ represents a vector of serially uncorrelated normal errors. This filtering equation allows serial correlation among the forcing variables through $\{\beta_k\}_{k=0}^{K}$ and Σ.

Once the filtering equation (1) is estimated by using historical data, an *N*-year random sample of forcing variables, $\{\tilde{z}_t\}_{t=1}^{N}$, can be generated by feeding into the estimated filter the ε shocks, $\{\tilde{\varepsilon}_t\}_{t=1}^{N}$, that are drawn from $N(0, \Sigma)$.[73] Finally, the corresponding *N*-year random sample of the NPV of debt-to-GDP ratio, denoted by $(npvd_t\}_{t=1}^{N}$, can be obtained by substituting $\{\tilde{z}_t\}_{t=1}^{N}$ into the debt dynamics equation given by:

[72] Focusing on the 10-year horizon strikes a compromise between the growing uncertainties of long-term projections and the desire to capture adequately the debt-service obligations and associated financing needs arising from new borrowing in light of often long grace periods.

[73] In the simulation, a random sample of ε is constructed by pre-multiplying the *i.i.d.* shocks drawn from the standard normal distribution by the Choleski factor W of Σ, where W is a lower-triangular matrix that satisfies $\Sigma = WW'$.

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(2) $npvd_t = \frac{(1+r_t)(1-\mu_t)}{(1+g_t)(1+\rho_t)} npvd_{t-1} + (1-ge_t)(ndf_t - cb_t)$

where $1-\mu_t = (1-ge_t)/(1-ge_{t-1})$ and ge_t represents the grant element defined as the difference between the debt stock and the NPV of debt, expressed in percent of the debt stock.[74] By simulating (2) repeatedly, a "fan chart" of possible outcomes of the debt ratio (with their associated probabilities) can be generated.

3. The next step is to compare the debt ratios implied by the stress tests in the sustainability framework to this empirically derived probability distribution. Specifically, let $npvd^s$ denote the debt ratio implied by the respective stress test, and $p^s = prob(npvd \geq npvd^s)$ the likelihood (known as the p-value) that the actual debt ratio will exceed this level. Then, as noted above, a reasonable choice would be to calibrate $npvd^s$ to yield a *p-value* of about 25 percent at a 10-year horizon. If the p-value is much lower, then the stress test may be considered too extreme in the sense that it models an event whose likelihood is relatively low. A significantly higher p-value would suggest that the stress test is too benign since there is high probability that the actual debt ratio will exceed the level implied by the stress test.

4. To calibrate the stress tests in the sustainability framework, stochastic simulations were performed for a "representative" low-income country. Representative time series data for forcing variables were generated for the period from 1985 to 1999 by taking averages across 20 PRGF-eligible countries.[75] Given the relatively short time span of the dataset in annual frequency, a parsimonious specification was estimated for (A.1) by restricting the order of lags for z to 1 (i.e., K=1), and suppressing off-diagonal elements of β_k to zero.[76] Based on the estimated filtering equation, the NPV of debt-to-GDP ratios were simulated 10,000 times over the 20-year period, assuming a constant grant element of 30 percent and an

[74] See IMF (SM/03/185), Appendix I, for how this formula is derived.

[75] The following countries were included in the sample: Burundi, Djibouti, Dominica, Gambia, Ghana, Grenada, Guinea-Bissau, Kenya, Madagascar, Maldives, Mali, Mozambique, Nigeria, São Tomé & Príncipe, Senegal, Solomon Islands, Sri Lanka, St. Vincent and Grenadines, Togo, and Vanuatu.

[76] This specification is equivalent to assuming for each forcing variable a univariate first-order autoregressive process. Under this formulation, potential serial correlation across forcing variables would be captured through the moment matrix Σ, which was constructed by using the estimated residuals over the last 10-year period of the sample for consistent comparison with the standard template tests.

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initial value of the NPV of debt-to-GDP ratio of 40 percent.[77] Accordingly, the standard template tests were conducted over the same time span, applying isolated two-period, one-standard deviation shocks to the key parameters, and a two-period one-half standard deviation combined shock, with standard deviations derived as averages across countries over the last 10-year period of the sample.[78] Under the baseline (the most likely outcome, assuming a continuation of historical trends) the debt ratio rises from 40 percent of GDP to 70 percent of GDP over a 20-year period.

Table 1. Summary Results of Stochastic Simulation

Year	Severity of shock in its impact on NPV of debt-to-GPD ratio						
	Most extreme	Second	Third	Fourth	Fifth	Sixth	Least extreme
	A. NPV of debt-to-GDP ratio from standard template analysis (in percent) 1/						
1	53.0	48.9	45.9	45.2	44.7	43.0	42.6
5	62.8	58.3	56.8	53.7	52.5	49.2	48.5
10	66.8	62.6	61.2	58.4	57.2	54.2	53.5
15	70.5	66.6	65.3	62.7	61.6	58.8	58.2
20	73.9	70.3	69.1	66.7	65.7	63.1	62.6
	B. Associated shock 1/						
1	exr	comb	xg	ρ	fdi	ntr	g
5	comb	xg	exr	ρ	fdi	ntr	g
10	comb	xg	exr	ρ	fdi	ntr	g
15	comb	xg	exr	ρ	fdi	ntr	g
20	comb	xg	exr	ρ	fdi	ntr	g
	C. *P*-value (in percent)						
1	3.7	11.4	21.9	25.4	27.7	38.2	41.1
5	15.7	22.3	24.8	31.2	33.9	41.9	43.7
10	**26.4**	31.9	34.1	38.3	40.5	45.5	46.9
15	31.5	36.0	37.8	41.4	42.9	47.0	47.6
20	36.3	39.8	41.1	43.6	44.7	48.0	48.6

Source: Staff simulations.
1/ The isolated shocks are modeled as two-year, one-standard deviation shocks to g = real GDP growth, ρ = dollar GDP deflator, xg = export growth, and non-debt creating financing (including fdi and ntr = net transfers) as a share of GDP. The combined shock (comb) is applied as a two-year, one-half of a standard deviation shock to these variables. The exchange rate shock (exr) corresponds to a 30 percent depreciation of the local currency.

[77] The assumed grant element of 30 percent was chosen based on the 2001 average across PRGF-eligible countries. The initial value of the NPV of debt at 40 percent of GDP was assumed to be consistent with the targeted ratio (150 percent) of the NPV of debt-to-exports under the HIPC Initiative, and the average GDP share of exports among PRGF-eligible countries (i.e., about 25 percent).

[78] In addition, one stress test assumes a one-time 30 percent depreciation of the local currency vis-à-vis the U.S. dollar. All shocks are applied to the beginning of the projection period.

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5. Table 1 summarizes the results of the stochastic simulations for a representative low-income country by reporting debt ratios from the standard template (in a descending order) after applying the above shocks and the corresponding *p*-values. The results of the standard template analysis indicates that under the most extreme sensitivity test—which, at all horizons, is associated with a combined shock to the forcing variables—the NPV of debt ratio would reach 67 percent over the 10-year horizon (instead of 54 percent of GDP in the baseline). It also indicates that the ordering of shocks in terms of their impact on the debt ratio tends to remain stable over the five to twenty-year horizon. The *p-value* associated with the most extreme shock is 26 percent at the 10-year horizon (16 and 36 percent over 5 and 20 years, respectively)—suggesting that the stress tests are calibrated appropriately.

6. Table 1 also indicates that the *p*-value (i.e., the likelihood that the debt ratio exceeds the level corresponding to the respective stress test) tends to increase over the projection horizon. Moreover, the *p*-values are typically higher than those reported for emerging market countries (see IMF (2003b)). The former observation can be explained by the tendency of the true probability density function of debt ratio to become more fat-tailed as the projection horizon lengthens, which is indeed the case for the simulated probability distribution as shown in Figure 1. The latter seems to be related to the fact that forcing variables of debt dynamics are generally more volatile in low income countries than emerging market countries. Although not reported here, the simulated probability distribution of the debt ratio tends to be more fat-tailed at all horizons when the volatility of forcing variables increases.

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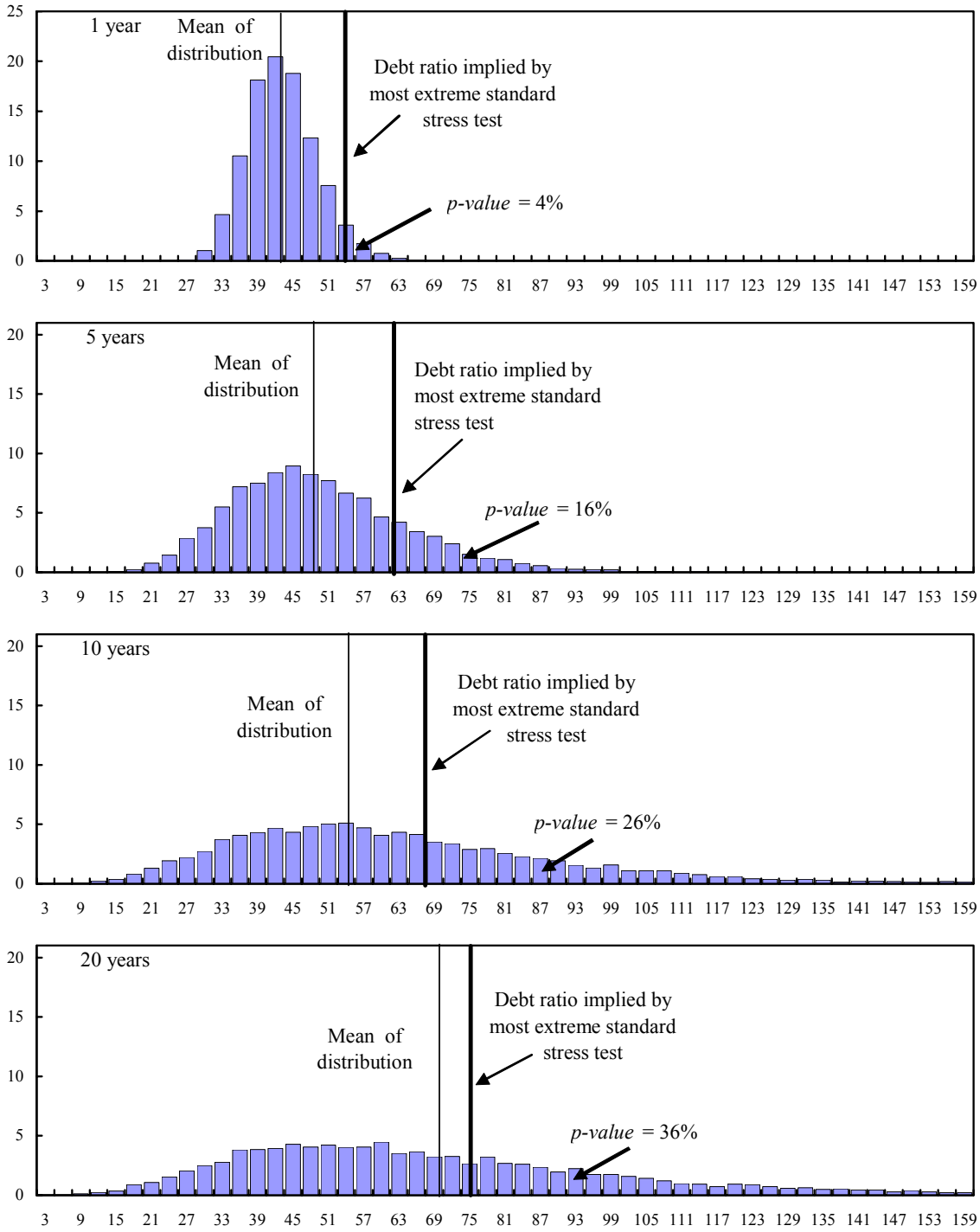
Figure 1. Simulated Probability Density Function of Debt Ratio and P-Value Implied by Standard Stress Test at Selected Horizons



Source: Staff estimates.

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IMF Publication

Financial Sector Regulation - Issues and Gaps - Background Paper

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Financial Sector Regulation: Issues and Gaps—Background Paper

Prepared by Staff of the Monetary and Financial Systems Department

Approved by Stefan Ingves

August 17, 2004

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GLOSSARY

BCBS	The Basel Committee on Banking Supervision
BCP	Basel Core Principles
CCP	Central counterparties
CDF	Credit default swaps
CDO	Collateralized debt obligations
CIS	Collective investment schemes
CGFS	Committee on Global Financial System
COIs	Cooperating official institutions
CRT	Credit Risk Transfer
FASB	Financial Accounting Standards Board
FSAP	Financial Sector Assessment Program
FSF	Financial Stability Forum
GATS	General agreement on trade services
GDP	Gross Domestic Product
IAA	International Actuarial Association
IAASB	International Auditing and Assurance Standards Board
IAIS	International Association of Insurance Supervisors
IAS	International Accounting Standards
ICP	Insurance Core Principles
IFAC	International Federation of Accountants
IFRS	International Financial Reporting Standards
IOSCO	International Organization of Securities Commissions
LCFI	Large and Complex Financial Institutions
MoU	Memorandum of Understanding
MWGED	Multidisciplinary Working Group on Enhanced Disclosure
NPLs	Nonperforming loans
OTC	Over-the-Counter markets
SFI	State-Owned Financial Institutions
WTO	World Trade Organization

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I. Financial System Structure and Trends: Implications for Financial Regulation

1. **Financial systems across the world show considerable diversity and continue to evolve.** This section discusses selected structural features and recent trends in financial systems with important implications for financial sector regulation. These include the following: (i) increased conglomeration and risk transfer; (ii) significant and growing internationalization; (iii) growing dollarization; (iv) weaknesses in infrastructure underpinning regulatory systems; and (v) government ownership of financial institutions. Appendix I in Section I summarizes the key issues and regulatory challenges by region—as brought out by recent FSAP reports—in the same sample of 36 countries covered in the main paper.

A. Increased Conglomeration and Risk Transfer

2. **Growing linkages among different segments of the financial system—banks, insurers, pension funds, securities firms—are a key trend in the financial sectors.** These linkages are increasingly complex, due to a number of factors, including the formation of financial conglomerates and new methods of risk transfer, including credit derivatives.

3. **The main factor leading to the formation of conglomerates is financial system liberalization, allowing cross-ownership among firms in different sectors in many countries.** Improvements in technology, which lowered telecommunication and information costs, have also facilitated the expansion of these financial conglomerates across borders. The industry often cites revenue enhancement and diversification resulting from wider range of products and the ability to offer one-stop shopping to clients and economies of scope in the production of financial services as the reason for growing conglomeration. While there may be benefits in cross-selling some products and services, the evidence on economies of scope is not clear-cut. Globalization of clients of major financial institutions, who demand not only global access to services, but also wide product mix, likely contributed to the conglomeration trend.

4. **In emerging markets, the motivation for conglomeration is similar to the reasons in advanced economies, but the focus on banking has been stronger.** The catalyst here may have been the deregulation pursued in response to macroeconomic pressures and banking crises in the 1990s, combined with higher capital requirements, threatened profits, and an encouragement of more competitive behavior, see BIS (2001) and IMF (2001). Universal banking allowed banks to diversify from traditional commercial banking to retain customers who, for instance, started raising funds through securities rather than borrowing.

5. **The trend in conglomeration globally is documented in recent studies**. The conglomeration trend can be observed both in regions where conglomeration has been historically allowed (Western Europe) and in jurisdictions where restrictions on permissible activities of intermediaries have been lifted only recently (United States and Japan). The evidence on large financial institutions worldwide indicates remarkable increases in conglomeration in some emerging market countries.

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6. **More specifically, the evidence in De Nicoló et al. (2003a) comes from an examination of firm-level data for the largest 500 financial institutions worldwide**.[1] These institutions were classified as conglomerates or nonconglomerates based on information on their major lines of business and/or main activities (for example banking, insurance, and securities). As suggested by Table 1 below, the predominance of conglomerates within the top financial institutions has increased between 1995 and 2000 from 42 percent to 60 percent, as measured by number of conglomerates in the sample and from 72 percent to 80 percent, as measured by assets held by conglomerates. The increase of conglomeration has been recorded in all subgroups, from the top 50 to the top 500 firms, with the level of conglomeration being the highest among the largest firms.

Table 1. Conglomeration Trends: by Asset Size

	1995			2000		
		Conglomerates (%)			Conglomerates (%)	
Size	Average Asset Size (bn US$)	Number	Assets	Average Asset Size (bn US$)	Number	Assets
Top 500	299.55	41.8	72.1	646.3	59.6	80.1
Top 250	310.79	69.2	80.7	657.7	72.2	83.6
Top 100	340.37	85.0	86.8	699.0	89.0	91.7
Top 50	379.72	88.0	89.4	769.5	92.0	94.2

Source: De Nicoló et al. (2003a), original data from Worldscope.

7. **In terms of regional trends, conglomeration increased in all regions depicted in Table 2 below as measured by the number of conglomerates among the largest financial firms.** The same holds true—except for the United States—if we measure the prevalence of conglomeration by total assets.

Table 2. Conglomeration Trends: by Region

	1995			2000		
		Conglomerates %)			Conglomerates (%)	
Region	Number of Institutions	Number	Assets	Number of Institutions	Number	Assets
Unites States	102	42.0	78.6	109	61.5	73.0
Canada	18	61.0	87.4	14	71.4	89.6
Japan	127	7.0	44.0	119	21.0	57.3
Australia	9	66.0	81.8	9	100.0	100.0
Western Europe	201	61.7	89.4	162	73.5	91.6
Eastern Europe	–	–	–	4	100.0	100.0
Latin America	5	40.0	64.6	16	93.8	96.3
Asia	32	31.3	31.2	51	64.7	68.4
Africa and Middle East	6	66.0	55.3	16	100.0	100.0
Total	500	41.8	72.1	500	59.6	80.1

Source: De Nicoló et al. (2003a), original data from Worldscope.

[1] Institutions ranked by total assets, as reported in the Worldscope database.

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8. **The impact of conglomeration on systemic financial risk is not obvious.** Conglomerates may benefit from economies of scope and product diversification, helping them become more efficient and reduce their risk profiles. On the other hand, firms with a wider range of activities can be tempted to take on more risk, particularly if they are large (as illustrated in Table 1) and may be considered to be "too big to fail" or become difficult to discipline effectively. Also, complex structures may become difficult and costly to manage efficiently (including the management of risk) and the risk faced by the conglomerate as a whole may be larger than the sum of risks faced by individual units since the results of one unit may be affected by the actions of another unit.[2]

9. **De Nicoló et al. (2003a) found that large firms undertaking a wide scope of activities did not exhibit lower levels of risk than smaller and specialized firms in 1995, but exhibited higher risk-taking levels in 2000.** The authors interpret this result to suggest that the factors creating incentives for firms to take on more risk, including moral-hazard-induced incentives, appear to have outweighed the risk reduction potentially achievable through scale and scope economies, both regarding geographic placement and product diversification. It should be noted that these results are still tentative and more work is needed to explore the impact of conglomeration on systemic risk.

10. **From a regulatory perspective, there are several vulnerabilities**. Besides the potential for systemic risk due to contagion, there could be conflicts of interest in the ownership structure. Moreover, the financial safety nets can be de facto extended to nonbank financial firms, if banking activities are not effectively ring fenced and public expectations are not carefully managed. Large conglomerates with complex structures pose particular challenges to understand and supervise effectively. Perhaps even more important, conglomeration increases the opportunities for regulatory and supervisory arbitrage, with firms channeling more risky activities to areas with relatively less developed or stringent regulation and supervision.[3]

11. **Besides conglomeration, other forms of risk transfer within the financial sector have raised concerns of market observers, regulators, and policy makers.** For instance, IMF (2002 and 2004) point out that the recent growth in credit derivatives as complex credit risk transfer instruments and the relative lack of transparency of these transactions have prompted concerns about risks migrating from the banking sector. Recently, various official and private sector organizations have undertaken work, including surveys of market participants, to shed more light on these issues. A Fitch (2003) survey concluded that the global banking industry was a significant buyer of protection, since it transferred nearly US$100 billion of credit risk outside the industry. Also, the Financial Stability Forum initiated work on a study on credit risk transfer in 2003.

12. **IMF (2004) finds that there has been a relatively stronger growth in the credit exposure of the insurance sector compared to the banking sector.** This study also argues

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[2] See De Nicoló et al. (2003a) for a discussion of risk factors involved and additional references.

[3] IMF (2003) and Das, Davies, and Podpiera (2003) explore the potential for systemic issues arising from insurance, on the backdrop of growing interlinkages between the insurance and banking sectors.

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that the broader and ongoing reallocation of credit risk could have implications for financial stability. This is despite the fact that the patterns and levels of insurer involvement in credit instruments differ widely across countries and, in gross terms, banks have conducted credit derivative transactions largely with other banks to achieve their desired exposures.[4] However, the cited IMF study concluded, albeit with important caveats, that the relative reallocation of credit risk between the banking and insurance sectors appears to have enhanced financial stability.

B. Significant and Growing Internationalization

13. **The increasing internationalization of financial sectors has been augmenting the regulatory challenges of conglomeration.** As foreign ownership of financial intermediaries increases, systems need to be put in place to ensure proper cross-border coordination among supervisors. At the same time, appropriate adjustments to laws regulations, and deposit insurance systems should be introduced. Effective collaboration among supervisors is growing in importance as financial market shocks become more easily transmitted across borders and sectors. This is not just a problem for regulators in developed countries, but is fast becoming one for a greater number of developing and transitional countries as they become integrated into the global economy and financial system. This of course creates a situation where they are more vulnerable to shocks that are transmitted through patterns of capital flows and international financial markets.

14. **Trends in internationalization have been given an impetus through discussions relating to market access, price limit issues, liberalization of financial sector, and the role of "prudential carve out" in the context of the World Trade Organization's (WTO) General Agreement on Trade in Services (GATS) [see also Box 1]**. As cross-border capital movements become liberalized and exchange rate controls are abolished or reduced, financial markets are becoming increasingly integrated. Furthermore, economic globalization enhances the strategic motives for businesses to expand internationally to compete, spurring a boom in cross-border mergers and acquisitions and foreign direct investment.[5]

[4] Insurance companies have been found to be a net taker of credit risk through credit derivatives, but the net positions formed only a small part—generally 3 to 4 percent—of their asset portfolios.

[5] One of the consequences of the internationalization of financial flows is the emergence of the major countries' financial systems as major "hubs" for gross international capital flows and investment.

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Box 1. Financial Services Liberalization and Regulatory Standards

Financial liberalization, the emergence of integrated financial services, financial conglomerates, and integrated financial sector supervision pose challenges for the current standards and codes. In several countries, some of the basic preconditions for effective supervision remain absent.

Fund staff work has so far focused on the liberalization of the capital account and its sequencing and coordination with the liberalization of financial sector reforms. Although a systematic approach toward issues relating to financial services liberalization and its linkages with trade liberalization has not been fully developed, some efforts have been made in the context of the FSAPs and the work relating to standards assessment.

The main issues concerning the linkages between financial and trade liberalization are related to these issues: (i) sequencing of reforms and the best approaches to create and improve the operation of financial markets and infrastructure; and (ii) market access and movement of capital issues, including prudential rules on licensing financial institutions, and rules governing the handling of domestically-owned and foreign-owned financial institutions.

Although evidence on the benefits and costs of financial liberalization is mixed (Aizenman, 2002), it is usually suggested that liberalization increases the probability of crises (Williamson and Mahar, 1998, Kaminsky and Reinhart, 1999). A stylized fact is that boom-bust cycles in investment, asset prices, and output are preceded by financial liberalization. However, not all countries that have liberalized their financial sectors experienced financial crises (Ishii and Habermeier, 2002). Although economic fundamentals and policies differ from one country to another, a common element of economies avoiding crises appears to be the good management of moral hazard problems. Differences in corporate governance and institutional environment may explain differences in potential fragilities and severity of eventual crises after liberalization (Mitton, 2002, Lemmon and Lins, 2002).

In this regard, Fund work suggests a need for careful sequencing in financial services liberalization, not just in the liberalization of capital flows. Although liberalizing long-term flows is desirable in principle, there is no simple method for devising an operational plan for sequencing and coordinating capital account liberalization with financial liberalization. The present approach regarding financial services rules pursued by a number of bodies (such as the Committee on Trade in Financial Services) suggests that liberalization should be based on verifiable benchmarks and transparency rules. A rules-based approach would bind members in their commitments to the extent that a perceived violation could result in use of dispute settlement procedures. Such an approach raises a number of questions regarding verification and adherence to regulatory standards. The question also arises as to what body would provide verification of adherence. Currently, the competing sets of standards and codes are largely voluntary ("soft law"), and hence not subject to litigation.

15. **Significant and growing internationalization in the banking sector can be illustrated by foreign bank ownership data.** Data compiled on the total assets and foreign-controlled assets in 143 countries across the world (Table 3), (with foreign-controlled assets defined as total assets of banks in which more than 50 percent of equity is owned by foreign entities) shows that in absolute terms, foreign-controlled assets increased worldwide by almost 40 percent between 1995 and 2002. The total foreign-controlled asset share, or the ratio of foreign-controlled assets to total assets, has been growing gradually, from 19.7 percent to 21.5 percent during this same time period.

16. **These developments in foreign ownership have not been uniform.** Foreign-controlled assets have increased most in Latin America, most likely as a result of progress in privatization, and in Europe, due to an advanced process of European integration and ownership consolidation. A significant increase was also recorded in the United States, but the

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foreign ownership share in Africa, the Middle East and Central Asia remained virtually unchanged, while East Asia recorded a 5 percent decline in foreign ownership share.[6]

Table 3. Foreign-Controlled Bank Assets: by Region

	1995		2000		2002	
Region	Total Bank Assets (US$ bn)	Foreign Asset Share (%)	Total Bank Assets (US$ bn)	Foreign Asset Share (%)	Total Bank Assets (US$ bn)	Foreign Asset Share (%)
North America (2)	3,759	2.5	5,647	8.2	6,292	9.5
Europe (22)	3,914	23.1	5,664	28.2	6,401	32.5
Latin America (29)	744	12.4	950	19.1	961	24.8
Africa (49)	258	8.7	323	7.8	319	8.7
Middle East (11)	371	25.1	599	22.5	624	26.2
Central Asia (6)	165	15.3	246	15.4	262	13.8
East Asia (24)	10,718	18.4	11,057	13.5	10,493	13.4
All countries (143)	19,928	19.7	24,486	20.7	25,352	21.5

Sources: Compiled from IMF's International Financial Statistics and Fitch-IBCA.

17. **Internationalization may allow economies of scale and favor financial firms' geographic diversification, thereby reducing the risk profile of those firms that expand internationally.** However, the possible capture of the highest quality customers by foreign institutions may leave domestic financial firms to serve a higher proportion of domestic higher risk customers, thereby worsening risk profiles. In addition, protected domestic institutions, such as state-owned banks, may respond to increased foreign competition by venturing into higher risk areas to maintain their franchise value. These developments reinforce the need to look at the challenges posed to supervision of financial sector activities across jurisdictions, such as the growing need for effective coordination of supervisory activities across borders.

C. Growing Dollarization

18. **One of the important trends in financial systems in recent years has been a substantial increase of de facto dollarization**, that is, the domestic use of foreign currency (mostly the U.S. dollar) in many developing, emerging market, and transition economies. In these economies, foreign currency partly assumes all three functions of money—means of payment, store of value, and unit of account. Dollarization can be "official," when the U.S. dollar is adopted as the legal tender, or "partial" when the local currency remains the legal tender but dollar-denominated transactions are permitted, effectively allowing a bi-currency system to take hold.

[6] Notwithstanding, financial systems are dominated by foreign banks in many developing and emerging market economies. For instance, the presence of foreign banks in Cameroon is overwhelming, with foreign banks controlling the majority of the banking systems in Tanzania, Kenya, and Uganda. In the transitional economies of Estonia, Hungary and the Czech Republic, foreign banks have a dominant position.

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19. **While financial dollarization has not affected all countries equally, it is widespread, and on an upward trend**.[7] As documented by De Nicoló, Honohan, and Ize (2003), the annual growth rate in dollarization across the world during the 10 years to 2001 has been about 1 percentage point per year. There were important variations in dollarization trends, however, both across regions and across countries. Dollarization increased the most in Latin America and transition economies, increased moderately in Africa, Asia, and the Middle East, and remained constant or slightly declined in the Caribbean and in developed countries (Table 4). Even prior to the recent increases, however, the level of dollarization has been substantial. Most recently available, 2001, data show that deposit dollarization exceeded 50 percent in South America and was close to this level in transition economies.

Table 4. Average Foreign Currency Deposits to Total Deposits

Region	Number of Countries	1996	1997	1998	1999	2000	2001
South America	8	45.8	46.1	49.4	53.2	54.0	55.9
Transition economies	26	37.3	38.9	43.5	44.3	46.9	47.7
Middle East	7	36.5	37.2	37.7	37.5	38.2	41.9
Africa	14	27.9	27.3	27.8	28.9	32.7	33.2
Asia	13	24.9	28.0	26.8	28.8	28.7	28.2
Central America and Mexico	7	20.6	20.8	22.0	22.1	22.5	24.7
Caribbean	10	6.3	7.6	6.8	6.7	6.1	6.2
Developed economies	14	7.4	7.5	7.5	6.7	7.0	6.6

Sources: De Nicoló, Honohan, and Ize (2003), original data from IMF's International Financial Statistics, Economic Data Sharing System, and central banks' statistical publications.

20. **Dollarization can have important implications for financial stability.** Balance sheet effects and the diminished role of central banks as lenders of last resort are usually mentioned among the main risks entailed by dollarization. Although it is suggested that financial dollarization entails not only risks, but also benefits (Baliño, Bennett, and Borensztein, 1999), the exposure to solvency and liquidity risks might make financial systems inherently more fragile. Empirical evidence suggests that financial dollarization may increase the vulnerability of financial systems to solvency and liquidity risks. Cross-country estimates of the impact of dollarization on key financial soundness indicators are consistent with the hypothesis that increased dollarization increases financial vulnerability [see De Nicoló, Honohan, and Ize (2003) and Box 2]. The variance of deposit growth is positively and significantly correlated with dollarization, suggesting that dollarized financial systems may be more exposed to credit cycles and liquidity risk. Based on estimates of nonperforming loans (NPLs) or a composite systemic risk measure, dollarized economies also tend to be more exposed to solvency risk. The main risks likely result from the currency mismatches, which in the event of large depreciation can affect a financial institution's balance sheet both directly and indirectly by worsening the quality of its foreign currency portfolio.

[7] See, for instance, Reinhart, Rogoff, and Savastano (2003). A number of theoretical explanations have been suggested to explain this phenomenon: lack of monetary credibility (Calvo and Guidotti, 1989), moral hazard problems (Aghion, Bacchetta, and Banerjee, 2004**,** Burnside et al., 2001) or optimal portfolio allocations (Campbell, Viceira, and White, 2003).

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21. **The limited backing of banks' dollar liabilities by U.S. dollars and their convertibility at par subjects the financial system to a very specific type of liquidity risk**. Systemic liquidity risk arises when the demand for local assets falls, due to a perceived increase in country or banking risk, prompting foreign banks to recall short-term lines of credit and depositors to convert their deposits into dollars or transfer them abroad. Unless liquid dollar liabilities are backed by sufficient liquid dollar assets abroad, banks may run out of dollar liquid reserves and fail to pay off dollar liabilities. Similarly, central banks may run out of international reserves to provide dollar lender of last resort support to distressed banks. When this happens, deposit (or loan) contracts may need to be broken and disruptive or confiscatory measures taken, imposing a heavy cost on the financial system.

Box 2. Dollarization and Regulatory Standards

Do regulatory standards directly or indirectly address the potential risks caused by dollarization? By promoting healthy institutions, ensuring sound supervisory and regulatory frameworks they can help strengthen individual financial institutions. Given the risks posed by dollarization, proper guidance is needed, particularly for emerging and developing market supervisors. Regulators do address dollarization risks directly by improving supervision, regulation, and the quality of surveillance, and indirectly by strengthening financial infrastructure. Moreover, the "preconditions" also assume special importance in the context of the risks posed by dollarized financial systems.

In particular, the principles relating to capital adequacy and risk management, and regulations regarding solvency and liquidity, can help national authorities to deal with potential vulnerabilities posed by dollarization by, for instance: (i) including capital requirements for exchange-rate-related risks; (ii) imposing adequate regulatory limits on banks' open foreign exchange positions; (iii) imposing adequate reserve requirements; (iv) setting out adequate requirements for evaluating asset quality and the adequacy of loss provisions and reserves for loans in foreign currency; (v) establishing adequate systems for the granting and managing of dollar loans and investments; and (vi) requiring banks to have in place proper systems to measure, monitor, and control foreign-currency-related market and material risks.

22. **Dollar deposits are often more vulnerable to runs than local currency deposits, even in the absence of exchange rate adjustments.** In highly dollarized countries, local currency deposits are mostly held for transaction purposes, and are less affected by expected yield differentials than dollar deposits, which are predominantly held as store of value and are close substitutes for deposits abroad or dollars cash. Moreover, even when the demand for local currency deposits is affected, the small size of these deposits in the most highly dollarized countries limits the threat they represent to banks' liquidity.

23. **The lack of dollar monetary instruments can further inhibit the scope for interest rate defenses against deposit withdrawals.** An interest rate defense may be ineffective once a run has started because the central bank has limited ability to raise the interest rate on dollar deposits. Banks are often reluctant to raise interest rates on dollar deposits, because of concerns that increasing rates may be interpreted as a sign of weakness, further exacerbating deposit withdrawals.

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D. Weaknesses in Infrastructure Underpinning Regulatory Systems

24. **Regulation is only part of a wider range of measures that are needed to ensure the development, proper functioning and stability of financial systems.** The financial sector and its regulators must rely on the underpinning infrastructure that allows the economy to function properly. These arrangements are largely outside the authority of regulators and supervisors.

25. **The infrastructure underpinning regulation as noted within the various standards differs, but many common features exist.** In the area of banking, as recognized by the Basel Core Principles, this infrastructure includes (i) sound and sustainable macroeconomic policies; (ii) a well-developed public infrastructure, including reliable accounting, auditing, and legal and judiciary systems; (iii) effective market discipline; (iv) procedures for efficient resolution of problem banks; and (v) mechanism for providing an appropriate level of systemic protection (public safety net). In insurance, the first Insurance Core Principle addresses conditions for effective insurance supervision and states that insurance supervision relies on the following principles: (i) a policy, institutional, and legal framework for financial sector supervision; (ii) a well-developed and effective financial market infrastructure; and (iii) efficient financial markets. In the securities area, each jurisdiction is expected to have an appropriate and effective legal, tax, and accounting framework in place.

26. **Recent assessments of compliance with regulatory standards found a number of weaknesses in the underpinning infrastructure.**[8] The most frequent weaknesses in the case of the banking sector were (i) unstable macroeconomic conditions; (ii) obsolete bankruptcy laws, long judicial delays in loan collection and procedures for collateral foreclosure; (iii) weak accounting standards, lack of meaningful financial reports; (iv) inefficient resolution of bank problems; and (v) a widespread presumption that the authorities would not allow any bank to fail. In insurance, some countries have been found to have outdated laws and only few qualified insurance professionals, with other weaknesses—in judiciary and accounting, for instance—similar to those of banking. In securities regulation, the most frequently cited concerns relate to the inadequacy of the general bankruptcy and insolvency procedures, with enforceability of legal obligations, the operation of the judicial system and the quality of accounting standards being other major concerns.

27. **A survey of published Basel Core Principles (BCP) ROSCs, focusing on the preconditions for banking supervision, suggests that there are only minor weaknesses in developed countries** (Appendix II presents detailed results).[9] Preconditions for effective banking supervision are generally in place in advanced economies; in fact, in none of the five cases has there been any significant concerns reported. The ROSCs suggest that accounting and auditing are generally well developed and in compliance with international standards.

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[8] See IMF (2001, 2002b, and 2002c).

[9] FSSAs for 39 countries have been published and are available at www.imf.org. Several of them, however, do not discuss the preconditions in any detail, so our sample consists of 31 countries (5 advanced, 10 developing, and 16 emerging market countries).

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Transparency requirements generally appear to allow investors to evaluate the financial condition of credit institutions. A range of corrective measures is available and, apparently, no major obstacles to their use exist. The legal framework is well established and comprehensive, the judiciary is well developed, and no problems with credit culture are reported.

28. **In developing countries, a number of shortcomings in the underpinning infrastructure were observed.** Transparency is rather low, at times due to opaque financial statements and problems in accounting and auditing. Although some countries have moved to International Accounting Standards (IAS) recently, there are problems with application of the standards. There are exceptions, however, where national accounting standards are closely aligned to IAS with relatively solid disclosure practices. Supervisors in developing countries generally have a range of corrective measures for problem bank resolution, but their practical application is often weak and slow.

29. **The emerging market economies exhibit considerable heterogeneity.** Some countries benefit from well-functioning accounting systems, auditing in line with international standards, considerable disclosure requirements, and efficient legal and judicial systems (albeit with some gaps). However, many emerging markets that recently experienced the transition to market economies face substantial challenges in making their accounting systems consistent with international practices, and the need to test and properly implement recent changes in their legal system.

30. **Overall, published ROSCs point to significant problems in preconditions, primarily in emerging and developing countries.** However, despite favorable ROSC assessments, advanced economies have not avoided manifestations of weaknesses in infrastructure in recent years. Since the late 1990s, aggressive accounting practices by some companies, lapses in investor oversight, and gaps in regulatory enforcement have been observed. In the past two years, investor trust in reported earnings and accounting practices was shaken by several major restatements of earnings by high-profile firms in North America and Europe, including WorldCom, Xerox, Parmalat, Vivendi and Nortel. These incidents brought the issues already raised by Enron's collapse into sharp focus, fueling the debate over accounting, disclosure and transparency issues. The need to further develop information-sharing mechanisms between regulators, both domestically and internationally, was also highlighted by these incidents.

31. **The relationship between preconditions and implementation can also be illustrated by the correlation between governance indices and average level of regulatory standards implementation.** To illustrate this point, an index of average implementation of three standards—BCP, IAIS, and IOSCO [10] core principles—is used for 36 Fund member countries. In these countries, an evaluation was undertaken across banking, insurance, and securities sectors in the context of the joint Bank-Fund Financial Sector Assessment Program (FSAP). All three standards classify the level of implementation of individual principles into four categories, denoted as compliant, largely compliant, broadly compliant, and noncompliant. Each of the categories was assigned a numeric value, from 4.0 (compliant)

[10] Representing the Basel Core Principles, International Association of Insurance Supervisors, and International Organization of Securities Commissions.

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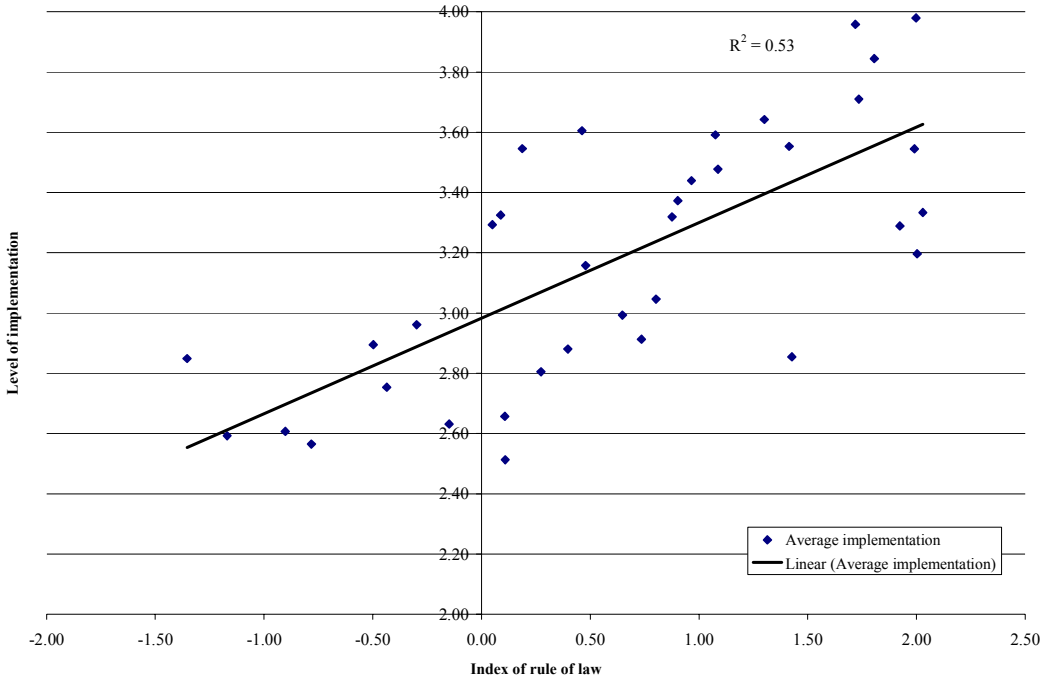
to 1.0 (noncompliant). Simple averages of the regulatory principles compliance were used to obtain average level of implementation across the three standards. As a measure of preconditions, indices were used of the rule of law and overall government effectiveness compiled by Kaufmann, Kraay, and Mastruzzi (2003).[11]

32. **The data show a clear positive relationship between rule of law and government effectiveness on one hand and the average level of implementation of standards on the other hand** (Figures 1 and 2). However, the level of preconditions observance—the rule of law index as well as other governance indicators like overall government effectiveness—is also positively correlated with the level of income across countries. In fact, the correlation coefficient between the rule of law and income was 0.84 in our sample, while the same indicator for government effectiveness and income stood at 0.85. Further research will be needed to disentangle the interaction between income level and regulatory preconditions and their relevance for standards implementation and performance of the financial sector.

Figure 1. Rule of Law and Implementation of Regulatory Standards



[11] The cited reference is an update of previous work by Kaufmann, Kraay, and Zoido-Lobaton (KKZ indices). The rule of law index includes perceptions of incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts.

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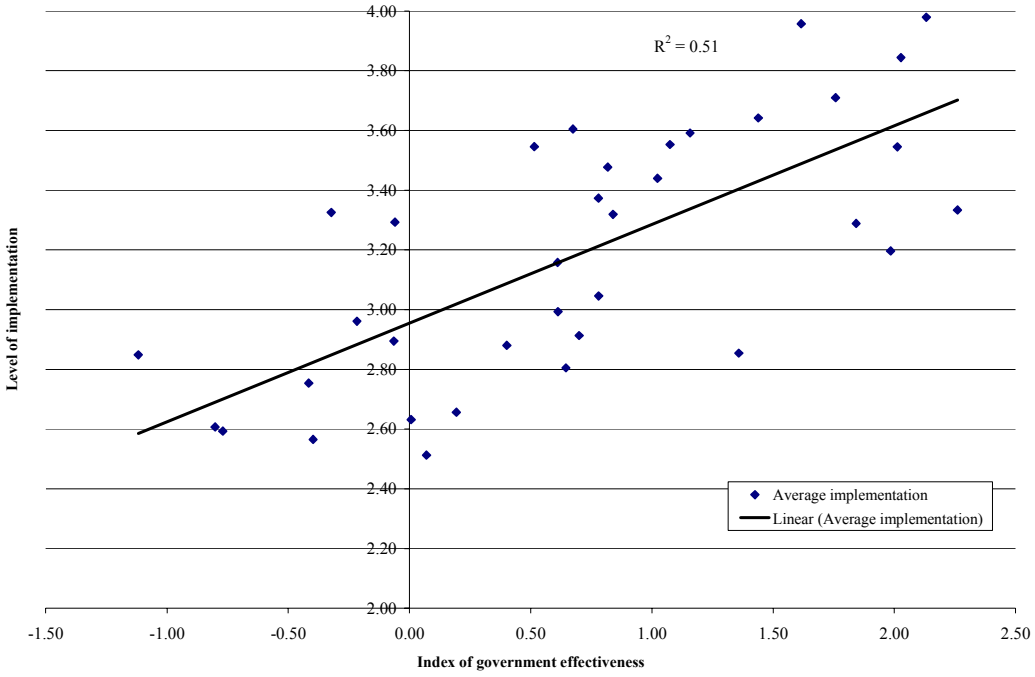
Figure 2. Government Effectiveness and Implementation of Regulatory Standards



E. Government Ownership of Financial Institutions

33. **In many countries, the financial system structure is characterized by the prevalence of state-owned financial firms.** While the phenomenon of state ownership is more common in the banking industry, it is also seen in the insurance and securities sectors. State ownership generates special concerns which may not be addressed fully by the sector standards. We explore the first issue—the implications of government ownership—in this subsection.

34. **La Porta, Lopez-De-Silantes, and Sleifer, (2002) document the continuation of a large and pervasive government ownership of banks around the world.** Based on a sample of 92 countries, the authors found that in an average country 42 percent of the equity of the 10 largest banks was owned by the government in 1995. While this share was down from 59 percent in 1970, apparently due to the transition to a market economy in many countries, it remains sizeable.

35. **A recent Fund staff survey confirms that governments continue to be a major presence not only in banking, but also in the areas of insurance, contractual savings and investment schemes**.[12] In banking, despite several privatization initiatives over the past decade, public sector banks still account for an estimated 40 percent of total banking sector

[12] Preliminary results of the survey were presented at the conference "The Role of State-Owned Financial Institutions" organized by the World Bank, IMF, and the Brookings Institution in April 2004 (available at www.worldbank.org/wbi).

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assets. The survey also shows that a government presence also exists, albeit in a lesser degree, in insurance and contractual savings and investment schemes. In addition, although it is often more prominent in the developing world, a government presence can also play an important role in the developed world, taking a variety of forms from explicit (banking in Germany) to implicit (government-sponsored enterprises in the United States), see Table 5.

36. **The size of the SFI sector can be significant (Table 6).** In the sample, the size of the assets of the state-owned financial institutions (SFI) varied from insignificant to 159 percent of GDP. Among the different types of institutions, banks tended be the most significant in size, with the largest a single bank having assets equal to 47 percent of GDP, development banks 13 percent, insurance companies 2.9 percent, development financial institutions 2.3 percent and a pension fund 18 percent. The size of the assets under management of AMCs was not given.

Table 5. State-Owned Financial Institutions: A Cross-Country Survey

	Advanced Economies		Other Emerging and Developing Economies		Total	Total
	Institutions	Countries	Institutions	Countries	(Institutions)	(Countries)
Commercial banks 1/ 2/	19	5	56	11	75	16
Development banks	4	4	9	5	13	9
Commercial cum development banks	1	1	9	3	10	4
Postal banks	1	1	2	2	3	3
Nonbank finance companies	0	0	2	2	3	3
Development financial institutions	1	1	6	2	7	3
Leasing companies	0	0	2	1	2	1
Mutual guarantee companies	21	1	0	0	21	1
Insurance companies 3/	3	2	2	2	5	3
Asset management companies/funds	0	0	10	3	10	3
Mutual funds	0	0	2	1	2	1
Pension/provident funds	0	0	3	2	3	2
Investment companies/funds	0	0	4	1	4	1
Health insurance fund	0	0	1	1	1	1
Total 4/	50	–	108	–	159	–

1/ Under commercial banks, advanced economies, institutions, includes one bank providing both banking and insurance services, and another bank providing banking, insurance, and asset management services.
2/ Under commercial banks, other emerging and developing economies, the total number of institutions includes four banks providing banking and asset management services, and one bank providing banking, insurance, and securities services.
3/ Under insurance companies, other emerging and developing economies, the total number of institutions includes re-insurance companies.
4/ Under the total, advanced economies, the number of institutions exclude 520 savings banks owned by the state and local governments reported by one country for which aggregated data was reported.

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Table 6. State-Owned Financial Institutions: Size

Size to GDP (in percent)	Advanced Economies	Other Emerging/ Developing
0-1	3	2
1-10	1	4
10-50	2	6
50-100	1	1
100+	1	1
Total	8	14

Note: Under the size to GDP column, 100+ includes 520 banks excluded from Table 1, which together account for 48 percent of GDP in the country.

37. **State-owned financial firms have the same need for adequate supervision as privately owned banks, insurance companies, and securities firms.** Government ownership creates a number of additional regulatory problems: (i) weak corporate governance structure and management; (ii) political interference with business decisions at the firm, such as taking on risks at unprofitable prices to support a political objective, (iii) conflicts of interest, such as preferential lending to state-owned enterprises or investing assets in other state-owned firms without prudent due diligence; (iv) difficulties in implementing and enforcing any remedial measures that would be normally imposed on privately owned firms; and (v) the absence of market discipline owing to the lack of influential public investors or the fact that counterparties assume that the government will bail out or act as a backstop to the obligations that its firms undertake.

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FSAP Assessments and Key Cross Sector Structural and Regulatory Risk Factors (36 countries)

Region	Structural Factors	Regulatory Risk Factors
Africa	***Financial structure*** • Rapid restructuring and liberalization under way. • Entry of new firms and increasing dominance of foreign banks with non bank affiliates. • Entry of internationally active financial conglomerates. ***Intermediation*** • Changing patterns. Growth in cross market products, and regional cross border activity. • Dollarized financial systems. • Linkages between banking and insurance and some evidence of bank assurance. ***Regulatory system*** • Steps toward regional integration, shared financial infrastructure, harmonization of laws and regulations. • Safety net arrangements weak. • Move toward unifying regulatory agencies.	• Operating environment weak and serious macroeconomic risks. • Regulators and regulated at less than arms' length distance. • Regulatory resources inadequate. • Credit risk management poor. • Scenario of exit by foreign banks. • Conglomerates taking advantage of different regulatory, prudential and tax policies. • Single licensing for banks and insurers. • Delays or reluctance to act on problem banks and insurers. • Consolidated supervision not in place, and regulatory cooperation ill defined. • Banks exposed to non deposit taking financial institutions (significant elative to bank capital).
Asia	***Financial structure*** • Large size of financial conglomerates and complex financial institutions in industrialized countries and financial centers. • Conglomerates also active in developing countries. ***Intermediation*** • Actively intermediating cross borders. • Participants in money, foreign exchange markets, and payments and settlement systems. • Stronger ownership and financial inter linkages across banking, insurance and securities. ***Regulatory systems*** • Existence of and move toward unified regulators. • Regulation still on single lines of activity. • Focus on public interest and prudential health.	• Less developed consolidated supervision, growing issues in market conduct, related party transactions, and investment management. • Contagion risk high but channels not well understood. • Problems in measuring interconnectedness and concentration. • Reputational risk factor. • Lack of insolvency regime for internationally active conglomerates. • Scope for regulatory arbitrage due to lack of unified approach to risk and capital.

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Region	Structural Factors	Regulatory Risk Factors
Europe	***Financial structure*** • Some countries with a longer tradition of conglomerates. • Cross-sectoral interconnectedness on the rise. ***Intermediation*** • Financial systems strongly exposed to internationalization of capital flows. • Dollarized financial systems in developing countries. • Functional "blurring" occurring most in banking and insurance. • Cross-border, cross-sector, cross-currency transactions. ***Regulatory systems*** • Unified regulators recently set up in several countries.	• Emerging and developing countries practice different approaches toward consolidated supervision. • Unified regulator model, and cross-border, cross-sector conglomerate trends raise concerns relating to the lender-of-last-resort and safety nets. • Rising reputational concerns and risks intrinsic to each sector, both becoming correlated. • Growing moral hazard related to safety nets such as deposit insurance for deposits within a group offering non deposit saving products. • High potential for regulatory arbitrage across sectors.
Middle East and Central Asia	***Financial structure*** • Less evidence of conglomerate structures. ***Intermediation*** • Dollarization of developing country financial systems. ***Regulatory systems*** • No instance of a unified regulator. • Prevalence of Islamic financial principles.	• Stronger regulatory focus needed on the foreign exchange risk.
Western Hemisphere	***Financial structure*** • Prevalence of large internationally and regionally active financial conglomerates. ***Intermediation*** • Conglomerate activities in offshore financial centers • Dollarized financial systems.	• Problem of disclosure and related party and intra group transactions. • Absence of a uniform prudential requirements and accounting systems for financial groups. • Transactions across groups not "fire walled"; some conglomerates connected to nonfinancial companies.

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Preconditions in Published BCP ROSCs 1/

No.	Country	Audit, Accounting, and Financial Reporting	Market Discipline	Resolution of Problems in Banks	Public Safety Net	Judiciary	Credit Culture	Legal Framework (Banking and Banking Supervision)	Corporate Governance
1	Finland	Well developed, generally compatible with international standards.	Transparency requirements allow investors to evaluate the financial condition of credit institutions.	FSA has a range of procedures to achieve resolution of problem banks (but these are not anticipatory in nature).	The safety net consists of the Deposit Guarantee Fund and central bank (CB) emergency liquidity assistance.		Credit culture fosters the honoring and enforcement of financial contacts.	Well developed and stable.	No prescribed corporate governance best practice, but no government efforts to influence commercial decisions.
2	Germany			Legal framework for resolution exists, but resolution is sought within the system itself.	Structure of deposit insurance is complex.	Efficient.		Comprehensive and regularly updated.	
3	Iceland	Broadly in line with international standards.						Generally adequate	
4	Luxembourg			The supervisor can use a range of formal and informal corrective measures.	A mutual deposit guarantee scheme providing limited protection to depositors and investors.			Established legal system	
5	United Kingdom	Well developed and subject to full liability for breach of duty	Market discipline is reinforced by the fact that the authorities have publicly stated that it is neither possible not desirable to remove all risk of financial failure.			Well-developed judicial system with a reputation for probity and professionalism			High standards for corporate governance
6	Georgia	Financial statements remain largely opaque.		CB has faced significant difficulties in the efficient resolution of problem banks.			Credit culture is generally weak	Legal and administrative procedures for collateral enforcement need to be strengthened.	Corporate governance remains weak.

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No.	Country	Audit, Accounting, and Financial Reporting	Market Discipline	Resolution of Problems in Banks	Public Safety Net	Judiciary	Credit Culture	Legal Framework (Banking and Banking Supervision)	Corporate Governance
7	Kyrgyz			CB can impose a full range of corrective measures and penalties.		Judicial outcomes have at times been unpredictable and there are numerous reports of suspicious political influence within the judiciary.		Legal system appears to be the most serious constraint relating to public infrastructure. Laws are inconsistent and contradictory.	
8	Macedonia					Excessive delays, questionable court decisions, perceived political interference and corruption.	Lack of respect of law and culture of noncompliance and nonpayment.	Broader legal framework generally sound, but implementation and enforcement problematic.	
9	Mauritius	Accounting standards are based on IAS. The level of disclosure in the annual reports of the two large banks is of high standard.		A history of dealing decisively with problem banks; resolution– mostly rescues/takeovers by other banks.	No explicit deposit insurance scheme.	Legal proceedings can take an extended period of time to complete, but generally a strong rule of law.	Credit culture is well established.	Generally appropriate body of commercial law	
10	Morocco					Effort to streamline the operation of courts, commercial courts introduced in 1997.		Profound changes in legal system in recent years, several laws amended.	
11	Mozambique	Substantial further progress required.				The justice system is inadequate, which makes it difficult and time consuming for banks to take action against loan defaulters.	Credit decisions are often not made on an arm's length basis and do not take into account the willingness or ability of the borrower to repay.		Substantial further progress required.
12	Philippines	Accounting standards progressively evolving in the direction of IAS.		A number of procedures for bank resolution exist, but their application is hampered by the absence of coercive legal instruments, forbearance, and the possibility of judiciary interventions.		Developments in judiciary have led banks rely more systematically on contractual arbitrage and settlement outside the courts.		Operating environment for banks has been difficult.	Corporate governance promoted through regulatory changes.
13	Tanzania	Auditing guidelines modeled on international guidelines. Accounting standards closely based on IAS, to be fully harmonized by mid-2004				The judicial system needs to be resourced to enable it to efficiently process commercial litigation.		The legal system is being developed, Land Act one area of concern.	New Companies Act to strengthen some aspects of corporate

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No.	Country	Audit, Accounting, and Financial Reporting	Market Discipline	Resolution of Problems in Banks	Public Safety Net	Judiciary	Credit Culture	Legal Framework (Banking and Banking Supervision)	Corporate Governance
									governance, but further strengthening is desirable.
14	Uganda	IAS adopted, but its application remains uneven. Greater disclosure is required.	Government's decision to fully compensate depositors of three closed banks undermined market discipline.	A broad range of remedial measures to deal with problem banks available, but response to developing problems in practice has been weak and slow.	Lender-of-last-resort (LOLR) facility of the CB has been historically available for extended periods without adequate security.			Generally appropriate framework of commercial law. Bankruptcy act outdated and in need of revision.	
15	Ukraine	Accounting standards in the enterprise sector far from international best practices, which makes it very difficult for banks to monitor borrowers.			Formal deposit insurance scheme and LOLR at CB.	The court system lacks expertise in commercial matters, resulting in long delays and legal uncertainty.		Important weaknesses in availability and realization of collateral.	Poor corporate governance in many enterprises.
16	Barbados	Generally sound						Generally sound	
17	Bulgaria	Accounting standards differ from IAS in some respects, but moving to IAS. Corporate accounts unreliable.	Markets unable to exercise discipline over banks	CB effective in closing banks but not in liquidation (slow).		Inefficient		Quite good; but delays in foreclosure up to several years	
18	Croatia	Annual accounts audited, both stand-alone and consolidated; auditors required to report violations to CB. IAS mandatory for banks.		Current Banking Law allows regulator to ensure banks comply with law.					
19	Czech Republic	Banks must appoint external auditors. Accounting standards required, differ from IAS somewhat; major banks use also IAS.		CB needs to work closely with government and other agencies		Inefficiencies and cumbersome administrative procedures impede enforcement	Attempts to remedy legal imbalance favoring debtors.	Legal system in transition, recent changes untested.	
20	Estonia			CB has a reasonable array of instruments to encourage compliance with prudential norms					
21	Hong Kong SAR	Audit in conformity with international standards. Well-functioning accounting system in place; NAS converging to international standards. Extra disclosure requirements in the			No deposit protection scheme in place.			Well-functioning system in place. Gaps: no corporate reorganization legislation.	

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No.	Country	Audit, Accounting, and Financial Reporting	Market Discipline	Resolution of Problems in Banks	Public Safety Net	Judiciary	Credit Culture	Legal Framework (Banking and Banking Supervision)	Corporate Governance
		absence of accounting standards for financial institutions.							
22	Hungary			Delays imposed by the law on the use of certain types of remedial actions.					
23	Israel	Broadly in line with international standards.		No significant hindrances to application of remedial actions.	No deposit insurance.			Adequate	
24	Korea	Not fully compliant with IAS, moving to be fully consistent for banks.	Scope for strengthening market discipline by implementation of IAS and enhancing financial transparency of corporations.		Comprehensive public safety net and an explicit deposit insurance system.	Relatively efficient court system.		Significant body of recently revised laws.	
25	Latvia	Annual accounts audited by an auditor approved by the central bank.		CB is entitled to revoke licenses in the event of noncompliance.					
26	Lithuania	Scope for further progress.						Scope for further progress.	Scope for further progress.
27	Malta	Banks audited by recognized international auditing firms. IAS required for financial and enterprise sectors.		Broad framework for resolution of distressed banks if provided in banking legislation.	A new deposit insurance scheme, developed along EU standards, was introduced.	Foreclosure process can be lengthy and costly given the inefficiencies in the legal system.		Generally adequate. Legislative framework dealing with collateral and loan recovery requires strengthening.	
28	Mexico	Nontransparent disclosure of banks' financial condition.	Market discipline weak due to implicit blanket guarantee provided by the government.	Lack of well-defined process for the closure, resolution and liquidation of banks.	Universal deposit guarantee, to be gradually changed to limited guarantee.			New secured lending and bankruptcy laws need to be tested.	
29	Singapore	Standards of auditing are based on the international standards; banks employ international accounting firms as auditors, who have legal responsibility to report problems to the				The legal system operates efficiently, enabling creditors to secure interests in collateral or force bankruptcy or receivership on		The legal system incorporates well-established and globally accepted principles.	

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No.	Country	Audit, Accounting, and Financial Reporting	Market Discipline	Resolution of Problems in Banks	Public Safety Net	Judiciary	Credit Culture	Legal Framework (Banking and Banking Supervision)	Corporate Governance
		supervisor. Accounting standards follow closely IAS. Banks face a statutory requirement of continuous disclosure; listing rules required additional disclosure.				delinquent debtors without undue delay or costs.			
30	Slovak Republic	Banks are audited, based on accounting standards, but foreign-owned banks increasingly receive dual audits (also IAS). Accounting standards different from IAS, which impacts the usefulness of bank reporting. Disclosure practices lag behind international best practices.	Market discipline is generally weak.	Exit policies should be improved, experience suggests weaknesses in bankruptcy law and procedures when applied to banks.	Deposit insurance is provided by currently insolvent Deposit Protection Fund.	General court procedures need strengthening to provide enforceability of contracts, collateral, and creditor rights.		A number of changes made recently in the legal framework.	Lags behind international best practices.
31	Slovenia				A replacement of the blanket deposit guarantee by limited deposit insurance scheme is imminent.			New EU-consistent banking law and numerous regulations have been adopted, implementation will be important.	

Source: Distilled from individual country ROSCs.
1/ CB = central bank, MoF = Ministry of Finance

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II. ASSESSMENT OF REGULATORY STANDARDS: AN UPDATE ON LEVELS OF OBSERVANCE

38. **Assessments of regulatory standards are undertaken, primarily in the context of the FSAP**. The assessment findings are used to support the broader assessment of the macroeconomic and structural risks affecting financial systems. The FSAP also provides a common platform for policy advice and technical assistance relating to the implementation of regulatory standards. Specifically, the standards assessments under the FSAP are aimed at: (i) identifying regulatory strengthens, risks and vulnerabilities, (ii) assessing the level of observance of regulatory standards, (iii) ascertaining the financial sector's developmental and technical assistance needs; and (iv) prioritizing financial sector policies to meet these needs.

39. **Since the inception of the FSAP, 158 assessments of regulatory standards have been carried out as of end-June, 2004** (see Appendix I in this section).[13] These assessments have aimed at providing country authorities with: (i) a comparison of their regulatory system with the internationally accepted benchmark in this area, (ii) an identification of regulatory vulnerabilities that could feed into the overall assessment of the risks and vulnerabilities their economies are facing; and (iii) developmental needs pertaining specifically to financial regulation and to make informed policy decisions about the reforms needed. Motivated by the need to develop comprehensive and thoroughgoing standards assessment tools and techniques, Fund (and Bank) staff have been working with the respective standard-setting bodies to prepare methodologies, templates, guidance notes and review techniques to strengthen the assessment process.

40. **The experience thus far, has however, raised the following practical issues relating to the assessment process**: (i) how to assess actual implementation; (ii) the best way to account for country-specific factors; (iii) application of standards and the individual principles on the basis of their relative significance depending on stages of development and the regulatory preconditions; and (iv) cross-sectoral issues and interdependencies between standards.

41. **To address some of these issues, the Fund staff (together with the Bank staff) has adopted a four-pronged strategy, which encompasses:**

- An analysis and review of the experience with the assessment of individual standards. Based on the analysis, provide feedback to the standard setters suggesting issues to be considered while reviewing the standards and assessment methodologies.

[13] The regulatory standards assessed under the FSAP consist of: (i) Basel Core Principles for Effective Banking Supervision (BCP); (ii) International Organization of Securities Commissions (IOSCO) Objectives and Principles of Securities Regulation (IOSCO Principles); and (iii) International Association of Insurance Supervisors (IAIS) Insurance Core Principles (ICP); in addition 14 of the 37 assessments have been carried out outside the FSAP, under the OFC Program.

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- Obtain feedback from national authorities on the assessment experience and determine usefulness of the assessment outcome.

- Discuss with the FSAP mission chiefs and Bank-Fund staff the relevance of the standards assessments in the diagnosis of a country's financial system vulnerabilities and development priorities.

Cooperating official institutions

42. **Drawing upon the expertise of the Fund-Bank staff and experts from Cooperating Official Institutions (COIs), the regulatory standards assessment framework offers "peer review" of national regulatory, and oversight systems**. Fund staff has worked closely with COIs in identifying experts for use in various FSAPs. Starting from a small base in FY 2000, the list of COIs now comprise over 65 institutions (Appendix Table I in this section).

43. **The assessments are based on on-site discussions with country regulators and market participants**. Regulators primarily come from the supervisory agency, but discussions are also held with the staff from the other agencies. The draft assessment is required to be discussed with the regulators with a view to ensuring the accuracy of the information on which the assessment is based. This provides them with an opportunity to react to the assessment. The assessment template requires that authorities' views are recorded together with any disagreements about the assessment remain after these discussions. The draft assessment is usually discussed again at the end of the mission with a wider group of country authorities and left with them.

A. Basel Core Principles

44. **The last review of compliance with the BCP was carried out and reported to the Board in 2002 (SM/02/310)**. This update reveals that the overall profile of the results has not altered. Similar areas are showing strengths or weaknesses, and notwithstanding better overall performance of industrialized countries, similarities in relative strengths and weaknesses exist across country income groups (industrialized, developing and emerging). It is significant to note that in all countries the broad area of credit risk management has relatively low rates of compliance.

45. **Two crucial areas that are also relatively weak are those of capital adequacy and consolidated supervision.** The two areas are connected, as in a number of cases, capital adequacy systems were considered noncompliant or materially noncompliant because capital adequacy was not calculated on a consolidated basis. Also other prudential standards, such as those related to loan quality and other prudential standards are much less meaningful if supervision is not exercised on the basis of consolidated reports, accounts, and implementation of remedial action. The principle on anti-money laundering is also among those that are insufficiently implemented in many countries (Table 7).

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Table 7. Observance of Basel Core Principles for Effective Banking Supervision

Core Principle (number and main topic)	Observance (in percentage of total countries assessed)[14]		Issues Raised by Assessors
	Compliant/largely compliant	Materially noncompliant/noncompliant	
1.1 Framework for supervisory authority/Objectives	89	11	Fragmented responsibilities; unclear role of external auditors
1.2. Independence	61	39	Political interference in licensing and remedial measures; forbearance; insufficient legal protection; weak autonomy; insufficient staffing.
1.3. Legal framework	90	10	Insufficient basis for cooperation and information exchange, also with foreign supervisors.
1.4. Enforcement powers	80	19	Legal basis inadequate or overly rigid; forbearance, court intervention, need to consult political authorities.
1.5. Legal protection	71	29	Rules on legal protection not explicit, inadequate or absent; no rules on legal expenses; accountability concerns.
1.6. Information sharing	71	29	Lack of legal basis or formal agreements; rigid confidentiality constraints, MoUs not implemented in practice.
2. Permissible activities	94	6	No authority to act against unauthorized banks; laws unclear on licensing requirements; no protection of the word "bank".
3. Licensing Criteria	84	16	Reputation of managers not tested; inadequate fit and proper tests, refusal to grant license can be appealed at Ministry of Finance; foreign supervisors not contacted; political interference.
4. Ownership	82	18	Prior supervisory approval not required; no fit and proper test for shareholders; no definition of significant ownership, nor qualitative criteria to determine ownership.
5. Investment criteria	75	25	No approval authority; inadequate definitions of investments requiring approval; no criteria for impairment of supervision resulting from acquisitions.
6. Capital adequacy policies	67	33	No calculation on a consolidated basis; no market risk charges, inadequate risk weightings, inappropriate capital components.
7. Credit policies	66	34	Insufficient supervisory guidance on credit policies; no rules on arm's length lending; unclear board and management responsibility for credit policies; no dissemination of policies to staff; insufficient supervisory monitoring.

[14] Figures do not always add up to 100, as "non-applicable" gradings have been excluded.

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8. Loan evaluation	68	32	Insufficiently rigorous loan classification and provisioning rules, insufficient monitoring, no cash flow based assessment, rules too lenient on use of collateral, restructured or evergreened loans, no tax deductibility for specific provisions, off balance sheet items not included.
9. Large exposures	74	26	Exposures not reported/monitored on a consolidated basis, inadequate and/or overly rigid criteria to establish group connections.
10. Connected lending	59	41	Regulations absent or without sufficient legal basis; inadequate/overly rigid definitions of connectedness.
11. Country risk	38	48	Absence of regulations, usually because banks have little or no exposure.
12. Market risk	46	51	Absence of regulations, or inconsistency with Basel guidance, usually because banks have little or no exposure; no supervision on a consolidated basis, weak or no enforcement.
13. Other risks	51	49	Absence or inadequacy of rules on risk management, absence of guidelines on interest rate, liquidity and operational risk; inadequate supervisory capacity.
14. Internal control	66	34	Inadequate or no standards, unclear responsibilities of management for internal controls, examination mandate inadequate, no rules on corporate governance.
15. Anti-Money laundering	55	45	Inadequate or no legal framework.
16. On-site and off-site supervision	73	27	Inadequate frequency of visits, staff shortages, insufficient skills, no risk-based supervision, unclear objectives.
17. Contacts with bank management	83	17	Insufficient frequency, no clear procedure to maintaining contact.
18. Off-site supervision	74	26	No supervision on a consolidated basis, reporting framework not set by supervisor, nonbank affiliates not covered, inaccurate reporting.
19. Validation of information	77	23	Inadequate response to weak audits, no control over external auditors, insufficient frequency of inspections.
20. Consolidated supervision	39	45	No requirements on consolidation or consolidated supervision, no legal basis to require consolidated reporting, scope of consolidation too limited (e.g. not covering nonbank affiliates, no reporting of related interests).
21. Accounting	73	27	Standards do not comply with IAS, supervisor has no authority to set bank accounting standards.
22. Remedial measures	65	35	Insufficient legal basis, enforcement ineffective, forbearance, limited range of measures, proactive action not possible, court intervention.
23. Global consolidation	47	25	Scope too limited, no supervision on a consolidated basis, insufficient authority to oversee foreign banks, insufficient information exchange and MoUs.
24. Host country supervision	58	23	No formal arrangements for contacts with home supervisors, little contact in practice, confidentiality constraints.
25. Supervision of foreign establishments	77	20	Insufficient exchange of information, insufficient MoUs, no inspection authority for foreign supervisors.

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B. IAIS Core Principles on Insurance Supervision

46. **Observance of the IAIS Core Principles on Insurance Supervision has been assessed in 42 jurisdictions**. The Core principles have been revised in October 2003, but the assessments on which the current review is based were adopted in October 2000. Overall, observance differs across core principles, with several weaknesses and strengths. As shown in Table 8, the area in which insurance supervision is most deficient relates to corporate governance of insurance companies. Less than one-third of countries is observant or broadly observant with this core principle. This is mainly a result of unclear jurisdiction of the insurance supervisory bodies over corporate governance issues. Rules on corporate governance are to be found in general in corporate law. Also in the field of internal controls the supervisory authorities seem to have limited jurisdiction, and the system depends on general corporate laws and regulations.

47. **The major areas of assessed weaknesses are organization of the supervisor and asset risk management**. The organization of a supervisory agency needs to be improved in broadly one-third of the countries assessed. In a significant number of cases, the insurance regulator was incorporated into the Ministry of Finance, but insufficient resources and unclear budgetary autonomy proved to be problematic in many cases. Although observance is better in this area, risk management with regard to the asset portfolio is still weakly supervised in approximately one third of countries, mostly concentrated in developing and emerging market countries. As in the banking sector, this is an area of serious concern, mainly because adverse developments in asset values would in all likelihood directly impact the financial viability of the institutions. Deficiencies also occur in supervision of off-balance sheet exposures, notably in derivatives in more than half of the countries assessed. These issues arise mainly in developing and emerging market countries, and consist primarily in the absence of any regulations in this area.

48. **Other areas of concern relate to market conduct.** Rules were in many cases limited to rules on registration of brokers and agents and cross-border operations. The most important issue with regard to this principle relates to deficiencies in the exchange of information with other supervisors.

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Table 8. Observance of IAIS Core Principles

Core Principle (number and main topic)	Observance (in percentage of total countries assessed)		**Issues Raised by Assessors**
	Observant/ largely observant	Materially non-observant/non-observant	
1. Organization of an Insurance Supervisor	67	33	Weaknesses stem from incorporation with MOF, insufficient budget and staff resources and unclear decision making processes.
2. Licensing	92	8	
3. Changes in Control	77	23	Absence of ownership thresholds above which supervisory permission is needed.
4. Corporate Governance	32	68	Where rules and regulations in this area exist, corporate governance laws and regulations are usually part of general or corporate law and the insurance supervisor has uncertain jurisdiction. The supervisor has not made up for this shortfall by promulgating insurance-specific corporate governance regulations.
5. Internal Controls	49	51	Follows ICP4, above.
6. Assets	64	36	Weaknesses relate mainly to the lack of requirements for companies to have an investment and risk management strategy.
7. Liabilities	88	12	The lack of international standards on the strength of reserves means that countries are assessed to their own standards. The CPs describe the elements that should comprise reserves but do not specify a desired, targeted or required level. In this respect, the over-used and perhaps abused target of having "adequate" reserves gives too much leeway and allows weak reserving–which can undermine the capital adequacy regime.
8. Capital Adequacy and Solvency	84	16	The lack of international standards in this area mean that countries are assessed to their own standards.
9. Derivatives and 'Off- Balance Sheet' Items	48	52	Related to ICP6, above.
10. Reinsurance	76	24	This CP relates to the reinsurance arrangements of primary insurers, not to reinsurers.
11. Market Conduct	54	46	Regulations were generally limited to the registration of brokers and agents–not extending to the way in which they conduct business or treat customers.
12. Financial Reporting	90	10	The lack of international standards on financial reporting means that countries are assessed to their own standards.
13. On-Site Inspection	80	20	Constraints stem from inadequate resources.
14. Sanctions	90	10	The strong compliance reflects the existence of legislative powers. There is a measure of inconsistency amongst the assessments in the observation of whether the powers are used in practice.
15. Cross-Border Business Operations	65	35	Licensing requirements are almost entirely pervasive for both foreign companies in the local market and the ability to obtain information on foreign operations of domestic companies. Adverse comments relate to the inability of a supervisor to exchange information, following CP16, below. This CP was not applicable to countries that host entirely domestic markets and 26 percent (included within the 35 percent) of countries assessed were recorded as "NOT APPLICABLE" not as poorly compliant.
16. Coordination and Cooperation	78	22	Supervisors do not generally have the legal authority to cooperate with other supervisors.
17. Confidentiality	96	4	The high rate of compliance reflects the high ethical standards imposed throughout the population of supervisory authorities.

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C. IOSCO Objectives and Principles of Securities Regulation

49. **In April, 2002, the Executive Boards of the Fund and Bank were provided with an overview of the experience with the assessment of the IOSCO Objectives and Principles of Securities Regulation**. The paper concluded that weaknesses in the implementation of many of the Principles were evident across the range of jurisdictions assessed, although the most marked concerns related to assessments of developing and emerging markets. The paper also touched on the difficulties in drawing clear connections between the weaknesses identified in regulation of securities markets and financial sector vulnerabilities.

50. **Since publication of the paper, a number of developments have occurred with respect to the assessment process.** For example, in late 2001, IOSCO recommended a new grading scale for the IOSCO self-assessment process that was subsequently adopted in the FSAP. The new scale introduced an additional assessment category of "broadly implemented," thus providing assessors with greater scope to reflect implementation of Principles that was substantially, although not fully, effected. In addition, in 2003 IOSCO finalized work on the development of an assessment methodology. The IOSCO Assessment Methodology provides a comprehensive framework for analyzing the implementation of the Principles and is especially strong in establishing the market and regulatory context for the various Principles. In some respects, however, the Methodology could be viewed as overly rigid in outlining the benchmarking process to determine grades.

51. **An analysis of a completed IOSCO assessment indicates that there are specific areas of weakness in the implementation of the IOSCO Principles.** Weaknesses in implementation are particularly evident with respect to principles for enforcement of securities regulation (Principles 8–10) and principles for issuers (Principles 14–16). Assessors overall found that regulators had a lack of authority to investigate, had limited access to time-sensitive data needed for surveillance purposes, insufficient resources for inspection, surveillance and investigation, and often a limited enforcement mandate. With respect to issuers, there is a clear need for more efficient methods to disseminate information to the public and to improve the quality of the information being released. In addition, there is a need to improve the legislative and policy framework relating to the treatment of shareholders, enhance the regulatory regime for auditors, and also address the lack of harmonization between international and domestic accounting and auditing standards.

52. **In turn, the Principles with relatively higher levels of full and broad implementation are regulation of collective investment schemes (Principles 18-19), market intermediaries and the secondary market (Principles 21 and 25) and Principles 1 and 4-5 regarding the regulator.** Some common deficiencies noted by the assessors in terms of the issues relating to the regulator include the following: a lack of operational independence; limited enforcement powers; and inadequate resources, thus hampering the ability to perform regulatory functions efficiently and effectively. The lack of operational independence raises particular questions as to control of resources (both human and financial). The lack of a clear mandate, or the lack of clear regulatory powers, also inhibits regulatory functions, such as licensing, access to necessary (sometimes confidential) data, and so forth. Other common deficiencies include the need for appropriate regulations dealing with collective investment

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schemes; the need to expand the scope of the regulator's responsibilities; and improvement of licensing requirements for trading systems and increase the scope of trading arrangements.

53. **While assessors are not able to readily consider preconditions, the comments in specific assessments do, nevertheless, allude to the poor state of legal and accounting systems in many jurisdictions**. For example, many assessments note the inadequacy of the accounting framework—both in terms of standards and professional arrangements—as linked to weaknesses in the implementation of the Principles for issuers. Likewise, audit issues are commonplace and aspects of the oversight of auditors feature prominently in many assessments. The insolvency regime is, not surprisingly, often cited as requiring attention in those jurisdictions exhibiting lower levels of implementation of the Principles related to market intermediaries. An efficient court system, highly skilled legal profession, and well-designed administrative review processes would no doubt support strengthening of the enforcement of laws in those countries that have been assessed as not having fully implemented the Principles relating to enforcement and cooperation. (Table 9).

Table 9. Observance of IOSCO Core Principles for Securities Regulation

Core Principle (Number and Main Topic)	Observance (in % of total countries assessed) 1/		**Issues Raised by Assessors**
	Implemented/ Broadly Implemented	Partly Implemented/ Non-implemented	
Principles Relating to the Regulator			
Principle 1	86	14	Need for legislation that states clearly the responsibilities of the regulator, its objective, definition of key concepts. There is a lack of legislative harmonization that leads to fragmentation of responsibilities. There is a need for MoUs to streamline the scope of regulatory agencies' responsibilities.
Principle 2	38	62	Lack of operational independence (from the government or the central bank) in the following areas: in setting the salary of the regulator, the decision-making process, appointment of regulator and board members, reliance on state budget, and inability to propose legislation.
Principle 3	49	51	Deficiency with respect to adequate resources and capacity to perform its functions. This is found in these areas: insufficient resources, inability to do investigation of unsupervised entities, failure to hire and retain experienced and qualified staff, lack of access to data, no power to grant and revoke licenses and levy fines, inability to control the allocation of its own resources, and failure to facilitate the protection of investors' and shareholders' rights.
Principle 4	83	17	Need to improve information-sharing methods; lack of consistent regulation; need to educate the investors; lack of transparency with respect to formal rules for consultation procedure with market participants (thus perceived conflict of interests); need to publish the process of formulation of policy and rule-making, necessity to make available procedures for administrative disputes.
Principle 5	78	20	There is a need to introduce a Code of Ethics, particularly for those staff trading and holding securities, to increase professionalism, confidentiality and ethics, avoid conflict of interest.

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Principles of Self-Regulation			
Principle 6	67	20	Need for clearly defined operational regulations for SROs (self-regulatory organizations): specifically regarding who supervises SROs, how they coordinate work with other supervisory agencies, and how they define objectives and responsibilities (operational independence).
Principle 7	67	35	There is a need for comprehensive regulations that outline supervision of SROs
Principles for the Enforcement of Securities Regulation			
Principle 8	66	32	Lack of authority to investigate cases; need access to bank data protected by secrecy law; need for automatic surveillance methods; insufficient resources to perform surveillance, investigation, and inspection.
Principle 9	60	38	Need for broader and more specific powers to regulate the market and take corrective actions, particularly to inspect non-supervised entities, investigate insider trading, and improve type and quality of sanctions and quantity of fines.
Principle 10	46	54	Limited enforcement mandate; limited resources to perform functions properly; need for training of supervisory staff.
Principles for Cooperation in Regulation			
Principle 11	66	34	Need for more extensive and frequent information-sharing methods.
Principle 12	60	38	Increased cooperation with domestic and international financial regulators needed (i.e., more extensive use of MoUs).
Principle 13	65	33	Need for improved methods for information collection; formalizing arrangements for information-sharing ability to gather information with domestic and foreign regulators.
Principles for Issuers			
Principle 14	55	42	Need for clear and efficient methods for dissemination of time-sensitive information; improvement needed in disclosure requirements and quality of information that is made available to the public, that is , information on unlisted issuers.
Principle 15	56	37	Need for improvement of rules outlining treatment of minority shareholders and ensuring their protection.
Principle 16	60	40	Close gap in the application of international and domestic standards of accounting and auditing; weak and unclear rules for auditors.
Principles for Collective Investment Schemes			
Principle 17	68	29	Need to improve the regulatory framework so that it covers all forms of collective investment schemes and sets out the eligibility criteria of a collective investment scheme; need to unify, simplify, and rationalize the current regulations.
Principle 18	75	22	The range of supervision of all types of collective investment schemes should be improved, so that all rules of custodial arrangements are clarified, in addition to the transparency of rules for investors, and rules for open-end funds.
Principle 19	72	23	Quality and quantity of information available to the public should be improved.
Principle 20	65	32	Regulation that states the mechanism to calculate asset valuation and pricing of units in the funds, calculation of net asset value, redemption of shares needs clarification.
Principles for Market Intermediaries			
Principle 21	76	17	Scope of regulations requires clarification of rules for entry requirements and licensing market intermediaries.
Principle 22	57	41	Monitoring and inspection systems to ensure compliance with capital and prudential requirements should be introduced.
Principle 23	63	35	A higher degree of investor protection should be added. This can

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			be done through formalized rules, and an increased number of supervisory staff, as well as improved technology.
Principle 24	51	47	General bankruptcy procedures are inadequate.
Principles for the Secondary Market			
Principle 25	70	17	Licensing requirements for trading systems should be improved, and the scope of trading arrangements should be increased.
Principle 26	65	25	The inspection process needs improvement, for example, by increasing the number of on-site inspections and their frequency.
Principle 27	69	21	There needs to be increased transparency of trading and clearer guidelines established.
Principle 28	49	47	Market operation rules need to be expanded by including unfair trading practices, price manipulation, rules for governing the use of a related company for trading services, borrowing and lending between related companies, and the use of a third party custodian.
Principle 29	65	26	Improve mechanisms for addressing large exposures, default risk and market disruption, difficulties signals.
Principle 30	55	27	Improve clearing and settlement system.
All Principles	63	33	

Source: Monetary and Financial Systems Department IOSCO Database
1/ Common sample of countries assessed across the three sectors is 42.

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Table 1. List of FSAP Cooperating Official Institutions

Country	Cooperating Official Institution
Argentina	Central Bank of the Republic of Argentina
Australia	Reserve Bank of Australia Australian Prudential Regulation Authority Australian Securities and Investment Commission
Austria	Austrian National Bank Financial Market Authority
Belgium	National Bank of Belgium Banking and Finance Commission
Brazil	Central Bank of Brazil
Canada	Bank of Canada Office of the Superintendent of Financial Institutions
Chile	Central Bank of Chile Superintendency of Banks and Financial Institutions
Colombia	Bank of the Republic
Czech Republic	Czech National Bank
Denmark	Denmark National Bank Danish Financial Supervisory Authority
Finland	Bank of Finland Financial Supervision Authority
France	Bank of France Banking Commission
Germany	Deutsche Bundesbank German Banking, Securities and Insurance Supervision Authority (BAFin)
Hong Kong	Hong Kong Monetary Authority
Hungary	National Bank of Hungary Hungarian Financial Supervisory Authority
India	Reserve Bank of India
Ireland	Central Bank of Ireland
Israel	Bank of Israel
Italy	Bank of Italy Italian Securities Commission
Japan	Bank of Japan Financial Services Agency
Malaysia	Bank Negara Malaysia
Mexico	Bank of Mexico Banking and Securities Commission
Morocco	Central Bank of Morocco
Netherlands	Bank of Netherlands Securities Board of the Netherlands
	Netherlands Pension and Insurance Supervisory Authority
New Zealand	Reserve Bank of New Zealand Securities Commission of New Zealand
Nigeria	Nigerian Deposit Insurance Corporation
Norway	Bank of Norway Banking, Insurance and Securities Commission
Peru	Central Reserve Bank of Peru
Poland	National Bank of Poland
Portugal	Bank of Portugal
	Portuguese Securities Market Commission
Saudi Arabia	Saudi Arabian Monetary Agency

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Country	Cooperating Official Institution
Singapore	Monetary Authority of Singapore
South Africa	South African Reserve Bank Financial Services Board
Spain	Bank of Spain National Securities Commission
Sri Lanka	Central Bank of Sri Lanka
Sweden	Bank of Sweden Financial Supervisory Authority
Switzerland	Swiss National Bank Swiss Federal Banking Commission
Thailand	Bank of Thailand
Tunisia	Central Bank of Tunisia
Turkey	Central Bank of the Republic of Turkey
United Kingdom	Bank of England Financial Services Authority Financial Supervision Commission, Isle of Man
United States	Federal Reserve System Office of the Comptroller of the Currency Federal Deposit Insurance Corporation
ECB	European Central Bank
	Standard Setting Bodies
BCBS	Basel Committee on Banking Supervision
CPSS	Committee on Payment and Settlement Systems
IASB	International Accounting Standards Board
IAIS	International Association of Insurance Supervisors
IOSCO	International Organization of Securities Commissions
	Other Institutions
AfDB	African Development Bank
BIS	Bank for International Settlements
IADB	Inter-American Development Bank
COBAC	Banking Commission of Central African States (COBAC).
BEAC	Central Bank of Central African States (BEAC)
BCEAO	Central Bank of West African States (BCEAO)

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Table 2. FSAP: Assessment of Regulatory Standards

FSAP	BCP	IAIS	IOSCO
AFR			
Cameroon	X	X	
Gabon	X	X	
Ghana	X	X	X
Mauritius	X		
Mozambique	X		
Nigeria	X	X	X
Senegal	X	X	X
South Africa	X	X	X
Tanzania	X		
Uganda	X		
Zambia	X		
APD			
Bangladesh	X		X
Hong Kong SAR	X	X	X
India	X		X
Japan	X	X	X
Korea	X	X	X
New Zealand	X		X
Philippines	X	X	X
Singapore	X	X	X
Sri Lanka	X		X
EUR			
Bulgaria	X	X	X
Croatia	X	X	X
Czech Republic	X	X	X
Estonia	X	X	X
Finland	X	X	X
Germany	X	X	X
Hungary	X	X	X
Iceland	X	X	X
Ireland	X	X	X
Israel	X	X	X
Latvia	X	X	X
Lithuania	X	X	X
Luxembourg	X	X	X
Macedonia, FYR	X		
Malta	X	X	X
Poland	X	X	X
Romania	X		X
Russia	X	X	X
Slovak Republic	X	X	X
Slovenia	X	X	X
Sweden	X	X	X
Switzerland	X	X	X
Ukraine	X		
United Kingdom	X	X	X
MCD			
Algeria	X		
Armenia	X		
Egypt	X	X	X
Georgia	X	X	
Iran, Islamic Republic of	X		
Jordan	X		X
Kazakhstan	X	X	X
Kuwait	X		X
Kyrgyz Republic	X		
Lebanon	X		
Morocco	X	X	X
Tunisia	X	X	X
United Arab Emirates	X		
Yemen, Republic of	X		
WHD			
Barbados	X	X	X
Bolivia	X		
Brazil	X	X	X
Canada	X	X	X
Colombia	X		
Costa Rica	X		
Dominican Republic	X	X	
El Salvador	X		
Guatemala	X		
Honduras	X		X
Mexico	X	X	X
Peru	X		
Total Completed	**70**	**42**	**46**

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Table 3. OFC: Assessment of Regulatory Standards

OFC	BCP	IAIS	IOSCO
Andora	X		
Anguilla	X		
Aruba	X	X	
Bahamas	X		X
British Virgin Islands	X	X	X
Cyprus	X		
Gibraltar	X	X	X
Guernsey	X	X	X
Isle of Man	X	X	X
Jersey	X	X	X
Liechtenstein	X	X	X
Macau	X	X	
Marshall Islands	X		
Monaco	X		X
Montserrat	X		
Netherlands Antilles	X	X	
Palau	X		
Panama	X		
Seychelles	X		
Samoa	X		
Vanuatu	X	X	
Total Completed	**20**	**10**	**7**

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III. STANDARD SETTERS: ONGOING WORK TOWARD STRENGTHENING FINANCIAL REGULATION

54. **Various initiatives are under way toward strengthening international guidance on financial regulation by standard setting bodies.** The Basel Committee on Banking Supervision (BCBS), the International Association of Insurance Supervisors (IAIS), and the International Organization of Securities Commissions (IOSCO) are pursuing a three-fold strategy: (i) working individually and through the Joint Forum (comprising the BCBS, IAIS and IOSCO), to define areas of financial regulation in which it is desirable to develop internationally agreed-upon standards of best practice; (ii) providing guidance through studies, surveys, and reports in areas where international agreement may be slow; (iii) working with the Fund and the Bank staff on the FSAP to help foster implementation and convergence by as wide a range of countries as possible.

55. **The ongoing work focuses specifically on a country's prudential framework and regulatory practices.** Work has also been accelerated in the area of financial integrity and safety net arrangements. It is widely recognized that regulators need to place a stronger focus on prudential standards, particularly on risk management and internal controls across sectors. However, issues such as the lack of a common accounting standards on the valuation of assets and liabilities of a regulated firm, and differing quality of auditing standards used to review them are keeping the process from reaching a meaningful convergence on the prudential framework across the three sectors. Attention is also being given to disclosure of accurate and timely information, sound legal environment, and financial market infrastructure, so as to strengthen the foundation for market discipline to complement official or regulatory discipline. Since many of these areas are outside the scope of the regulatory standard setters, substantial work is being undertaken in close collaboration with other standard setters such as the OECD, International Federation of Accountants (IFAC), FATF, and IASB.

56. **However, the regulatory standards remain voluntary and have no legal force.** The trend is toward their adoption by most countries. Their universality is considerably enhanced by their use in the FSAP. This is also helping in the adoption of a common regulatory approach, enabling countries to "benchmark" their current regulatory systems to international recognized practices. The Financial Stability Forum (FSF), set up in 1999, is also helping to facilitate both the development and the convergence processes. The principal standard setting bodies are the members of the FSF, and the Forum is welding together countries, international institutions and groupings, and the standard setters to work together closely on financial regulation issues.

57. **Fund staff has been participating in work of standard setters.** Recent Fund involvement, mostly through MFD staff participation, has been substantial in the Basel Committee on Banking Supervision, mainly through work in both the Core Principles Liaison Group and the Working Group on Capital. Participation in the work of other standard setters has been focusing on the key issues relevant for the Fund mandate, on transparency in the reinsurance sector regarding the IAIS (Task Force on Transparency and Disclosure in Reinsurance) or implementation issues in the case of the IOSCO (Implementation Committee). Details about Fund staff involvement in the work of standard setters are provided in Appendix I of this section.

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A. Objectives and Design of Regulatory Standards

58. **The Basel Committee on Banking Supervision (BCBS) will review the Basel Core Principles for Effective Supervision (BCP).** This will likely take into account the framework for an updated Basel Capital Accord, so-called Basel II, issued by the Committee in June 2004. The Basel Committee member countries are expected to start implementing the new framework in 2007.[15] Other supervisory authorities worldwide are encouraged by the BCBS to consider adopting the framework when it is consistent with their broader supervisory priorities. Within the European Union the intention is to include all credit institutions operating in EU-countries under a directive based on Basel II rules. Basel II, as such, will not become part of the BCP because it is not an international minimum standard applicable to all countries. However, many of its components are already in the Core Principles, such as detailed requirements for risk management and capital adequacy. Regulators will be required to have more powers and responsibilities to validate and assess banks' management of risks and of capital. Banks' board and management will be held responsible for the implementation and monitoring of the operation of the risk management systems. Regulators will also require banks to enhance public disclosure, in particular on information pertaining to risks and capital.

59. **New guidance for the supervision of insurance is contained in a revised and expanded "Insurance Core Principles and Methodology" adopted by the International Association of Insurance Supervisors (IAIS) in October 2003.** The 28 principles cover all aspects of a supervisory framework—from licensing to closure of activities. The principles also address such issues as transparency of the supervisory process, assessment and management of risk, consumer protection, and anti-money laundering. Initial steps have been taken to develop a comprehensive framework for the supporting standards and guidance for insurance supervision, consistent with the three pillars highlighted by Basel II. Using the revised insurance regulatory standard as a foundation, documentation is being prepared that address a range of issues more fully, including capital adequacy and solvency, use of third-parties (actuaries) as part of the supervisory model, and stress testing by insurers.

60. **A Methodology for Assessing Implementation of the IOSCO Objectives and Principles of Securities Regulation was adopted by the International Organization of Securities Commissions (IOSCO) in October 2003.** The methodology will assist jurisdictions in identifying areas where their securities regulations do not meet international standards. The methodology categorizes any failures in implementation by degree of severity, identifies areas for priority action, and helps developing action plans for any necessary reforms. IOSCO also updated and published in September 2003 a new version of the "Objectives and Principles of Securities Regulation", which includes references to work done from September 1998 to May 2003. A pilot program to assist its members in the completion of a self-assessment of their level of implementation of the IOSCO Core Principles was approved in February 2003. Pursuant to this pilot program, experts will assist each participating jurisdiction in the assessment and in the development of an action plan to correct identified deficiencies.

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[15] The Basel Committee member countries are Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, the U.K., and the U.S.

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B. Regulatory Preconditions

61. **A platform of standards which will allow the adoption of International Financial Reporting Standards (IFRSs) in 2005 is being completed by the International Accounting Standards Board (IASB).** The IASB's initial efforts have focused on improving International Accounting Standards (IASs), providing guidance to those companies adopting IFRSs for the first time, and issuing standards in the areas where current IASB literature is deficient. The Financial Accounting Standards Board (FASB) of the United States and the IASB continue to make progress on their convergence project.

62. **The BCBS, IAIS, and IOSCO are providing input to the IASB in the development of standards in areas of supervisory interest.** The BCBS Accounting Task Force has started to revise the BCBS paper "Sound Practices for Loan Accounting and Disclosure" and is planning to publish the document for consultation. In October 2003, the IAIS sent a comment letter on the IASB exposure draft regarding insurance contracts, noting the need for comparable and consistent accounting policies and for prevention of the accounting mismatch of assets and liabilities. The IOSCO Technical Committee completed a survey on the accounting review and enforcement mechanisms currently in place. IOSCO has also initiated a project on regulatory interpretations of IFRSs. The aim of the project is to improve communications among members for a consistent application and enforcement of IFRSs, with the major expected outputs of this project being a central database of regulatory decisions and a process for facilitating communications and cooperation among regulators.

63. **In 2003, the International Auditing and Assurance Standards Board (IAASB) of the International Federation of Accountants (IFAC) completed its standards related to audit risk assessment.** Standards on fraud, the form and content of the auditor's report, quality control for both audit firms and audit engagements, on group audits and reviews of interim financial information are to be updated in 2004. Additional projects to be completed in 2005 include updating current standards on audit materiality, auditing accounting estimates and the audit of related party transactions. To achieve convergence of auditing standards on a worldwide basis, the IAASB is working closely with IFAC member bodies on joint projects and seeking the input of experienced standard setters, international and national regulators, and regional accountancy organizations. The BCBS, IAIS, and IOSCO also evaluate International Standards on Auditing (ISAs) issued by the International Auditing and Assurance Board (IAASB) in order to provide supervisory input. In October 2003, IOSCO endorsed two Statements of Principles relating to (1) Auditor Oversight, and (2) Auditor Independence, which now represent international standards relating to these issues.

64. **IFAC is working on achieving lasting reforms that increase confidence in the accounting profession and the credibility of financial information.** IFAC proposals were approved in November 2003, with the BCBS, IAIS, IOSCO, the World Bank, and the European Commission closely involved in all stages of development. IFAC encourages accountability of the profession notably through its Code of Ethics, Compliance Program and Transnational Auditors Committee. IFAC standard setting committees—auditing, ethics, education and public sector accounting—will enhance the operations of their respective Consultative Advisory Groups to solicit both strategic and technical guidance from interested external parties. During 2004, IFAC anticipates approving seven Statements of Membership

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Obligations (SMOs) which will set standards of compliance. These will include following the IFAC Code of Ethics and using their best endeavors to support the adoption of the IFRS in their jurisdictions.

65. **The drafting of international standards of practice for actuaries working in the field of insurance by the International Actuarial Association (IAA) has been progressing rapidly.** While the impetus for this work was the IASB's project on accounting for insurance contracts, it will also contribute to the effectiveness of insurance supervision.

66. **A Survey on Auditor Oversight was undertaken by IOSCO.** The survey will cover not only compliance with the existing IOSCO principles, but other aspects of oversight including legal frameworks. The questionnaire will capture information on existing practices that may not be in conformity with the IOSCO Principles and include a progress report on implementation of the principles. The BCBS has also issued a paper on the supervisors relationship with external auditors in 2002.

67. **In the payment and securities settlement area, the Committee on Payment and Settlement Systems (CPSS) and the IOSCO are working together.** A CPSS working group on general principles for payments infrastructure will formulate practical guidance procedures on the development and evolution of payment infrastructure by 2005. In the light of the growing interest in developing central counterparties (CCP) and expanding the scope of their services, the CPSS and IOSCO concluded that international standards for CCP risk management are a critical element in promoting the safety of financial markets. In recent years, the use of CCPs has moved beyond derivatives markets to many securities markets, including cash markets and over-the-counter markets. Although a CCP has the potential to reduce risks to market participants significantly, it also concentrates risks and responsibilities for risk management. A joint consultative report "Recommendations for Central Counterparties" has been issued in March 2004 for public comment.

C. Prudential Framework and Regulatory Practices

Cross-border and cross-sector issues

68. **Building on the high-level principles for cross-border implementation of Basel II issued in August 2003, the BCBS is currently evaluating several case studies of internationally active banks.** In January 2004, the BCBS released for consultation a set of high-level principles governing cooperation and effective information exchanges between home and host supervisors. The document, designed to reduce duplication of supervisory rules while preserving the legal powers of host country supervisors, sets out basic principles for supervisory cooperation. Currently, much of the work of the BCBS Accord Implementation Group is devoted to issues pertaining to the cross-border implementation of Basel II. On a related matter, a paper looking at the implications of foreign direct investment in the financial sector of emerging market economies was also published by the Committee on the Global Financial System (CGFS) in April 2004.

69. **The BCBS, through its "offshore group", issued papers on "Shell Banks and Booking Offices", and "Parallel-owned Banking Structures" in January 2003.** These

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papers set out recommendations for supervisors in licensing and supervising such institutions. The Financial Stability Forum (FSF) is presently reviewing its Offshore Financial Centers Initiative. In this document, the FSF encourages OFCs to enhance their prudential and supervisory standards.

70. **A report "Trends in Risk Integration and Aggregation" was issued in August 2003 by the Joint Forum (BCBS, IAIS, IOSCO).** The report builds on the previous efforts of the Joint Forum to better understand approaches to the management of major individual risks in the banking, insurance, and securities sectors. At the same time, the Joint Forum issued a report "Operational Risk Transfer Across Financial Sectors" to foster dialogue among supervisors and financial firms around the transfer of operational risk, both within a financial conglomerate and to third parties.

Risk management and internal control issues

71. **Banks' management of risk and capital will be more rigorously assessed by supervisors who, under Basel II, will be able to exercise more power and responsibilities.** Under this framework, an individual bank can be required to maintain capital above the regulatory minimum, if its risks are deemed high or if its risk management is thought to be inadequate in relation to the norms.

72. **A paper entitled "Management and Supervision of Cross-Border Banking Activities" was issued by the Electronic Banking Group of the BCBS in July 2003.** It also carried out, at the end of 2003, a stocktaking exercise to collect input from members on electronic security and IT outsourcing developments in their respective countries. A report will be released, summarizing the relevant supervisory rules, policies and guidance that are currently in place and tentatively addressing the main supervisory concerns associated.

73. **Best practices for risk management by banks have been identified by the BCBS.** In 2003, the BCBS issued papers entitled "Sound Practices for the Management and Supervision of Operational Risk," and "Consolidated Know-your-customer Risk Management", and a consultative paper "Principles for the Management and Supervision of Interest Rate Risk." The management of compliance risk (risk of legal or regulatory sanctions, financial loss or reputation damage) that a bank may suffer as a result of its failure to comply with applicable laws, rules and standards has been studied by the BCBS, with a consultative document on the compliance function in banks published in October 2003. Compliance risk management has become more formalized within the past few years and has emerged as a distinct risk management discipline.

74. **Latest developments on the credit risk transfer (CRT) market are to be reviewed by the Joint Forum with a particular focus on the most recent CRT techniques (credit default swaps–CDS, and collateralized debt obligations–CDO).** The Joint Forum will give emphasis to the issues most relevant for financial stability: (i) whether the instruments/transactions accomplish a clean risk transfer, (ii) the degree to which the CRT market participants understand the risks involved, and (iii) whether CRT activities are leading to undue concentrations of credit risk inside or outside the regulated financial sector. The Joint

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Forum provided an interim report to the FSF in March 2004; a final report, potentially encompassing some recommendations, is expected in September 2004.

75. **The IAIS approved supervisory guidelines or issues papers "Quantifying and Assessing Insurance Liabilities," "Stress Testing by Insurers," and "Insurance Securitization" (life and non-life) in October 2003**. A paper on investment risk management is nearing completion. The IAIS is also revising its paper "Principles on the Supervision of Insurance Activities on the Internet" for adoption in October 2004. The IAIS is also preparing a paper "Disclosure of Technical Performance and Risks of Non-life Insurers and Reinsurers," to be completed in 2004, and one entitled "Disclosure of Investment Performance of Insurers and Reinsurers" expected in 2005.

76. **IOSCO published a "Report on Investment Management Risk Assessment: Marketing and Selling Practices" in September 2003.** It describes the relevant risk factors associated with the marketing and selling practices of a collective investment scheme operator as well as regulatory responses to those risks.

77. **The transparency of corporate bond markets has been studied by IOSCO in a May 2004 report.** The report reviews trading methodologies, transparency arrangements and regulatory frameworks for corporate bonds, including reporting requirements, in 15 developed countries. A number of core measures directed at the implementation of Principle 27 of the IOSCO Core Principles are proposed. These core measures call for greater access to bond market trading information and market surveillance to improve price discovery mechanisms and deter market manipulation.

78. **A project on "outsourcing" has been undertaken by the Joint Forum.** Supervised firms are increasingly entering into arrangements whereby other firms perform significant aspects of the entities' regulated and/or unregulated functions. To the extent that such activities are outsourced to third party entities, supervisors need to ensure that the functions are performed in accordance with relevant policies and procedures, and that the supervisors can enforce compliance with such policies.

Capital requirements

79. **The quantitative capital requirements of Basel II cover a wider range of risks, including credit, market and operational risks.** Banks that have developed advanced risk measurement and management systems may be allowed by their supervisors to use these when calculating their capital requirements. Banks will also be allowed to benefit from a wider field of risk mitigates when calculating capital requirements.

80. **"Principles on Capital Adequacy and Solvency" were developed by the IAIS.** After having been adopted in 2002, they were incorporated as essential criteria under ICP 23 in the 2003 revision of the ICPs. A paper "Solvency Control Levels" prepared by IAIS was also adopted in October 2003. Two papers entitled "Appropriate Forms of Capital" and "Forms of Capital Adequacy Requirements" are expected in 2005. The IAIS has been supported in its work by the IAA, which has, for example, prepared a paper called "A Global Framework for Insurer Solvency Assessment" (adoption by the IAA expected in 2004). In addition, the

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Solvency II project is working toward the development of a harmonized, risk-based, three-pillar approach for use throughout the European Union. It is part of a number of supervisory authorities' and multi-jurisdictional organizations' efforts to strengthen capital adequacy and solvency frameworks.

Corporate governance issues

81. **The OECD Steering Group on Corporate Governance has undertaken its assessment of the OECD Principles of Corporate Governance with a view to completing it by April/May 2004.** The OECD is also progressing on the development of new "Guidelines for the Corporate Governance of State-Owned Assets," due for completion by early 2005. In January 2004, the IAIS issued a compilation of existing documents detailing corporate governance requirements for insurers. The OECD should also complete new guidelines on governance of insurers in 2004.

82. **Governance systems of collective investment schemes' operators will be examined by IOSCO.** The intended output of this work will be the identification of general principles on infrastructures for decision-making, conflicts of interest, fiduciary duties, investor rights and the transparency of information. IOSCO will conduct a survey of the different models of governance for collective investment schemes and their internal control framework and procedures.

Remedial action issues

83. **A supervisory guidance paper "Solvency Control Levels," was approved by the IAIS in October 2003.** It emphasizes the need to intervene early when solvency levels are deteriorating.

84. **IOSCO will undertake an initiative called the "Review and Enforcement of Application of Financial Reporting Standards."** This will focus on the range of activities and powers that relate to reviews of public company financial statements by securities regulators and others. This project will focus on the powers and activities of a review process, and criteria and actions needed, regardless of the accounting standards in use. The major output of this project is expected to be an IOSCO statement of principles, best practices, and/or descriptions of effective models in use for such review functions. This project is expected to conclude in 2005.

D. Financial Integrity and Safety Net Arrangements

85. **A working group to follow up the April 2001 report of the Multidisciplinary Working Group on Enhanced Disclosure (MWGED) was created by the Joint Forum in 2002.** The group has met with relevant end users of financial reports to gain knowledge about their disclosure needs and with a number of firms including hedge funds to hear their views on the MWGED recommendations. The group issued its report in May 2004.

86. **The IAIS Reinsurance Task Force has developed a "Framework to Enhance the Transparency of the Global Reinsurance Market" in March 2004.** It suggests measures to improve risk-oriented disclosure by individual reinsurance firms. An IAIS Steering Group has

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succeeded the Task Force to follow up on the various recommendations. The first report on global reinsurance statistics is expected to be issued by end-2004. Basel II requires enhanced public disclosure by the banks, in particular on information pertaining to risks and capital. This is intended to strengthen market discipline. The IAIS is currently preparing a paper "Disclosure of Technical Performance and Risks of Non-life Insurers and Reinsurers," which is expected to be completed in 2004. A paper "Disclosure of Investment Performance of Insurers and Reinsurers" is to be completed in 2005.

Consumer protection issues

87. **Recent high profile incidents in securities fraud and market abuse led IOSCO to set up a special chairmen's Task Force in February 2004 to organize and coordinate IOSCO's response.** The priorities of the Task Force are to do the following: (i) identify potential new issues, including concerns about transparency in the bond markets, unregulated entities, complex group structures and appropriate levels of sanctions; (ii) review existing standards, including current mechanisms for international cooperation; and (iii) suggest responses aimed at producing regulatory incentives, such as better risk identification and assessment by regulators together with enhanced attention to uncooperative and under-regulated jurisdictions.

88. **A consultation document "Performance Presentation Standards for Collective Investment Schemes (CIS)," was issued by IOSCO in 2003.** The final best practices paper on this topic was issued in May 2004. A new mandate to develop international best practices has been approved by IOSCO. Market timing, whereby arbitrageurs rapidly buy and sell shares in collective investment schemes to take advantage of out of date prices within a collective investment scheme's net asset value, raises costs for the collective investment schemes and harms other investors by lowering the collective investment schemes' overall returns.

89. **The IAIS is developing a guidance paper called "Anti-Money Laundering and Combating the Financing of Terrorism."** It will address topics such as features within the insurance industry, customer due diligence, role of the supervisor, and case studies. It is expected that the paper will be adopted in 2005. The IOSCO's Task Force on Client Identification and Beneficial Ownership has developed a paper "Principles on Client Identification and Beneficial Ownership for the Securities Industry," which was approved by the IOSCO Technical Committee in May 2004.

90. **The International Association of Deposit Insurers was established in 2002.** Its mission is to contribute to the enhancement of deposit insurance effectiveness by promoting guidance and international cooperation.

91. **A special IOSCO Project Team on Cooperation has completed the development of a multilateral Memorandum of Understanding (MoU) to enhance information exchange among securities regulators and facilitate financial crime investigation.** The MoU, which was endorsed in May 2002, builds on the many previously existing IOSCO Resolutions and Principles to establish an international benchmark for cooperation and information sharing. A report "Regulation of Intermediaries in a Cross-Border Environment" was issued by the IOSCO Technical Committee in September 2003. This report addresses regulatory issues

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relating to the increased provision of cross-border services by market intermediaries that do not have a physical presence in the jurisdiction in which the service is provided.

92. **Implications of the use of Internet in securities related activities have been considered in a series of roundtable discussions hosted by IOSCO.** Financial service regulators, consumer groups, financial service firms and relevant information services firms, such as Internet service providers, have been invited. A "Report on Securities Activity on the Internet III," summarizing the discussions at the Roundtables, was adopted in October 2003.

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Standard Setters and Role of Fund Staff

Standard Setter	Membership	Fund Representation	Role of Fund Staff
Basel Committee on Banking Supervision (BCBS)	The Basel Committee member countries are Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, the U.K., and the U.S.	The Fund staff is represented in the Core Principles Liaison Group and Working Group on Capital and attends ICBS meetings.	Fund staff participates in the work of the Core Principles Liaison Group and the Working Group on Capital and promotes Fund's agenda. For instance, Fund staff recently highlighted the need for Basel Committee guidance on loan classification and provisioning to complement capital adequacy guidelines. Staff has also provided substantial input on the areas for revisions of the BCP and is included in key drafting groups, for instance, on guidance for the transition to Basel II and on revising the BCP.
International Organization of Securities Commissions (IOSCO)	IOSCO has over 184 members, representing most jurisdictions with a securities market.	The Fund staff is an affiliate member of IOSCO and Fund staff attends the annual meetings. Fund staff is a member of the Implementation Committee established to develop mechanisms to promote the implementation of IOSCO's standards among members of the organization.	Staff has participated in the development of the IOSCO Methodology on the implementation of the IOSCO Objectives and Principles of Securities Regulation. In consultation with the Bank and IOSCO, staff has implemented a program to test the IOSCO Methodology in the field and will be providing detailed feedback to IOSCO on the efficacy of the Methodology in the context of the FSAP.
International Association of Insurance Supervisors (IAIS)	IAIS: supervisory authorities of some 100 jurisdictions Reinsurance Task Force of the IAIS (TF Re): Supervisors and industry participants from the major reinsurance jurisdictions (US, UK, Germany, Switzerland, Bermuda, France, and Japan) plus IMF and WB.	The Fund staff has an observer status. IAIS Annual Meetings attended by Fund staff TF Re: Fund staff members were members of the TF secretariat	Reinsurance Task Force of the IAIS: Staff has provided input, both conceptually and practically, to the design of global reinsurance market database, which will form basis for greater transparency. Fund staff also provided substantial input into the final report of the TF.
Committee on Payment and Settlement Systems of the G-10 countries (CPSS)	Central Banks of G-10 countries (secretariat: the Bank for International Settlement in Basel)	The Fund staff is represented in both subgroups.	Staff will provide substantial input to the drafting of the General Guidance Report. The input will be based on the FSAP and TA missions in the payment area, as well as on the review and coordination of these missions. Significant input was also provided to the Task Force for securities and settlement systems
International Accounting Standards Board (IASB) (replaced the earlier International Accounting Standards Committee in April 2001)	The IASB has 14 Board Members, 12 of whom are full-time. They have strong and acknowledged background in accounting and represent nine countries	The Fund staff is represented on the SAC.	In addition review of the exposure drafts issued by the IASB and their implications for analysis of financial information in relation to the FSAP, staff actively participates in the regular meetings of the Standards Advisory Council.
International Association of Deposit Insurers (IADI)	Twenty eight member countries and nine associate members, the IMF, the European Forum of Deposit Insurers, and the EBRD.	Fund staff is a member, and has participated in several conferences hosted by IADI.	The first year of the institution has focused on internal development and structure. Staff has not participated in these discussions.
AML/CFT Standards and Organizations			
A. Financial Action Task Force on Money Laundering (FATF)	Established in 1989 by the G-7 Countries, the European Commission and eight other countries, FATF's membership has grown to 31 countries and territories and two regional organizations. Over 20 international organizations and bodies have observer status (the secretariat is located in Paris, France).	The Fund staff is an official observer at the FATF, and is represented at the plenary.	

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Standard Setter	Membership	Fund Representation	Role of Fund Staff
B. Offshore Group of Banking Supervisors (OGBS)	Nineteen jurisdictions with offshore centers: Aruba, Bahamas, Bahrain, Barbados, Bermuda, Cayman Islands, Cyprus, Gibraltar, Guernsey, Hong Kong SAR, Isle of Man, Jersey, Labuan (Malaysia), Macau SAR, Mauritius, Netherlands Antilles, Panama, Singapore, and Vanuatu. Established in 1980 following an initiative of the Basel Committee of Banking Supervisors (BCBS). It is not an independent standard setter but participates in the definition of cross-border banking supervisions standards; it has a status equivalent to an FSRB and participates in mutual evaluations of members.	The Fund staff is usually invited to the plenary and attends in order to keep the group informed of our OFC program and obtain feedback from members.	
C. EGMONT Group of Financial Intelligence Units (EGMONT)	EGMONT is an informal gathering of Financial Intelligence Units (FIUs) without an internationally binding agreement or any formal mandate. Established in 1995, it currently has 84 members. Its objective is to strengthen the exchange of information and experiences in the fight against money laundering, among FIU.	Given the nature of the organization, the Fund staff is not officially an observer and is not routinely represented. Nevertheless, EGMONT has invited the Fund to discuss issues of common interest (i.e., last Plenary's explanation of the IMF role on AML/CFT assessments and technical assistance).	Outreach presentation of IMF anti-money laundering work and explanation of available TA.
D. "FSRBs" (FATF-Style Regional Bodies)	FSRBs are regional intergovernmental organizations established to pursue broadly the same goals of the FATF (with occasional additional mandates) within a specific geographic area (i.e., in the Caribbean, Europe, South-Eastern Africa, or South America). Some members of FATF are also members of their respective regional organization (e.g., Brazil, Russia)		The Fund staff's work with all FSRBs can be summarized as follows: a) Outreach through observer status of the IMF (a nonpaying member): IMF attends plenary meetings; explains its role on AML/CFT; encourages TA requests from countries and regional bodies; obtains global knowledge of issues, difficulties and problems in applying international standards; b) Coordination of assessment schedule mutual evaluations to avoid duplication and obtain information FSP/OFC assessments; supply of independent assessment experts (IAEs) for assessments; c) Cooperation (TA): exchange of countries' needs; training of mutual evaluators on the use of the methodology and assessment expertise; support for FSRB workshops; provision of regional TA; identifying IAE and other short term experts for assessments; d) Review of reports on proforma basis for IMFs internal use (still very few but expected to increase).

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SPECIAL ISSUE

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Volume 51

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2004

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Thirty Years of Current Account Imbalances, Current Account Reversals, and Sudden Stops

SEBASTIAN EDWARDS*

In this paper I analyze the anatomy of current account adjustments in the world economy during the past three decades. The main findings may be summarized as follows: (i) Major reversals in current account deficits have tended to be associated with "sudden stops" of capital inflows. (ii) The probability of a country experiencing a reversal is captured by a small number of variables that include the (lagged) current account to GDP ratio, the external debt to GDP ratio, the level of international reserves, domestic credit creation, and debt services. (iii) Current account reversals have had a negative effect on real growth that goes beyond their direct effect on investments. (iv) There is persuasive evidence indicating that the negative effect of current account reversals on growth will depend on the country's degree of openness. More open countries will suffer less—in terms of lower growth—than countries with a lower degree of openness. (v) I was unable to find evidence supporting the hypothesis that countries with a higher degree of dollarization are more severely affected by current account reversals than countries with a lower degree of dollarization. And (vi) the empirical analysis suggests that countries with more flexible exchange rate regimes are able to accommodate the shocks stemming from a reversal better than countries with more rigid exchange rate regimes. [JEL F30, F32]

*Edwards is the Henry Ford II Professor of International Economics at the Anderson Graduate School of Management, University of California, Los Angeles, and Researcher at the National Bureau of Economic Research. This is a revised version of a paper presented as the *Fourth Mundell-Fleming Lecture* at the International Monetary Fund, November 6, 2003. I am grateful to Guillermo Calvo, Eduardo Ley, Ed Leamer, Al Harberger, Miguel Savastano, and Ernesto Talvi for helpful discussions and suggestions. I thank the participants of the IMF's Research Conference for helpful comments. Roberto Alvarez provided very able research assistance.

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Recent discussions on international macroeconomic policy have centered on the large current account imbalances experienced by a number of countries, including the United States with a deficit of 5 percent of GDP and China with a surplus of almost 3 percent of GDP.[1] Policymakers, analysts, and academics have focused on the international adjustment process, and have discussed the way in which the correction of these current account imbalances is likely to affect exchange rates, job creation, and economic growth.[2] The source of financing of the U.S. current account deficit has also become a source of concern. A number of analysts have argued that by relying on foreign—and particularly Asian—central banks' purchases of treasury securities, the United States has become particularly vulnerable to sudden changes in expectations and economic sentiments.[3] The IMF's former Director of Research, Ken Rogoff, has made a similar point. In a press conference given in September 18, 2003, a few days before stepping down from the position, he said:[4]

> [L]ooking . . . to the second half of 2004 and beyond, there are still many risks . . . These include the disturbing pattern of global current account imbalances, which is likely to get worse before it gets better, with the United States continuing to absorb a large share of world savings, and Asia providing much of it. (Rogoff, 2003.)

And from here Rogoff went on to argue that the effects of these imbalances on currency values are likely to be significant:

> [W]hen the dollar falls, the question is, where is the burden of adjustment going to be? It is going to be a serious problem regardless of how the fall in the dollar is distributed although the more slowly it happens, the better. But, clearly, if the euro has to bear the lion's share of the adjustment in the dollar, that is going to create a lot more difficulties than if it is more evenly distributed; than if the Asian currencies—not just China but all the Asian currencies—also appreciate, allowing themselves to appreciate significantly against the dollar. (Rogoff, 2003.)

Discussions on current account imbalances and on the burden of the adjustment process are not new in international policy circles. Indeed, in the 1940s John Maynard Keynes was clearly aware of the issue, and his proposal for an international

[1]Although it has attracted less international attention, Russia's current account surplus, in excess of 8 percent of GDP, is also becoming the subject of some debate.

[2]During his much-publicized trip to China and Japan in September 2003, U.S. Treasury Secretary John W. Snow tried to persuade the Japanese and Chinese authorities that they should allow their currencies to appreciate relative to the U.S. dollar. An appreciation of the yen and the yuan, he implied, would allow for a gradual correction of international imbalances and for a fairer distribution of the burdens of adjustment. Indeed, many analysts have argued that a strengthening of the Asian currencies is required to lift some of the pressure from the euro, whose appreciation during the past year and a half has seriously affected European competitiveness. See, for example, Hughes (2003).

[3]See, for example, Martin Wolf's October 1, 2003, article in the *Financial Times,* "Funding America's Recovery Is a Very Dangerous Game," (page 15).

[4]The complete press conference is available via the Internet at: *http://www.imf.org/external/np/tr/2003/tr030918.htm.*

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"Clearing Union" was based on the notion that in the face of large payments imbalances both deficit and surplus nations should share the burdens of adjustment.[5]

In recent years there have also been concerns regarding current account behavior in the emerging and transition countries. In particular, a number of authors have asked whether large current account deficits have been associated with the currency crises of the 1990s and 2000s. While some authors, including Fischer (2003), have argued that large current account deficits are a sign of clear (and future) danger, others have argued that significant deficits do not increase the probability of a currency crisis (Frankel and Rose, 1996). Recently, much of the discussion on the emerging and transition nations has moved towards the implementation of appropriate "crisis prevention" policies. In that spirit, a number of analysts have developed models of current account sustainability and have asked what determines the sustainable level of international financing that a particular country is able to secure over the medium and long run.[6] Some authors have also analyzed episodes of current account reversals, or large reductions in the current account deficit in a short period of time (Milesi-Ferretti and Razin, 2000; and Edwards, 2002).

Modern macroeconomic models of open economies have emphasized the fact that the current account is an intertemporal phenomenon. These models recognize two basic interrelated facts. First, from a basic national accounting perspective the current account is equal to savings minus investment. Second, since both savings and investment decisions are based on intertemporal factors—such as life cycle considerations and expected returns on investment projects—the current account is necessarily an intertemporal phenomenon. Sachs (1981) emphasized forcefully the intertemporal nature of the current account, arguing that to the extent higher current account deficits reflected new investment opportunities, there was no reason to be concerned about them. An important and powerful implication of intertemporal models is that, at the margin, changes in national savings should be fully reflected in changes in the current account balance (Obstfeld and Rogoff, 1996). Empirically, however, this prediction of the theory has been systematically rejected by the data.[7] Typical analyses that have regressed the current account on savings have found a coefficient of approximately 0.25, significantly below the hypothesized value of 1.

Numerical simulations based on the intertemporal approach have also failed to account for current account behavior. According to these models a country's optimal response to negative exogenous shocks is to run *very high* current account deficits, indeed much higher than what is observed. Obstfeld and Rogoff (1996), for example, develop a model of a small open economy where under a set of plausible parameters the steady state trade surplus is equal to 45 percent of GDP, and

[5]See, for example, the discussion in Chapter 6 of Skidelsky's (2000) third volume of Keynes' biography, and the papers, reports, and memoranda by Keynes cited in that chapter.

[6]Some of the most influential work on this subject has been done at the IMF by Gian Milesi-Ferretti and his associates. See Milesi-Ferretti and Razin (1996, 1998, 2000), Ostry (1997), Adedeji (2001), McGettigan (2000), and Knight and Scacciavillani (1998).

[7]See, for example, Ogaki, Ostry, and Reinhart (1995), Ghosh and Ostry (1995), and Nason and Rogers (2002).

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the steady state debt to GDP ratio is equal to 15.[8] According to a model developed by Fernandez de Cordoba and Kehoe (2000) the optimal response to financial reform in an industrial country such as Spain is to run a current account deficit that peaks at 60 percent of GDP.[9]

In trying to explain the lack of empirical success of intertemporal models a number of authors have compiled a list of (inadequate) assumptions that can account for the observed discrepancies between theory and reality. These include nonseparable preferences, less than perfect international capital mobility, fiscal shocks, and changing interest rates (Nason and Rogers, 2002). In a series of recent papers Kraay and Ventura (2000, 2002) and Ventura (2003) have proposed some amendments to the traditional intertemporal model that go a long way in helping bridge theory with reality. In their model portfolio decisions play a key role in determining the evolution of the current account balance. When investors care about both return and risk, changes in savings will not be translated into a one-to-one improvement in the current account. In this case investors will want to maintain the composition of their portfolios, and only a proportion of the additional savings will be devoted to increasing the holdings of foreign assets (i.e., bank loans). In addition, they argue that when short-run adjustment costs in investment are added to the analysis, the amended intertemporal model traces reality quite closely. In this setting the behavior of countries' net foreign assets play an important role in explaining current account behavior. In particular, and as pointed out by Lane and Milesi-Ferretti (2002, 2003), changes in foreign asset valuation stemming from exchange rate adjustments will tend to affect the adjustment process and the evolution of current account balances.

Models that emphasize portfolio balance are also promising for understanding current account behavior in emerging countries. In particular, shifts in portfolio allocations driven by changes in perceived risk in the emerging countries can explain some of the large changes in current account deficits observed in these countries, including major current account reversals. As pointed out by Edwards (1999), a reduction in foreigners' (net) demand of an emerging country's assets will result in a decline in the country's sustainable current account deficit, forcing it into adjusting. Indeed, if this reduction in foreigners' demand for the country's assets is abrupt and significant—that is, if the country faces what has become to be known as a "sudden stop"—we are very likely to observe a major current account reversal. The magnitude of the current account adjustment will be particularly large during the transition from the "old" to the "new" foreign (net) demand for the country's assets. Although portfolio-based models of the current account are powerful and show considerable promise, there are still a number of questions that need to be addressed. As Ventura (2003) has argued, these include understanding better the role of trade in contingent financial claims, and understanding why international risk sharing is limited and why countries do not buy insurance.

[8]Obstfeld and Rogoff (1996) do not claim that this model is particularly realistic. In fact, they present its implications to highlight some of the shortcomings of simple intertemporal models of the current account.

[9]Their analysis is carried on in terms of the trade account balance. In their model, however, there are no differences between the trade and current account balances.

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The purpose of this paper is to analyze the historical behavior of current account imbalances, and the patterns of adjustment followed by countries with large payments disequilibria.[10] Since the focus of the discussion is on adjustment, the analysis mostly deals with extreme observations or episodes when countries have experienced *large* deficits and, to some extent, large surpluses. I am particularly interested in understanding the connection between current account adjustments and exchange rates. I am also concerned with the costs of current account deficit reversals, and their connection to sudden stops of capital inflows.[11] I analyze whether openness, the extent of dollarization, and the exchange rate regime affect the costs of reversals. Broadly speaking, in addressing these issues I am interested in tackling the question of whether the current account *matters.* More specifically, I ask whether economic authorities should be concerned if the country in question runs (large) current account deficits. In the past, authors that have dealt with this issue have reached different conclusions. Sachs (1981), for example, argued that to the extent that a (large) deficit was the result of an increase in investment, there was *no* cause for concern or for policy action. In an important article Corden (1994) argues that "[a]n increase in the current account deficit that results from a shift in private sector behavior—a rise in investment or a fall in savings—*should not be a matter of concern at all*" (p. 92, emphasis added). This view that large current deficits don't matter if they stem from private sector behavior has been associated with former U.K. Chancellor of the Exchequer Nigel Lawson, and is sometimes referred to as *Lawson's Doctrine.* In a series of papers Fischer (1988, 1994, 2003) has taken a different position. For example, in Fischer (1988, p. 115) he argued that the "primary indicator [of a looming crisis] is the current account deficit." And, in 1994, months before the Mexican crisis, he said: "[t]he Mexican current account deficit is huge, and it is being financed largely by portfolio investment. Those investments can turn around very quickly and leave Mexico with no choice but to devalue . . . And as the European and especially the Swedish experiences show, there may be no interest rate high enough to prevent an outflow and a forced devaluation" (Fischer, 1994, p. 306).[12]

In terms of the current literature, this paper is (somewhat) in the tradition of the work by Milesi-Ferretti and Razin (1998, 2000) and Edwards (1999, 2002, 2003) on sustainability, and of the recent work by Ventura (2003), Kraay and Ventura (2000, 2003), and Edwards (2002) that emphasizes the role of portfolio asset allocation in understanding current account behavior. The paper is eminently empirical; readers interested in models of the current account are referred to Obstfeld and Rogoff (1996) and Ventura (2003).

[10]This paper is part of a research project on adjustment in open economies. Other papers in this project include Edwards (1999), De Gregorio, Edwards, and Valdes (2000), Edwards and Susmel (2003), and Edwards (2003).

[11]On sudden stops see Dornbusch and others (1995) and Calvo (2003).

[12]In Edwards (2002) I argue that there is evidence suggesting that large current account deficits increase the probability of a balance of payments crisis. For results that point in the opposite direction see Frankel and Rose (1996).

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I. Three Decades of Current Account Imbalances

In this section I analyze the distribution of current account balances in the world economy during the past 32 years. The data are taken from the World Bank data set (World Development Indicators) and cover all countries—advanced, transition and emerging—for which there is information.[13] In order to organize the discussion I have divided the data into six regions: (1) industrialized countries, (2) Latin America and the Caribbean, (3) Asia, (4) Africa, (5) Middle East and Northern Africa, and (6) Eastern Europe. The data set covers 157 countries during the 1970–2001 period. There are over 3,600 observations, and it is the largest data set that can be used in empirical work on the current account. There are 643 observations for the industrial countries, 808 for Latin America and the Caribbean, 513 for Asia, 1,108 for Africa, 297 for the Middle East and North Africa, and 286 for Eastern and Central Europe. As will be explained later, in some of the empirical exercises I have restricted the data set to countries with a population above 500,000, and income per capita above US$500 in 1985 purchasing power parity (PPP) terms. For a list of the countries included in the analysis see the appendix.

International Distribution of Current Account Imbalances

The data on current account imbalances during the past three decades are summarized in Figures 1 and 2. In these figures, as in all tables in this paper, a positive number denotes a current account deficit; surpluses have a negative sign. Figure 1 contains "box-and-whisker" plots that summarize the distribution of current account deficits for each of the six regions. The lines in the middle of each box represent the median of the current account balance for that particular region. Each box extends from the 25th percentile of the distribution to the 75th percentile, thus covering the interquartile range (IQR). The lines that come out from each box are called the whiskers, and extend to the largest data point up to 1.5 times the corresponding edge of the IQR. The whiskers capture the so-called "adjacent values." Observations beyond the end of the whiskers are depicted individually. Finally, the width of each box reflects the number of observations in each region.[14] In Figure 2, on the other hand, I present the evolution of the average current account deficit to GDP ratio by regions for the 1970–2001 period.

A number of interesting aspects of current account behavior emerge from these figures, and from the supporting data (see the appendix for details on the distributions by region and year). As Figure 1 shows, during this period the median balance was in every one of the six regions—including in the industrial countries—a *deficit*. For the complete 32 year period (1970–2001) more than one half of the countries had current account *deficits* in excess of 3.1 percent of GDP. For this 32 year period the third quartile corresponds to a current account deficit of 7.2 percent of GDP. Naturally, and as Figure 1 shows, the third quartile differs for each region, with the

[13]When data from the IMF's *International Financial Statistics* are used, however, the results are very similar.

[14]See Chambers and others (1983). The Stata manual provides a simple and useful explanation of box-and-whisker graphs.

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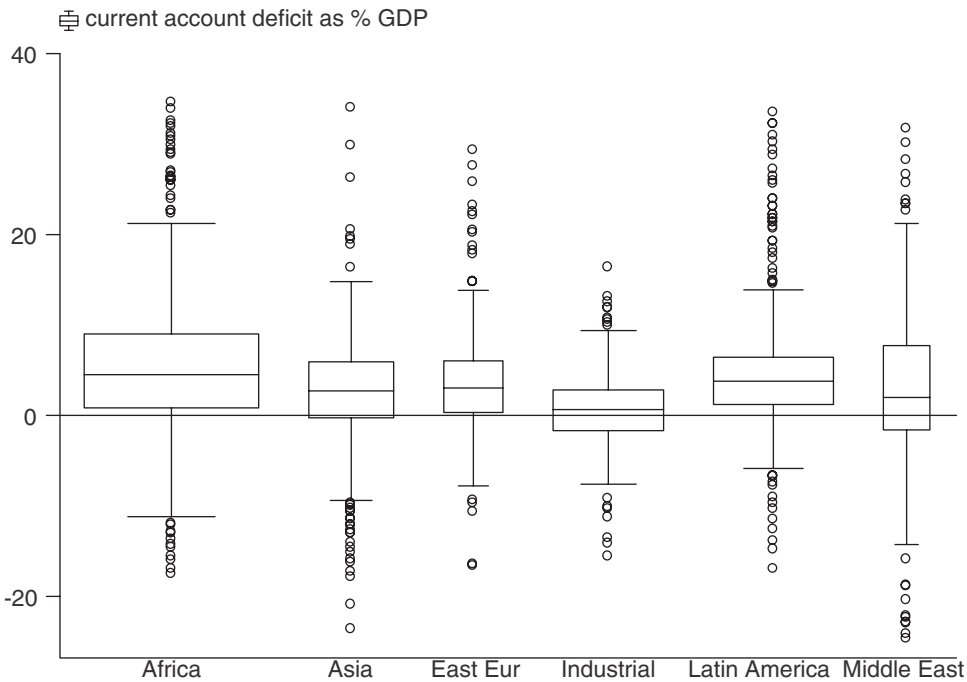
Figure 1. Distribution of Current Account Deficits as Percentage of GDP, by Regions, 1970–2001
(Deficits are positive numbers)



largest values corresponding to Africa and Latin America, with current account deficits of 9.9 percent and 8 percent of GDP respectively. The industrial countries have the smallest third quartile, with a deficit of 3 percent of GDP. Figure 1 also shows that the lowest limit of the interquartile range—the first quartile—corresponds to a current account surplus in only three of the regions: Asia, industrial countries, and the Middle East. The overall value (for all countries and years) of the first quartile corresponds to a current account surplus of 0.28 percent of GDP.

Out of the 3,655 country-year observations in the sample, 923 correspond to current account surpluses, and 2,732 correspond to deficits. Moreover, for the period as a whole the number of deficit countries exceeds the number of surplus countries in every one of the regions. Naturally, since by construction the sum of all current account balances around the world should add up to zero, the smaller number of surplus countries have to run relatively large individual surpluses, when these are measured in currency terms.[15]

Figure 2 shows that after the 1973 oil-shock there were important changes in *average* current account balances in the industrial nations, the Middle East, and

(*text continues on page 11*)

[15]An interesting recent puzzle is that the growing discrepancy between the sum of all recorded deficits and surpluses, as a practical matter the sum of all current account balances, is not equal to zero. Dealing with this (important) issue is beyond the scope of the current paper, however.

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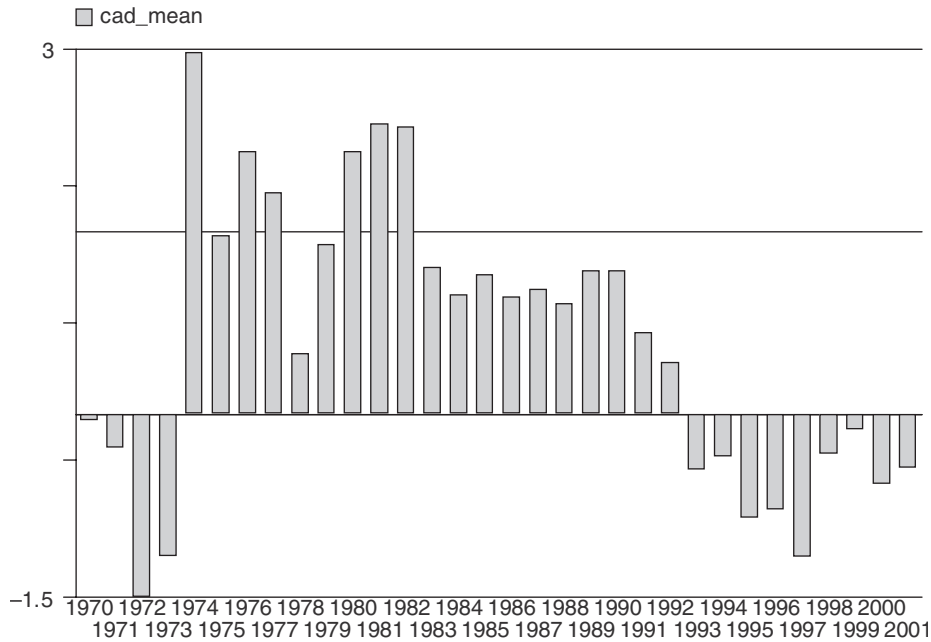
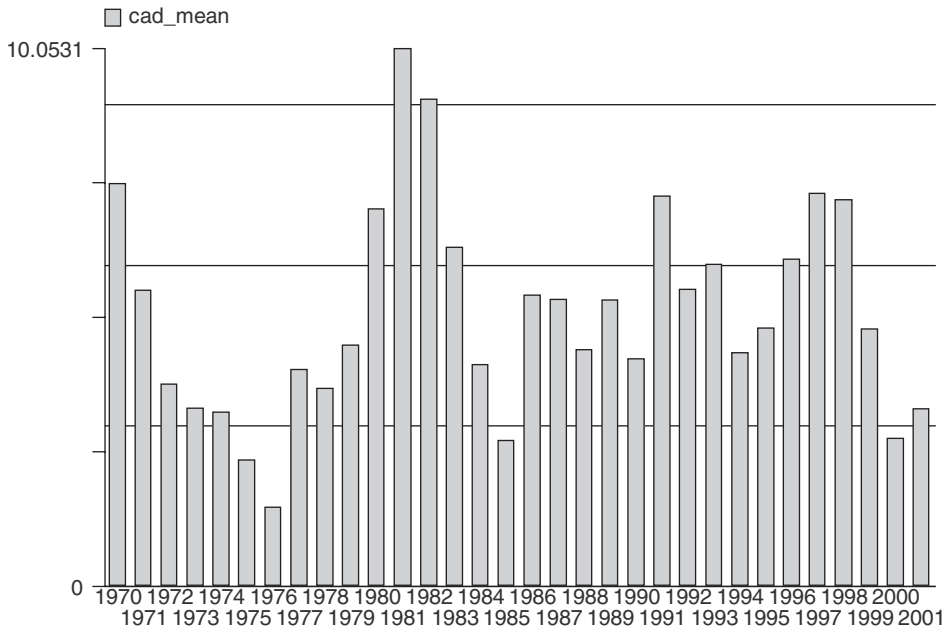
Figure 2. Average Current Account Deficits As Percentage of GDP by Region, 1970–2001

(Deficits are positive numbers)



A. Industrial Countries



B. Latin America and the Caribbean

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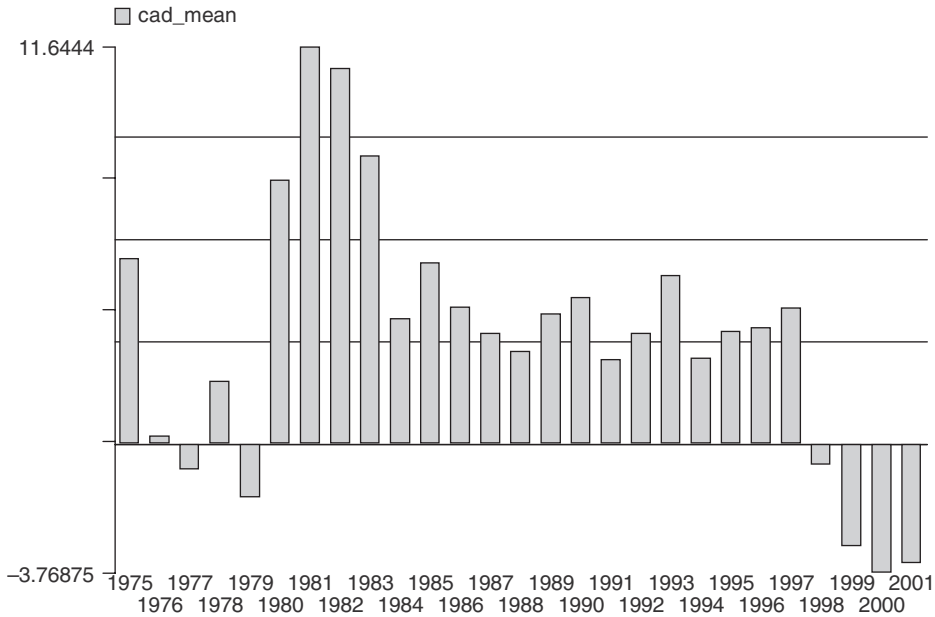
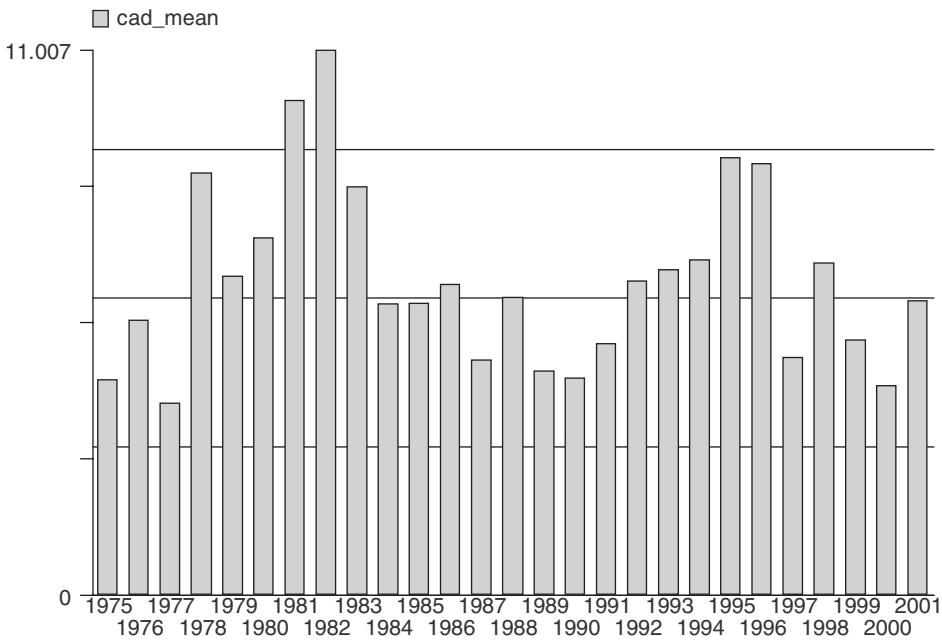
Figure 2. *(continued)*



C. Asia



D. Africa

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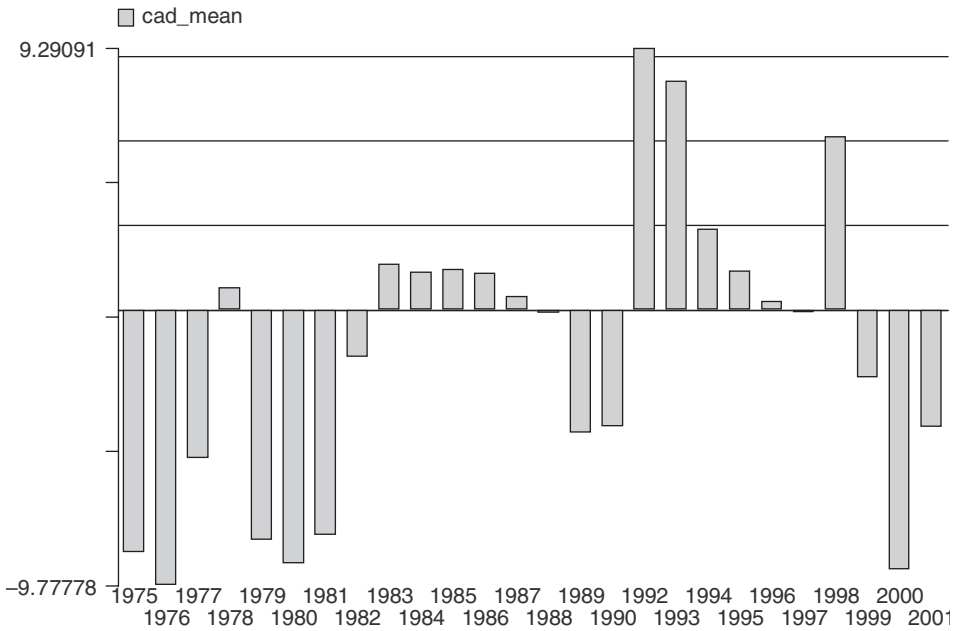
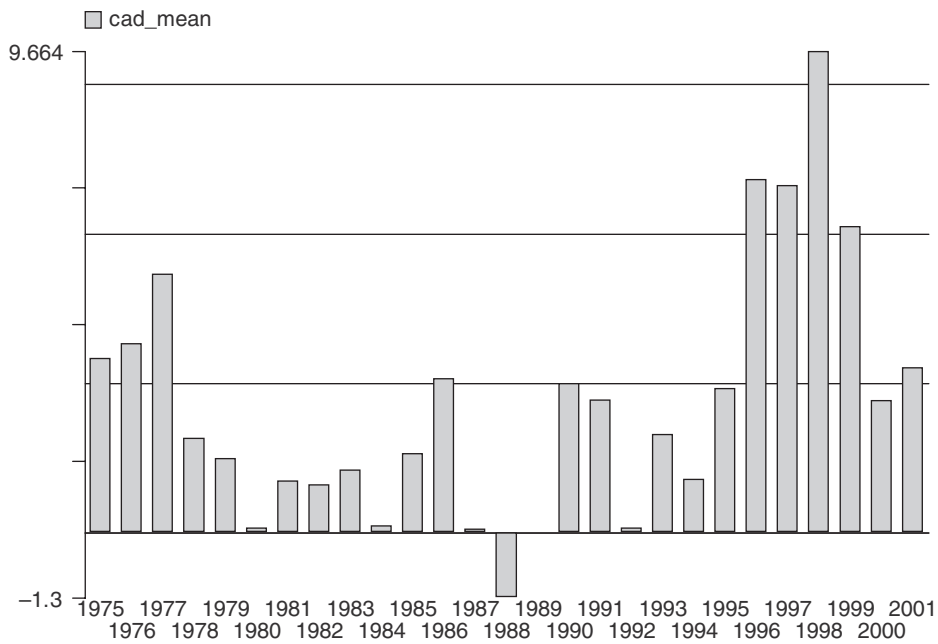
Figure 2. *(concluded)*



E. Middle East



F. Central and Eastern Europe

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Africa. Interestingly, no discernible change can be detected in Latin America or Asia. An analysis of median and third-quartile balances, however, shows a different picture, and indicates that after 1973 there were significant shifts in the distribution of balances (see the appendix for year to year details). For example, the median balance climbs from a deficit of 1 percent to one of 4 percent in Latin America; in Asia it goes from less than 1 percent to 3 percent of GDP. Interestingly, the median and third quartile deficits for Africa experience a *decline* after 1973, reflecting the region's inability to finance these large shocks. In contrast with the first oil shock, the 1979 oil shock affected both the means and medians of current account balances in every region in the world. The impact of this shock was particularly severe in Latin America, where the deficit jumped from an average of 3.7 percent of GDP in 1978 to over 10 percent of GDP in 1981.

Figure 2 captures vividly the magnitude of external adjustment undertaken by emerging economies during the debt crisis of the 1980s. In Latin America, for example, reduction in the average current account deficit amounted to 7.3 percent of GDP between 1981 and 1985. As may be seen from Figure 2, during the 1980s adjustment was not confined to the Latin American region. Indeed, other emerging regions also experienced severe reductions in their deficits during this period. In Asia, for instance, the current account adjustment was almost 8 percent of GDP between 1981 and 1984. As Figure 2 shows, the late 1990s and early 2000s have also been characterized by very large adjustments in the emerging and transition countries. These adjustments have been related to the recurrent currency crises of the second half of the 1990s and early 2000s, and have been particularly severe in Asia and Eastern Europe, where average balances adjusted by 7.5 percent and 6.3 percent of GDP, respectively. These tables also show that the industrialized countries went back to having sustained surpluses only after 1993.[16]

High and Persistent Current Account Deficits and Surpluses

According to modern intertemporal models of the current account, including the portfolio-based models of Kraay and Ventura (2000, 2002) and Edwards (1999, 2002), countries will tend to experience short-term deviations from their long-run *sustainable* current account levels.[17] This implies that large current account imbalances—or

[16]From the perspective of current controversies on the international adjustment process, it is interesting to compare the historical behavior of the U.S. current account to the distribution of current accounts for the industrial countries as a group. During the 1970s, the United States ran either small surpluses or small deficits, and the country's current account was very close to the median of the distribution for industrial nations. During most of the 1980s the United States ran a current account deficit. However, in every year but one (1987) the deficit was *below* the third quartile threshold for industrial countries. In 1987 an adjustment process began; the deficit declined steadily until in 1991 the United States ran a small current account surplus. Starting in 1992, a long period of deficits began, which continues until today. In 1999, 2000, and 2001, the U.S. current account deficit was among the 25 percent largest deficits of all industrial countries. There is little doubt that once data for 2002 and 2003 are collected, the United States will again be among the highest deficit countries for those two years. This will make the United States the first large industrial country to have persistently *large* current account deficits for five or more consecutive years. See the discussion below on persistent deficits.

[17]In these models changes in current account balances are (largely) the result of efforts by domestic economic agents to smooth consumption. The sustainable level of the current account balance will, in turn, depend on portfolio decisions both by foreign and domestic investors.

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large deviations from sustainability—should not be persistent through time. Once the temporary shocks that trigger the large imbalances have passed, the current account will return to its long-run sustainable level. In this subsection I use the data set described above to analyze the degree of persistence through time of large current account imbalances. I am particularly interested in finding out whether the degree of persistence is similar for large deficits and for large surpluses. I do this by estimating a number of probit regressions on the probability of countries' having a high deficit (or surplus) in a particular year. Although this analysis is *not* a test of the basic intertemporal models, or their portfolio-based versions, it does provide information on the important issue of persistence of large current account imbalances. As a first step I constructed two measures of "high deficits" and two measures of "high surpluses."

- High Deficit 1: This index takes the value of 1 if, in a particular year, a country's deficit is higher than its region's third quartile. The index takes a value of zero otherwise.[18]
- High Deficit 2: This index takes the value of 1 if, in a particular year, a country's deficit is higher than its region's ninth percentile. It takes a value of zero otherwise. Notice that this definition is "stricter" than the High Deficit 1 definition.
- High Surplus 1: This index takes the value of 1 if, in a particular year, a country's surplus is among its region's 25 percent highest surpluses. The index takes a value of zero otherwise.
- High Surplus 2: This index takes the value of 1 if, in a particular year, a country's surplus is among its region's 10 percent highest surpluses. It takes a value of zero otherwise.

In order to investigate the degree of persistence of high current account imbalances I estimated a number of panel probit regressions of the following type:

$$high_{jt} = \alpha + \sum \beta_k high_{jt-k} + \gamma X_{jt} + \varepsilon_{jt}, \tag{1}$$

where $high_{jt}$ is a dummy variable that takes a value of 1 if country j has a high surplus (deficit) in period t; X_{jt}, refers to other covariates including time, country, and/or region fixed effects. ε_{jt} is an error term with the usual properties.[19] My main interest is on the β_k coefficients on lagged high surpluses (deficits): I am interested in finding out whether having had a high deficit in the past (up to four years) affects the probability of having a high deficit in the current period. The results are in Table 1, where as is customary I report the estimated (dF/dx) coefficients, which capture the change in the probability of a high surplus (deficit) in period t, if there is a high deficit in period $t–k$.[20] As may be seen, the coefficients of all four years' lagged high surpluses' indicators are significantly different from zero at conven-

[18]Notice that the thresholds for defining *high* deficits and surpluses are year-specific. That is, for every year there is a different threshold for each region.

[19]An alternative strategy would be to estimate regressions using the quintiles themselves as the dependent variable. However, the results convey the same message as those reported here.

[20]The dF/dx have been computed for a discrete change in the dummy variables from 0 to 1, and have been evaluated for the mean values of all the regressors.

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Table 1. Probit Regressions: Deficits and Surpluses Persistence

Variable	(1) High surplus	(2) High deficit
First lag	0.543	0.403
	(12.15)**	(12.25)**
Second lag	0.169	0.082
	(3.54)**	(3.81)**
Third lag	0.143	0.026
	(2.77)**	(1.50)
Fourth lag	0.153	0.006
	(3.15)**	(0.38)
Pseudo-R^2	0.36	0.39
Observations	2,381	2,381

Notes: absolute value of z statistics in parentheses; **significant at 1 percent; and region and year dummies are included, but not reported.

tional levels, indicating a certain degree of persistence of high surpluses. Interestingly, when regressions of this type were estimated for the case of high deficits—equation 2 in Table 1—the results were quite different, and only the first two lagged coefficients are significantly different from zero. These estimates suggest that during the past three decades the international adjustment process has tended to be asymmetric: high current account surpluses have tended to be more persistent than current account deficits. This conclusion is supported by an analysis of the number of countries that have experienced high deficits or surpluses for at least five consecutive years. Table 2 contains such a list for the case of deficits; the case of surpluses is in Table 3.

As may be seen from Table 2 a rather small number of countries has experienced long periods of high deficits. Consider the case of Latin America, a region with a reputation for macroeconomic mismanagement: according to the first definition, only three countries have had persistently high deficits, and only one of these—Nicaragua—has had a high deficit for more than 10 consecutive years.[21] According to the data in Column A, only 7 out of the 49 African countries are persistent high deficit countries. Interestingly, New Zealand is the only country in the sample that according to the first definition has had two episodes of high persistent deficits—1982–88 and 1994–2001. Column A in Table 2 shows that only four countries in the sample—Australia, Nicaragua, Guinea-Bissau, and Mauritania—have had high deficits that have persisted for more than 10 consecutive years.[22]

[21]Nicaragua's severe crisis is largely the result of the economic mismanagement during the Sandinista rule during the 1980s.

[22]When different and a stricter definition of high and persistence deficits is used—those countries with deficits in the tenth decile of the distribution for at least five consecutive years—the results are broadly consistent with those discussed here—see Column B of Table 2 for details.

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Table 2. Countries with Persistent High Current Account Deficits by Region, 1970–2001

Region	(A) High deficit 1	(B) High deficit 2
Industrialized Countries		
Australia	1981–2000	—
Canada	1989–94	—
Ireland	1976–84	1978–84
New Zealand	1982–88 and 1994–2001	1984–88
Portugal	1996–2001	—
Latin America and Caribbean		
Guyana	1979–85	1979–85
Honduras	1975–80	—
Nicaragua	1981–2000	1984–90 and 1992–2000
Asia		
Bhutan	1981–99	1982–89
Lao P.D.R.	1994–98	—
Nepal	1996–2000	—
Papua New Guinea	1980–84	—
Singapore	1972–80	—
Africa		
Congo, Rep. of	1900–96	—
Guinea-Bissau	1982–96	1982–93
Lesotho	1995–2001	1995–2000
Mali	1984–90	—
Mauritania	1975–88	—
Mozambique	1987–98	—
Swaziland	1978–85	—
Middle East		
Cyprus[1]	1977–81	—
Egypt	1972–77	—
Lebanon	1992–98	—
Saudi Arabia	1983–91	—
Eastern Europe		
Armenia	1994–98	—
Azerbaijan	1995–99	1995–99

[1]Although Cyprus is considered a European country by the IMF, the author has listed it under Middle East in an effort to present more accurately the country's current level of economic development.

Source: Author's elaboration based on *World Development Indicators.*

As Column A in Table 3 shows, there are 30 episodes of persistently high surpluses during the period under study.[23] Of these, 9 correspond to advanced nations. Four of the 30 persistently high surplus episodes took place in major oil producers—Trinidad and Tobago, Nigeria, Kuwait, and Russia—and five episodes correspond to countries belonging to the South African currency union (Lesotho,

[23]Notice that I am referring to "episodes." Some countries have had more than one episode of high and persistent surpluses.

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Table 3. Countries with Persistent High Current Account Surpluses by Region, 1970–2001

Region	(A) High surplus 1	(B) High surplus 2
Industrialized countries		
Switzerland	1980–2001	1987–2001
Belgium	1986–2001	—
Finland	1995–2001	—
Japan	1983–1992	—
Netherlands	1972–77, 1981–91 and 1993–2000	—
Latin America and Caribbean		
Trinidad and Tobago	1990–96	—
Asia		
China	1994–98	—
Fiji	1985–89	—
Hong Kong SAR	1971–78 and 1980–94	1984–90
Singapore	1988–2001	1994–2001
Papua New Guinea	1992–96	—
Africa		
Algeria	1980–85	—
Botswana	1985–2001	1985–89 and 1991–2001
Chad	1980–84	—
Gabon	1978–84 and 1993–97	1979–84
Gambia, The	1984–1994	—
Lesotho	1980–84 and 1989–94	1990–94
Mauritania	1995–2001	1995–2001
Namibia	1990–2000	—
Nigeria	1984–92	—
South Africa	1985–95	—
Swaziland	1986–91	1987–91
Middle East		
Kuwait	1975–89	1980–89
Eastern Europe		
Russian Federation	1995–2001	—
Kuwait	1980–2001	1987–2001

Source: Author's elaboration based on *World Development Indicators.*

Namibia, South Africa, and Swaziland). Interestingly, neither China nor Japan have been among the persistent high surplus countries during the past few years—that is, after 1998. Of the 30 high surplus episodes in Column A of Table 3, 9 have lasted for more than 10 years, and four countries have had more than one five-year episode with high surpluses. Both of these figures are significantly higher than the equivalent ones for the case of high deficits; indeed, as Table 2, Column A shows, only four countries had high *deficits* for 10 or more consecutive years, and only one had more than one five-year episode with high deficits (New Zealand).

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II. Anatomy of Current Account Adjustments

In this section I investigate the anatomy of the adjustment processes in high deficit countries, investigating as many of the main aspects of the adjustment process as possible, and report empirical results that deal with the following questions:

- Has adjustment tended to be gradual, or rather abrupt?
- How common have large deficit reversals been during the past three decades?
- Has the incidence of current account deficit reversals been similar across regions?
- Following deficit reversals, have the current account adjustments tended to be lasting, or have current account balances deteriorated shortly after the reversal episode?
- Historically, have major current account deficit reversals been associated with sudden stops of capital inflows?
- To what extent have current account deficit reversals been associated with balance of payments and/or currency crises?
- Have current account deficit reversals been associated with banking crises?
- Have current account reversals tended to take place within the context of IMF programs?
- Have current account deficit reversals had a negative effect on growth or other forms of real economic activity? The analysis of this particular question is the subject of Section III.

The analysis presented in this section differs from other work on the subject, and in particular from studies on current account deficit reversals such as Milesi-Ferretti and Razin (2000), Edwards (2002), and Guidotti and others (2003), in several respects. First the coverage, both in terms of countries and time period, is greater in this paper than in previous work. Second, I use a methodology based on the calculation of nonparametric tests and frequency tables. And, third, I analyze aspects of reversals—including their possible connection to banking crises and "sudden stops" of capital inflows—that have not been addressed in previous work.

Current Account Deficit Reversals: Incidence and Duration

I define current account deficit reversals—reversals, in short—in two alternative ways: (i) Reversal A is defined as a reduction in the current account deficit of at least 4 percent of GDP in one year; and (ii) Reversal B is defined as a reduction in the current account deficit of at least 6 percent of GDP in a three-year period.[24]

In Table 4 I present tabulation tables on current account reversals by region as well as for the complete sample. These tables include two versions of the Pearson tests for the independence of the frequency of reversals across the six

[24]In both cases the timing of the reversal is recorded as the year when the episode ends. That is, if a country reduces its current account deficit by 7 percent of GDP between 1980 and 1982, the episode is recorded as having taken place in 1982. Also, for a particular episode to classify as a current account deficit reversal, the initial balance has to be indeed a *deficit*. Notice that these definitions are somewhat different from those used in other studies, including Freund (2000), Milesi-Ferretti and Razin (2000), Edwards (2002), and Guidotti and others (2003).

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Table 4. Incidence of Reversals

Panel A. *Reversal A*

Region	No reversal	Reversal
Industrial countries	98.0	2.0
Latin America and Caribbean	87.7	12.3
Asia	87.7	12.3
Africa	83.4	16.6
Middle East	85.0	15.0
Eastern Europe	88.9	11.1
Total	**88.2**	**11.8**
Observations	2,678	
Pearson		
Uncorrected χ^2 (5)	65.41	
Design-based $F(5, 13385)$	13.08	
p-value	0.00	

Panel B. *Reversal B*

Region	No reversal	Reversal
Industrial countries	97.3	2.7
Latin American and Caribbean	92.0	8.0
Asia	88.3	11.7
Africa	88.3	11.7
Middle East	86.6	13.4
Eastern Europe	90.7	9.3
Total	**90.8**	**9.2**
Observations	2,501	
Pearson		
Uncorrected χ^2 (5)	37.31	
Design-based $F(5, 12500)$	7.46	
p-value	0.00	

regions.[25] Panel A includes the results for the Reversal A definition, while Panel B has the results for the Reversal B definition. As may be seen, for the complete sample the incidence of Reversal A was 11.8 percent of all country-year observations, while it was only 9.2 percent for the Reversal B definition. The lowest incidence of deficit reversals occurs in the advanced countries, with 2 percent and 2.7 percent incidence for Reversals A and B respectively; the region with highest incidences is Africa with 16.6 percent and 11.7 percent respectively. As the χ^2 and the F statistics indicate, the incidence of deficit reversals is statistically different among the six different regions. Homogeneity tests also indicate that once the industrial countries' group is excluded, the incidence of reversals is still significantly different among the emerging and transition economies.

[25]The first one is the traditional Pearson χ^2 test. The second one is an F-test, which makes a correction in case the data in the sample are not identically and independently distributed.

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This finding differs from what was found by Milesi-Ferretti and Razin (2000, p. 292), who found that the occurrence of reversals was similar across groups of countries.

From a policy point of view an important question is whether these reversals have been sustained through time, or whether they have been short lived. I address this issue by investigating whether at horizons of three and five years after each reversal the current account deficit was still lower than what it was the year before the reversal. The results obtained are reported for in Table 5. As may be seen, these results suggest that in a vast majority of cases—between 68 percent and 83 percent of cases, depending on the definition of reversal—the current account deficit was lower three or five years after the reversal than what it was the year before the reversal started.

Current Account Deficits Reversals and Sudden Stops

Since the currency crises of the 1990s international economists have had a renewed interest in the behavior of capital flows around the world. In particular, a number of authors have argued that in a world of high capital mobility sudden stops of capital inflows can be highly disruptive, forcing countries to implement costly adjustments (Dornbusch and others, 1995; Calvo, 2003; Calvo and others, 2003; and Mody and Taylor, 2002). In this subsection I investigate the connection between sudden stops and current account reversals. The results indicate that, as expected, these two phenomena have been closely related. However, the relationship is less than one-to-one; historically there have been many major current account deficit reversals that have not been related to sudden stops, and there have been numerous sudden stops that have not been associated to reversals. This indicates that when facing a sudden stop of capital inflows many countries have been able to effectively use their international reserves in order avoid an *abrupt* and major current account reversal. At the same time, these results suggest that a number of countries have gone through large current account reversals without having faced a sudden stop in capital inflows. Most of the countries in this group were not receiving large inflows to begin with, and had financed their large deficits by drawing down international reserves.

Table 5. Sustainability Through Time of Current Account Reversals

	Sustainability		
	Not sustained	Sustained	Total
		At 3 years	
Reversal A	16.9	83.1	272
Reversal B	23.7	76.3	198
		At 5 years	
Reversal A	19.8	80.2	247
Reversal B	32.4	67.6	179

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Table 6. Incidence of Sudden Stops

Region	No sudden stop	Sudden stop
Industrial countries	96.5	3.5
Latin America and Caribbean	95.5	4.5
Asia	96.1	3.9
Africa	93.1	6.9
Middle East	89.4	10.6
Eastern Europe	92.9	7.1
Total	**94.4**	**5.6**
Observations	2,193	
Pearson		
Uncorrected χ^2 (5)	18.59	
Design-based F (5, 12500)	3.72	
p-value	0.002	

I defined a sudden-stop episode as an abrupt and major reduction in capital inflows to a country that up to that time had been receiving large volumes of foreign capital. More specifically, I imposed the following requirements for an episode to qualify as a sudden stop: (i) the country in question must have received an inflow of capital larger than its region's third quartile during the previous two years prior to the sudden stop; and (ii), net capital inflows must have declined by at least 5 percent of GDP in one year.[26] In Table 6 I present a tabulation of the incidence of sudden stops for the complete sample as well as by region. As may be seen, the historical occurrence is less than 6 percent for the complete sample, and ranges from 3.5 percent for the advanced nations to 10.6 percent for the Middle Eastern countries. When alternative and stricter definitions of sudden stops were used, the incidence for the complete sample declined to 3.9 percent of all observations. Notice that the nonparametric χ^2 and the F statistics indicate that the incidence of sudden stops is statistically different among the six different regions in our analysis.

In Table 7 I present two-way frequency tables for the sudden stops and the current account deficit reversal definition Reversal A, both for the complete sample as well as for each one of our six regions. The table shows that for the complete sample (2,228 observations) 46.1 percent of countries subject to a sudden stop also faced a current account reversal. At the same time, 22.9 percent of those with reversals also experienced (in the same year) a sudden stop of capital inflows. The regional data show that joint incidence of reversals and sudden stops has been highest in Africa, where approximately 62 percent of sudden stops happened at the same time as current account reversals, and almost 30 percent of reversals coincided with sudden stops. Notice that for every one of the regions, as well as for the

[26]In order to check for the robustness of the results, I also used two alternative definitions of sudden stops, which considered a reduction in inflows of 3 and 7 percent of GDP in one year. Due to space considerations, however, I don't report detailed results using these definitions.

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Table 7. Reversals and Sudden Stops

All countries

	No sudden stop	Sudden stop	Total
No reversal	1,892	69	1,961
	96.5	3.5	100
	90.2	53.1	88.0
Reversal	206	61	267
	77.1	22.9	100
	9.8	46.9	12.0
Total	2,098	130	2,228
	94.2	5.8	100
	100	100	100

Pearson χ^2 (1) = 159.78 p-value = 0.000

Industrial countries

	No sudden stop	Sudden stop	Total
No reversal	539	18	557
	96.8	3.2	100
	98.2	81.8	97.6
Reversal	10	4	14
	71.4	28.6	100
	1.8	18.2	2.5
Total	549	22	571
	96.2	3.8	100
	100	100	100

Pearson χ^2 (1) = 21.14 p-value = 0.000

Latin America and Caribbean

	No sudden stop	Sudden stop	Total
No reversal	578	23	601
	96.2	3.83	100
	87.2	44.2	84.1
Reversal	85	29	114
	74.6	25.4	100
	12.8	55.8	15.9
Total	663	52	715
	92.7	7.3	100
	100	100	100

Pearson χ^2 (1) = 18.35 p-value = 0.000

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Table 7. *(continued)*

Asia

	No sudden stop	Sudden stop	Total
No reversal	294	12	306
	96.1	3.9	100
	87.5	48.0	84.8
Reversal	42	13	55
	76.4	23.6	100
	12.5	52.0	15.2
Total	336	25	361
	93.1	6.9	100
	100	100	100

Pearson χ^2 (1) = 9.55 *p*-value = 0.002

Africa

	No sudden stop	Sudden stop	Total
No reversal	579	21	600
	96.5	3.5	100
	85.8	37.5	82.1
Reversal	96	35	131
	73.3	26.7	100
	14.2	62.5	17.9
Total	675	56	731
	92.3	7.7	100
	100	100	100

Pearson χ^2 (1) = 60.63 *p*-value = 0.000

Middle East

	No sudden stop	Sudden stop	Total
No reversal	193	12	205
	94.2	5.8	100
	87.7	50.0	84.0
Reversal	27	12	39
	69.2	30.8	100
	12.3	50.0	16.0
Total	220	24	244
	90.2	9.8	100
	100	100	100

Pearson χ^2 (1) = 22.38 *p*-value = 0.000

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Table 7. *(concluded)*

	Eastern Europe		
	No sudden stop	Sudden stop	Total
No reversal	159	8	167
	95.2	4.8	100
	91.4	57.1	88.8
Reversal	15	6	21
	71.4	28.6	100
	8.6	42.9	11.2
Total	174	14	188
	92.6	7.4	100
	100	100	100

Pearson χ^2 (1) = 10.80 *p*-value = 0.001

complete sample, the Pearson χ^2 tests have very small p-values, indicating that the observed differences across rows and columns are significant. That is, these tests suggest that although there are observed differences across these phenomena, the two are statistically related. Interestingly, these results do not change in any significant way if different definitions of reversals and sudden stops are used, or if alternative configurations of lags and leads are considered.

Current Account Deficit Reversals, Adjustment, and Currency Crises

In this subsection I investigate the nature of the adjustment associated with a current account deficit reversal. I am particularly interested in finding out whether current account reversals have been associated with broadly defined currency crises. Authors that have previously looked into this issue have focused on rather narrow definitions of "crisis." For example, Milesi-Ferretti and Razin (2000) considered abrupt devaluations to construct several indexes of crisis. Edwards (2002), on the other hand, focused on changes in an external condition index, as well as on discrete and large devaluations. In this paper, and in contrast with previous work on the subject, I distinguish between two type of crises: *international reserves* crises, and *exchange rate* crises. The starting point for this analysis is the construction of an index of "external pressures" along the lines suggested by Eichengreen and others (1996):

$$I_t = \Delta e/e - (\sigma_e/\sigma_R) * (\Delta R/R), \tag{2}$$

where $(\Delta e/e)$ is the rate of change of the nominal exchange rate, and $(\Delta R/R)$ is the rate of change of international reserves. σ_e is the standard deviation of changes in exchange rates, and σ_R is the standard deviation of changes in international reserves. Traditional analyses define a crisis (C_t) to have taken place when the index in equation (2) exceeds the mean of the index plus k standard deviations.

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The crisis indicator C_t takes a value of 1 (crisis) or zero (no crisis) according to the following rule:[27]

$$C_t = \begin{cases} 1 \; if \; I_t \geq mean(I_t) + k\sigma_I \\ 0 \qquad otherwise \end{cases}. \tag{3}$$

Instead of focusing on this single traditional index, I construct two alternative crisis indicators that help clarify the nature of the adjustment process. These alternative indicators make a distinction between changes in C_t that stem from large reductions in reserves, and changes in C_t that are the result of massive devaluations. In the construction of both of these indexes I take the value of k to be equal to 2. These crisis indicators are specifically defined as follows:[28]

- ***International Reserves Crisis*** (*Crisis_Res*): In this case the decline in reserves by itself accounts for triggering the crisis indicator C_t. That is, in this case, while the country experiences a major loss in international reserves, its nominal exchange rate does not go through a major adjustment.
- ***Exchange Rate Crisis*** (*Crisis_Er*): In this case it is the nominal exchange rate by itself that triggers the C_t crisis indicator. Here the country lets the exchange rate depreciate significantly *before* it has experienced a major loss in international reserves.

Table 8 presents a summary of the occurrence of the two types of crises for the complete sample, as well as for each one of the regions. The table also includes the Pearson tests for independence. Three conclusions emerge from this table: (i) crises have been a rather infrequent event;[29] (ii) The occurrence of both types of crises is statistically different across regions (see the χ^2 statistic); and (iii) the incidence of *Crisis_ER* has been, in every region, greater than the incidence of *Crisis_Res.*[30]

I use nonparametric tests based on a *stratified case-control* methodology to analyze whether current account reversals have been associated to the two types of crises defined above.[31] This approach consists of formally testing—using a χ^2 statistic—whether there is a significant relationship between a particular outcome (the case) and another variable to which both case and control variables have been "exposed." The first step is to separate observations into a "case group" and a

[27]The pioneer work here is Eichengreen and others (1996), who suggested that the index (2) also included changes in domestic interest rates. Most emerging and transition economies, however, don't have long time series on interest rates. For this reason, most empirical analyses are based on a restricted version of the index, such as 2.

[28]For details see the discussion in Edwards and Magendzo (2003).

[29]This is, in a way, by construction, since k was chosen to be equal to 2.

[30]As it has been usually been done in empirical work on crises I also built alternative indicators that considered a three-year window after each crisis. The results, however, are very similar to those obtained when the basic definitions are used. For this reason, and due to space considerations, I don't report them in this paper.

[31]This approach is used frequently by epidemiologists. I became interested in statistical techniques used by epidemiologists in doing research on financial crisis contagion across countries—see Edwards (2000). See Fleiss (1981) for details on the actual case-control method.

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Table 8. Incidence of "International Reserves" and "Exchange Rates" Crises

Region	Exchange-rate crises	Reserves crises
Industrial	2.8	2.4
Latin America	8.6	2.1
Asia	8.2	6.3
Africa	10.4	8.1
Middle East	4.7	2.3
East Europe	12.7	3.8
Total	**8.0**	**2.6**
Observations	2,528	2,528
Pearson		
Uncorrected χ^2 (5)	32.86	31.26
Design-based F (5, 12565)	6.57	6.24
p-value	0.00	0.00

"control group." Countries that for a given year have experienced a "crisis" are considered to be a "case." Noncrisis observations constitute the control group. The second step consists of calculating how many observations in both the case and control groups have been subject to a current account reversal—these are the exposed countries. From this information an odds ratio is calculated, and a χ^2 test is computed in order to determine whether the odds ratio is significantly different from 1. If the hypothesis that the odds ratio is equal to 1 is rejected, then there is evidence supporting the hypothesis that countries that are subject to a reversal have a significant probability of experiencing a crisis.

The results are presented in Table 9 for the *Reversal A* definition of current account reversals (4 percent of GDP in one year)—when the *Reversal B* definition (6 percent of GDP in three years) was used the results were very similar and, thus, are not reported here due to space considerations. These results may be summarized as follows: (1) the hypothesis that the odds-ratios are the same across regions cannot be rejected for any of the two definitions of crisis (see the test for homogeneity). This means that computing a single χ^2 statistic is appropriate for the sample as a whole. (2) The hypothesis that the odds-ratio is equal to one is rejected at conventional levels for the exchange rate definition of crises, *Crisis_Er.* This means that, statistically speaking, countries subject to current account reversals have a significant probability of suffering a major devaluation of their currency, even if international reserves do not decline massively. And (3) the hypothesis that the odds ratio is equal to one cannot be rejected for the reserves definition of crisis *Crisis_Res.* This means that the occurrence of current account reversals does not appear to increase the probability of a country facing a reserve crisis, as defined above.

Current Account Reversals, Banking Crises, and IMF Programs

In this subsection I investigate two final aspects of current account adjustment processes: (i) whether current account reversals have historically been related to

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Table 9. Current Account Reversals and Occurrence of Crises

Panel A. *Reversal A* and reserves crises

Region	Odd ratio	95 percent conf. interval	
Industrial countries	0.000	0.000	16.025
Latin American and Caribbean	1.578	0.162	7.877
Asia	0.681	0.075	2.974
Africa	0.995	0.021	9.006
Middle East	1.336	0.026	14.064
Eastern Europe	3.689	0.325	24.370
Test of homogeneity			
χ^2 (5)	2.86		
p-value	0.72		
Test odds ratio = 1			
Mantel-Haenszel χ^2 (5)	0.20		
p-value	0.65		

Panel B. *Reversal A* and exchange-rate crises

Region	Odd ratio	95 percent conf. interval	
Industrial countries	9.864	0.906	57.612
Latin American and Caribbean	2.716	1.159	5.939
Asia	3.006	1.068	7.678
Africa	1.160	0.578	2.193
Middle East	0.000	0.000	1.972
Eastern Europe	1.693	0.376	5.917
Test of homogeneity			
χ^2 (5)	4.80		
p-value	0.44		
Test odds ratio = 1			
Mantel-Haenszel χ^2 (5)	8.13		
p-value	0.004		

banking crises; and (ii), the relationship between current account reversals and IMF programs. A number of authors have argued that one of the costliest effects of external shocks is that they tend to generate banking crises and collapses. Most of the analyses on this subject have focused on the joint occurrence of devaluation crises and banking crises—see, for example, the discussion in Kaminsky and Reinhart (1999). In this subsection I take a slightly different approach, and I investigate whether major reversals in current account deficits—not all of which end up in devaluation crises, as established above—have been associated with banking crises. I address this issue in Table 10, where I present two-way tabulations for the *Reversal A* definition of current account reversals and a dummy variable that takes the value of 1 if that year there has been a banking crises.[32] The three panels in

[32]The data on banking crises are from Glick and Hutchison (1999). When the *Reversal B* definition is used the results are similar to those reported above.

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Table 10. Current Account Reversals and Banking Crisis*

Panel A. Contemporaneous

Reversal A	No banking crisis	Banking crisis	Total
No reversal	2,220	112	2,332
	95.2	4.8	100
	88.1	86.2	88.0
Reversal	299	18	317
	94.3	5.7	100
	11.9	13.9	12.0
Total	2,519	130	2,649
	95.1	4.9	100
	100	100	100

Pearson χ^2 (1) = 0.458 *p*-value = 0.498

Panel B. Lagged bank crises

Reversal A	No banking crisis	Banking crisis	Total
No reversal	2,332	110	2,442
	95.5	4.5	100
	88.2	85.3	88.1
Reversal	312	19	331
	94.3	5.7	100
	11.8	14.7	11.9
Total	2,644	129	2,773
	95.4	4.6	100
	100	100	100

Pearson χ^2 (1) = 1.00 *p*-value = 0.316

Panel C. Lagged *Reversal A*

Reversal A	No banking crisis	Banking crisis	Total
No reversal	2,161	110	2,271
	95.2	4.8	100
	88.2	85.3	88.1
Reversal	288	19	307
	93.8	6.19	100
	11.8	14.7	11.9
Total	2,449	129	2,578
	95.0	5.0	100
	100	100	100

Pearson χ^2 (1) = 1.03 *p*-value = 0.31

Table 10 present two-way tabulations under different structures of lags: while in Panel A both variables are contemporaneous, in Panel B the dummy for banking crises is lagged one year. This allows us to consider situations were a banking crisis follows in time a current account reversal episode. Finally, in Panel C the *Reversal A* dummy has been lagged one year. All three Panels—see, in particular,

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the Pearson χ^2 tests for independence of rows and columns—show that there has not been a significant relation, at any lag or lead, between reversals and major banking crises.

In Table 11 I present two-way tabulation tables for the *Reversal A* indicator and dummy variable (*imfprog*) that takes the value of 1 if during that year the

Table 11. Current Account Reversals and IMF Programs

Panel A. Contemporaneous variables

Reversal A	No IMF programs	IMF programs	Total
No reversal	890	761	1,651
	53.9	46.1	100
	86.2	84.6	85.5
Reversal	142	138	280
	50.7	49.3	100
	13.8	15.4	14.5
Total	1,032	899	1,931
	53.4	46.6	100
	100	100	100

Pearson χ^2 (1) = 0.98 *p*-value = 0.32

Panel B. IMF programs lagged

Reversal A	No IMF programs	IMF programs	Total
No reversal	866	784	1,650
	52.5	47.5	100
	84.5	86.6	85.5
Reversal	159	121	280
	56.8	43.2	100
	15.5	13.4	14.5
Total	1,025	905	1,930
	53.1	46.9	100
	100	100	100

Pearson χ^2 (1) = 1.78 *p*-value = 0.18

Panel C. *Reversal A* lagged

Reversal A	No IMF programs	IMF programs	Total
No Reversal	912	768	1,680
	54.3	45.7	100
	86.0	85.3	85.7
Reversal	149	132	281
	53.0	47.0	100
	14.0	14.7	14.3
Total	1,061	900	1,961
	54.1	45.9	100
	100	100	100

Pearson χ^2 (1) = 0.15 *p*-value = 0.69

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country in question had an IMF program, and a value of zero otherwise.[33] As before, the tabulations are presented for three different lag-lead structures. The results indicate that, at least within the leads and lags considered here, there has not been a strong historical relation between reversals and IMF programs. Indeed, the χ^2 tests for independence of rows and columns have relatively high *p*-values.

III. Costs of Current Account Reversals

In this section I investigate the extent to which current account reversals have had an effect on real economic performance. I am particularly interested in analyzing if the impact of current account reversals on real economic activity depends on variables such as the country's degree of openness, its degree of dollarization, and its exchange rate regime. According to a variety of models stemming from many different traditions—including models in the Mundell-Fleming tradition, as well as recent ones based on the sudden-stop framework—the real costs of foreign shocks are inversely proportional to the degree of openness of the economy.[34] According to these models, countries that are less open internationally will have to make a greater effort, in terms of reducing aggregate demand (absorption) and/or in terms of real devaluations, than counties with a larger external sector. In models in the Mundell-Fleming tradition, this phenomenon is reflected in the fact that the *expenditure reducing* effort, for any given level of expenditure switching, is inversely proportional to the marginal propensity to import—see Frenkel and Razin, 1987.

In a recent analysis of the 2001–02 Argentine crisis, Calvo and others (2003) have developed a model where a sudden stop of capital inflows results in an abrupt current account reversal, and in a major real exchange rate depreciation. In this model the "required" real depreciation depends on the country's degree of openness. Calvo and others (2003) argue that in Chile—one of the most open countries in Latin America—a sudden stop would require a 32 percent real depreciation to reestablish external equilibrium.[35] The authors' calculations suggest that in relatively closed Argentina the depreciation required for eliminating the current account deficit is, at 46 percent, significantly higher than in Chile. In this model the real depreciation that stems from the sudden stop—and concomitant current account reversal—has a more negative effect on real performance in countries with a higher degree of dollarization. This effect takes place through two channels. First, countries with corporate dollarized liabilities will experience massive jumps in indebtedness and will be unable to service their debts. Moreover, as Caballero and Krishnamurthy (2000) have argued, the value of collateral provided by producers of nontradables will decline significantly, further amplifying the costs of the crisis. The second channel is related to fiscal policy and fiscal sustainability.

[33]The variable *imfprog* takes a value of one if in that year the country has any of the following types of programs: Stand-by, ESAF, EFF and SAF. The raw data for constructing this dummy were taken from Evrensel (2002) and from the IMF web page: *http://www.imf.org/external/np/tre/tad/exfin1.cfm.*

[34]See, for example, Part II of Frenkel and Razin (1987) and Calvo and others (2003).

[35]The authors define "new equilibrium" as a situation in which the current account deficit is completely eliminated.

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To the extent that a proportion of the public sector debt is denominated in foreign currency, the real depreciation will increase the ratio of public sector debt to GDP.[36] In order to maintain fiscal sustainability the authorities will have to run a higher primary surplus, thus, reducing aggregate demand and economic activity.

For a long time economists have argued that the exchange rate regime plays an important role in the adjustment process. Meade (1951, pp. 201–2) argued early on that countries with a flexible exchange rate regime are able to accommodate better external shocks, including terms of trade and capital account shocks.[37] This suggests that current account reversals will have a smaller (negative) effect on real economic activity countries with more flexible regimes. In this section I use a treatment regressions framework to investigate empirically if these three factors—openness, the extent of dollarization, and the exchange rate regime—have indeed affected the way in which current account reversals affect real economic activity.

Previous empirical work on the (potential) real effects of reversals have reached different conclusions. Milesi-Ferretti and Razin (2000), for example, used both *before* and *after* analyses as well as cross-country regressions to deal with this issue and concluded that "reversal events seem to entail substantial changes in macroeconomic performance between the period before and the period after the crisis but *are not systematically associated with a growth slowdown* (p. 303, emphasis added)." Edwards (2002), on the other hand, used dynamic panel regression analysis and concluded that major current account reversals had a negative effect on investment, and that they had "a negative effect on GDP per capita growth, even after controlling for investment (p. 52)." Neither of these papers, however, analyzed the interaction between openness, dollarization or the exchange rate regime and the costs of current account reversals.[38]

Current Account Reversals and Growth: An Empirical Model

Changes in investment constitute, almost by definition, the main channel through which current account reversals affect economic activity. Since the current account deficit is equal to investment minus savings, a major reversal will imply, with a high degree of probability, a decline in investment and, thus, in economic activity. An important question is whether reversals affect growth through channels other than investment. In this section I tackle this issue by using panel data to estimate jointly growth equations and current account reversal equations.

My main interest is to understand what is the conditional effect—if any—of a current account reversal on real macroeconomic performance. In order to do this, I use a "treatment effects" model to estimate jointly an "outcome equation" on real GDP growth and a probit equation on the probability that a country experiences a

[36]See Edwards (2003) for an analysis of the relationship between fiscal sustainability and the real exchange rate in very poor HIPC countries.

[37]For a discussion and empirical analysis of this proposition see Edwards and Levy-Yeyati (2003).

[38]In a recent paper, Guidotti and others (2003) consider the role of openness in an analysis of imports and exports behavior in the aftermath of a reversal. The spirit of their analysis, however, is somewhat different from that of the other works discussed here.

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current account reversal. The empirical treatment effects model may be written as follows:

$$y_{tj} = \boldsymbol{x}_{tj}\beta + \gamma\delta_{tj} + \theta(\delta_{tj} \times Openness_{tj}) + \mu_{jt} \tag{4}$$

$$\delta_{jt} = \begin{cases} 1, \text{ if } \delta^*_{jt} > 0 \\ 0, \text{ otherwise} \end{cases} \tag{5}$$

$$\delta^*_{jt} = \boldsymbol{w}_{jt}\alpha + \varepsilon_{jt}. \tag{6}$$

Equation (4) is the real growth equation, where y_{jt} stands for real GDP growth in country j and period t; $\boldsymbol{x}_{jt}$ is a vector of covariates that capture the role of traditional determinants of growth, such as investment, openness, and government consumption; δ_{jt} is a dummy variable (i.e., the treatment variable) that takes a value of one if country j in period t experienced a current account reversal, and zero if the country did not experience reversal. Accordingly, γ is the parameter of interest: the effect of the treatment on the outcome. Whether the country experiences a current account reversal is assumed to be the result of an unobserved latent variable δ^*_{jt}, described in equation (5). Openness is a variable that measures the extent to which country j in period t is open to international trade. θ is the coefficient of the interaction between openness and the reversal dummy. δ^*_{jt}, in turn, is assumed to depend linearly on vector $\boldsymbol{w}_{jt}$. Some of the variables in $\boldsymbol{w}_{jt}$ may be included in $\boldsymbol{x}_{jt}$ (Maddala 1983, p. 120).[39] β and α are parameter vectors to be estimated. μ_{jt} and ε_{jt} are error terms assumed to be bivariate normal, with a zero mean and a covariance matrix given by:

$$\begin{pmatrix} \sigma & \varsigma \\ \varsigma & 1 \end{pmatrix} \tag{7}$$

If equations (4) and (6) are independent, the covariance term ς in equation (7) will be zero. Under most plausible conditions, however, it is likely that this covariance term will be different from zero.

Greene (2000) has shown that if equation (4) is estimated by least squares, the treatment effect will be overestimated. Traditionally, this problem has been tackled by estimating the model using a two-step procedure (Maddala, 1983). In the first step, the treatment equation (5) is estimated using probit regressions. From this estimation a hazard is obtained for each j t observation. In the second step, the outcome equation (4) is estimated with the hazard added as an additional covariate. From the residuals of this augmented outcome regression, it is possible to compute consistent estimates of the variance-covariance matrix (7).

[39]It is assumed, however, that δ^*_{jt} does not depend on y_{jt}. Otherwise, as discussed below, the model cannot be identified.

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An alternative to the two-step approach is to use a maximum likelihood procedure to estimate the model in equations (4) through (7) jointly.[40] As shown by Greene (2000), the log likelihood for observation k is given by equations (8) and (8′):

$$L_k = \log \Phi\left\{\frac{w_k\alpha + (y_k - x_k\beta - \delta)\,\varsigma/\sigma}{\sqrt{1-\varsigma^2}}\right\} - \frac{1}{2}\left\{\frac{y_k - x_k\beta - \delta}{\sigma}\right\}^2 - \log\sqrt{2\pi}\sigma, \qquad (8)$$

if $\delta_k = 1$

$$L_k = \log \Phi\left\{\frac{-w_k\alpha - (y_k - x_k\beta)\,\varsigma/\sigma}{\sqrt{1-\varsigma^2}}\right\} - \frac{1}{2}\left\{\frac{y_k - x_k\beta}{\sigma}\right\}^2 - \log\sqrt{2\pi}\sigma, \qquad (8')$$

if $\delta_k = 0$.

The model in equations (4)–(7) will satisfy the consistency and identifying conditions of mixed models with latent variables if the outcome variable y_{jt} is not a determinant (directly or indirectly) of the treatment equation—that is, if y is not one of the variables in $\boldsymbol{w}$ in equation (6).[41] For the cases of per capita GDP growth this is a reasonable assumption.

Since I am interested in understanding if openness (among other variables) plays a role in the effect of reversals on growth, one of the $\boldsymbol{x_{jt}}$ variables in equation (4) is a term that interacts the dummy variable δ_{tk} and an openness variable. The latter is defined as the ratio of imports plus exports over the country's GDP. Since the presence of such an interactive term makes the estimation of the system (4)–(8) somewhat complex, the results reported here correspond to the two-steps procedure described above. In the estimation I also impose some exclusionary restrictions; that is, a number of the $\boldsymbol{w_{jt}}$ covariates included in equation (6), are not included in the outcome equation (4). These exclusionary restrictions are not required for identification of the parameters, but they are generally recommended as a way of addressing issues of collinearity.[42]

Basic Results: Reversals and Openness

In this section I report the results obtained from the estimation of the treatment effects model given by equations (4) through (7). I proceed as follows: I first discuss the specification used for the first-stage probit equation on the probability of experiencing a current account reversal. I then discuss the specification for the outcome equations on GDP growth. Finally, I present the results from the estimation of the treatment models. In the subsections that follow I discuss some extensions and robustness issues.

[40]The two-steps estimates yield similar results and are available from the authors on request.

[41]Details on identification and consistency of models with mixed structures can be found in Maddala (1983). See, also, Heckman (1978), Angrist (2000), and Wooldridge (2002).

[42]Wooldridge (2002).

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Equation specification

The treatment equation. Following work done by Frankel and Rose (1996), Milesi-Ferretti and Razin (2000), and Edwards (2002), among others, in the estimation of the first-step probit regressions I included the following covariates: (i) the ratio of the current account deficit to GDP lagged one, two, and three periods. It is expected that, with other things equal, countries with a larger current account deficit will have a higher probability of experiencing a reversal. The best results were obtained when the one-year deficit was included. (ii) The one-year lagged external debt over GDP ratio. Its coefficient is expected to be positive in the estimation of the first-step probit equation (6). (iii) The ratio of net international reserves to GDP, lagged one year. Its coefficient is expected to be negative, indicating that with other things equal, countries with a higher stock of reserves have a lower probability of experiencing a current account reversal. (iv) Short term (less than one year maturity) external debt as a proportion of external debt lagged one period. Its coefficient is expected to be positive. (v) The one-year lagged rate of growth of domestic credit. Its coefficient is expected to be positive. (vi) The lagged ratio of external debt service to exports. Again, its coefficient is expected to be positive. (vii) Year dummies, and (viii) country-specific dummies. In some of the probit regressions I also included the ratio of FDI to GDP and the public sector deficit (both lagged). Their coefficients were not significant, however. Since these variables were available for a relatively smaller number of observations than the other variables, they were not included in the final specification of the probit equations (6).

Growth outcome equations. The dependent variable was real GDP growth obtained from the *World Development Indicators.* In specifying the growth equation I followed the by-now-standard empirical growth literature (Barro and Sala-ì-Martin, 1995; Barro, 1996). As is customary I included the following covariates: (i) the logarithm of initial GDP; its coefficient is expected to be negative and capture (conditional) convergence. (ii) The investment to GDP ratio; its coefficient is expected to be positive. (iii) The rate of growth of population, as a proxy for the rate of growth of labor. (iv) An openness index defined as the ratio of exports plus imports over GDP. As Sachs and Warner (1995) have argued, its coefficient is expected to be positive. (v) The ratio of government consumption to GDP, whose coefficient is expected to be negative (Barro and Sala-ì-Martin, 1995). (vi) Year dummies, and (vii) country specific dummies.[43]

In addition to the covariates discussed above, the outcome growth equation also includes the two variables of interest: the current account reversal dummy, and the current account reversal dummy interacted with the openness variable. If current account reversals have a negative impact on economic activity, beyond their effects on investment, we would expect the coefficient of the reversals'

[43]These country specific dummies capture the effect of structural variables that do not change (significantly) through time.

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dummy to be significantly negative in the estimation of equation (4). Moreover, if this effect is inversely proportional to the country's degree of openness, the coefficient of the interaction between reversals and openness should be significantly positive.

Main results

In Table 12 I summarize the basic results obtained from the estimation of number of treatment models for GDP growth (the coefficients of the time-specific and country specific dummy variables are not reported due to space considerations). The table contains two panels. The upper panel includes the results from the growth outcome equation; the lower panel contains the estimates for the "treatment equation," or probit equation on the probability of experiencing a current account reversal. As pointed out above, the treatment observations correspond to current account reversal episodes, and the untreated group is comprised of all country-year observations were there have been no reversals. Table 12 also includes the estimated coefficient of the hazard variable in the second step estimation, as well as the estimated elements of the variance-covariance matrix (7). The first two equations in the table include current values of the reversal dummy and of the interactive variable. The last two equations also include lagged values for these variables. Due to space considerations I only report the results for the *Reversal A* definition of current account reversals; those for the alternative *Reversal B* definition are similar.

Probability of experiencing a current account reversal. The probit estimates are presented in the lower panel of Table 12. As may be seen, the results are similar across models and are quite satisfactory. All of the coefficients have the expected signs, and are statistically significant at conventional levels. These results indicate that the probability of experiencing a reversal is higher for countries with a large (lagged) current account deficit, a high external debt ratio, and a rapid rate of growth of domestic credit. Countries that have a higher level of net international reserves have a lower probability of experiencing a reversal. The coefficients of the short-term debt and total debt service have the expected signs, but tend not to be significant.

GDP growth models. The results from the estimation of the growth equation are reported in Panel A of Table 12. The first equation (12.1) includes the current account reversal dummy, but does not include a term that interacts the reversals dummy with openness. The second equation (12.2) includes the interactive term. Equations (12.3) and (12.4) include lagged terms of the reversal dummy and of the reversal-openness interactive term. As the Table shows, the lagged values were not significant. Thus, in the discussion that follows I concentrate on equations (12.1) and (12.2).

As may be seen, the growth equation results presented in Table 12 are interesting: The traditional covariates have the expected signs, and with the exception of *openness* they are significant at conventional levels. More important for the topic of this paper, in equation (12.2) the coefficients of the current account

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Table 12. Growth and Current Account Reversals
(Treatment effects model—two-step estimates)

Variable	(12.1)	(12.2)	(12.3)	(12.4)
		Panel A		
Population growth rate	0.299	0.294	0.241	0.274
	(1.64)	(1.59)	(1.32)	(1.48)
Investment to GDP	0.176	0.168	0.189	0.173
	(6.98)**	(6.58)**	(7.35)**	(6.68)**
Government consumption to GDP	–0.162	–0.146	–0.172	–0.170
	(4.81)**	(4.28)**	(4.95)**	(4.84)**
Openness	0.006	0.002	–0.006	–0.007
	(0.57)	(0.24)	(0.60)	(0.70)
Log initial GDP per capita	–2.688	–2.733	–2.542	–2.472
	(2.73)**	(2.72)**	(2.59)**	(2.48)*
Reversal A	–1.82	–4.32	–1.714	–3.931
	(2.59)**	(4.11)**	(2.44)*	(3.73)**
*Reversal A** Openness		0.028		0.028
		(3.12)**		(3.03)**
Reversal A (–1)			0.253	–0.033
			(1.01)	(0.04)
Reversal A (–1)* Openness (–1)				0.007
				(0.77)
		Panel B		
Current account deficit to GDP (–1)	0.128	0.128	0.131	0.131
	(12.01)**	(12.01)**	(11.92)**	(11.94)**
External debt to GDP (–1)	0.004	0.005	0.006	0.006
	(2.82)**	(2.95)**	(3.52)**	(3.54)**
Net int. reserves to GDP (–1)	–14.26	–15.07	–14.16	–14.25
	(1.83)	(1.97)*	(1.82)	(1.83)
Short term ext. debt to exports (–1)	0.003	0.003	0.003	0.003
	(0.50)	(0.43)	(0.45)	(0.43)
Domestic credit growth (–1)	0.0002	0.0002	0.0001	0.0002
	(1.45)	(1.42)	(1.53)	(1.53)
External debt service / exports (–1)	0.002			
	(0.45)			
Hazard lambda	0.917	1.122	0.865	0.906
	(2.07)*	(2.48)*	(1.96)*	(2.01)*
rho	0.214	0.256	0.203	0.209
sigma	4.282	4.377	4.268	4.325
Wald χ^2 (215)	637.24	683.31	650.12	638.34
Observations	1540	1544	1504	1502

Notes: Absolute value of *z*-statistics in parentheses; *significant at 5 percent; **significant at 1 percent; (–1) denotes a one-period lagged variable; country-specific and year dummies are included, but not reported.

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reversal dummy is always significantly negative and the coefficients of the term that interacts openness and reversals is significantly positive. According to these results, the effects of reversals on growth depend significantly on the degree of openness of the economy—measured as the ratio of imports plus exports to GDP—and may be expressed as follows:

$$\textit{Growth Effects of Reversals} = -4.323 + 0.028\ \textit{openness}. \tag{9}$$

The variable *openness* in the data set varies significantly across countries. Its mean for the complete period is 64 percent, its standard deviation is 35 percent, and its median is 57.4 percent. The first quartile is 29.3 percent, and the third quartile is 84.5 percent. This means that for a country with a degree of openness equal to the mean, the point estimate of the effect of a current account reversal on growth is: −2.531 percent ($-4.323 + 0.028 \times 64 = -2.531$). If the country's degree of openness is equal to the first quartile, the (negative) effect of a reversal on growth is significantly higher at −3.50 percent. But if the country is very open to international trade, and its degree of openness corresponds to the third quartile, the effect of a reversal on growth is much smaller, at −1.96 percent. To make the point more vividly, consider the case of two neighboring countries in Latin America: Argentina and Chile. While Argentina is relatively closed—the average value for *openness* variable in the 1995–2001 period is 20 percent—Chile is quite open, with an average for the openness variable of 60 percent during the same period. This implies that a reversal in Argentina will tend to have a negative effect on growth equal to −3.763 percent; in Chile, on the other hand, the effect of the reversal on growth would only be −2.64.

In the rest of this section I report results from a number of extensions to the analysis presented in Table 12. In particular I analyze three issues: (i) whether the effects of reversals on growth depend on the level of external debt of the country in question; (ii) if reversals affect GDP growth differently in countries with different exchange rate regimes; and (iii) whether the reduction in growth depends on the actual magnitude of the reversal.

Dollarization and Current Account Reversals

As pointed out above, many recent discussions on macroeconomic instability in the emerging economies have centered on the role of dollarized liabilities. According to a number of authors countries with a high level of dollarized liabilities will be severely affected by reversals.[44] The argument is based on the notion that reversals tend to result (or be associated) with large exchange rate changes. To the extent that the real exchange rate indeed depreciates, the ratio of foreign currency denominated debt to GDP will increase massively, forcing the country to

[44]Strictly speaking this argument has been made in terms of sudden stops. As I argued above, sudden stops and reversals are distinctly different phenomena. The analysis in this section is in terms of reversals. On dollarization and the Argentine crisis see Calvo and others (2003). On a general discussion on the extent of dollarization in Latin America see Savastano (1992).

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implement a deep(er) and costly adjustment. In order to investigate whether this conjecture is supported by the data I estimated systems of the type of (4)–(7) where in addition to the regressors described above, I also included the reversals dummy interacted with the country's total external debt (both public and private) denominated in foreign currency. Since (most) advanced countries are able to issue debt denominated in their own currency they are excluded from the analysis. If countries with higher dollarized liabilities suffer more from a reversal we would expect the coefficient of the interactive term to be significantly negative. However, the results from these regressions (not reported here due to space considerations, but available on request) indicate that the interactive term is positive (rather than negative) and not significant at conventional levels. This result was maintained when alternative estimation methods and different samples were used.

There are several possible explanation for these results, including that total external debt is not the best indicator of the extent of dollarized liabilities; that the channels through which the presence of dollarized liabilities affect growth are complex, and not captured by a model such as the one estimated in this paper; and that what matters is the extent of currency mismatches in the financial sector, rather that the actual extent of dollarization.

In order to further investigate this issue I included a variable that interacted *Reversals* with the ratio of foreign debt to the sum of imports and exports.[45] This interactive variable would be high in countries with a high external debt to GDP and/or a low degree of openness. If the presence of dollarized liabilities and the lack of openness jointly amplify the costs of reversals, we would expect the estimated coefficient of this interactive variable to be significantly negative. This, however, was not the case. Its estimated coefficient was 0.023 with a z-test statistic of 0.23.

Unfortunately, there are no data for a large panel of countries on the extent of dollarization of the financial sector. It is possible, however, to use a more limited data set—both in terms of years and countries' coverage—to further investigate this issue. I use the data set recently assembled by Reinhart, Rogoff, and Savastano (2003b), which covers 117 countries for the period 1996–2001. As before, the results obtained from this analysis did not provide support to the hypothesis that current account reversals result in higher real costs in countries with a greater degree of dollarization (detailed results available on request).[46]

The results reported above refer to whether the extent of dollarization affects the costs associated with current account reversals. An alternative question, and one that is also important in the current policy debate is whether countries with a higher degree of dollarization have a higher probability of experiencing a current account reversal, or a sudden stop for that matter. This would indeed be the case

[45]Of course, this is equivalent to a ratio of two ratios: (i) the foreign debt to GDP ratio, relative to (ii) the imports plus exports to GDP ratio (openness).

[46]In investigating this issue I used three procedures. First, I included in the estimation of the treatment equations a term that interacts Reinhart and others (2003b) composite index of dollarization with the reversal dummy. Second, I split the sample according to their classification of very high, high, moderate, and low degree of dollarization. And third, I split the sample according to the authors' four types of dollarization. In neither of these cases did I find support for the hypothesis that dollarization amplifies the effects of current account reversals.

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if countries with dollarized financial systems are particularly vulnerable to external shocks (Calvo, Izquierdo, and Mejia, 2003). In order to investigate this issue I reestimated the propensity probit equation on the probability of experiencing a reversal with Reinhart and others (2003b) dollarization index as an additional regressor. The following results were obtained (z-statistic in parenthesis; time and country specific fixed effects not reported):

$$\delta_{jt} = \underset{(8.52)}{0.146}\ \textit{Current Account} + \underset{(4.72)}{0.214}\ \textit{dollarization} + \underset{(2.18)}{0.005}\ \textit{external debt}$$

$$\underset{(-0.91)}{-0.116}\ \textit{reserves} + \underset{(0.94)}{0.001}\ \textit{credit growth}$$

$$N = 892$$

All in all, I consider these results to be preliminary in nature. I believe that further research on the subject is required to come to a firmer conclusion on the effect of dollarization on the adjustment process. This additional research should include an effort to increase the coverage of the dollarization variables, both in terms of time-span as well as in terms of countries. Indeed, the fact that the best measure available—calculated by Reinhart, Rogoff, and Savastano (2003b)—covers only 1996–2001 means that the regression analysis reported above was undertaken on a limited number of observations.[47]

Exchange Regimes and Current Account Reversals

A number of recent policy discussions on the future of the international financial architecture have focused on the role of alternative exchange regimes in helping countries cope better with the vicissitudes of the international economy. In this section I investigate whether current account reversals have a different real effect on growth in countries with different exchange rate regimes. In particular, I analyze whether, as supporters of flexibility have argued, countries with flexible exchange rates have a greater capacity to absorb external shocks. If this were the case we would expect that the real costs of current account reversals would be smaller in countries with flexible regimes than in those with more rigid one.

I use the exchange rate regime classification devised by Levy-Yeyati and Sturzenegger (2003), that considers the *actual* rather than the *official* regime for each individual country at a particular moment in time.[48] Countries are classified into four regimes:

- ***Hard pegs*** (*Hard*): This group includes counties with currency boards, members of currency unions, and dollarized countries.

[47]In fact, when I used the Reinhart and others (2003b) dollarization index on the complete sample, the results were encouraging, and suggested that dollarized liabilities may indeed amplify the costs of reversals. Naturally, this conclusion is only valid to the extent that the 1996–2001 index also captures the extent of dollarization during the longer period. At this point, however, I am not prepared to make that claim.

[48]See also Reinhart and Rogoff (2002).

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- ***Pegged regimes*** (*Peg*): This definition includes all alternative versions of pegged regimes, including pegged-but-adjustable. It also includes the hard regimes described above.
- ***Intermediate regimes*** (*Intermediate*): This group includes crawling pegs, managed floats, and other forms of intermediate regimes.
- ***Flexible rates:*** (*Flexible*): This group includes countries with flexible exchange rates, including free floating.

I proceeded as follows: For each of the four regimes I estimated treatment regression systems of the type (4)–(7). I then compared the estimates of both the reversals treatment dummy, as well as the term that interacts reversals and openness. Formal χ^2 tests for the equality of coefficients across regimes were then performed. If more flexible regimes act as shock absorbers, as their supporters have argued, we would expect that their coefficient of reversals would be smaller, in absolute value, than that of the more rigid exchange rate arrangements. In the actual estimation countries were classified according to the regime they had the year before the reversal was initiated. This was done as a way of dealing with countries that switched regimes during the sample period, and to properly classify those countries that as a consequence of—or in conjunction with—the reversal moved from one regime to a different one.

The results obtained are presented in Table 13, where I only report the estimates for the *Reversal A* dummy and for the interactive term. As may be seen, the point estimates for the *Reversal A* dummy are significantly negative for *Hard, Pegged,* and *Intermediate* exchange rate regimes. Moreover the point estimate of this dummy strictly declines (in absolute value) as the exchange rate regime becomes more flexible. As may be seen, its estimated coefficient for the *Flexible* regime group is not significantly different from zero, suggesting that while reversals are indeed costly (in terms of reduced GDP growth) under rigid and semi-rigid

Table 13. Exchange Rate Regimes and Current Account Reversals: Selected Estimated Coefficients*
(Treatment regressions)

Exchange rate regime	*Reversal A* dummy	Interactive term (*Reversal A* * openness)
Hard Peg	–9.114	0.075
	(–2.61)	(3.20)
Pegged	–6.770	0.053
	(–4.48)	(4.15)
Intermediate	–4.710	0.027
	(–2.79)	(1.71)
Flexible	2.060	–0.025
	(1.07)	(–1.05)

Note: Each equation was specified as explained in the text.
*Numbers in parentheses are *z*-statistics.

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regimes, they are not significantly so in countries with exchange rate flexibility. A formal χ^2 test on the equality of these coefficients across different regimes' equations indicates that the null hypotheses is rejected: the χ^2 had a value of 21.1 for the *Reversal A* dummies, and 17.9 for the interactive terms.

Since, as the results in Table 13 indicate, the point estimates of the interactive term also vary across regimes, the actual effect of reversals on growth should be compared for given degrees of openness. The results indicate that for a variety of degrees of openness—up to 100 percent of GDP—the costs, in terms of a decline in GDP growth, of current account reversals has been higher in countries with more rigid exchange rate regimes, than in countries with more flexible ones.

Magnitude of the Reversals

The empirical results presented in this section has focused on current account reversals as a phenomenon that can be analyzed using a treatment-based analysis, where reversal events are captured by a "treatment" dummy variable. A potential limitation of this analysis is that it does not consider the actual magnitude of the reversal, and considers that a reversal of 5 percent of GDP is equal to one of 8 percent of GDP. In order to deal with this issue I estimated a number of treatment regressions systems that included terms that interacts the reversal dummy with the actual magnitude of the reversal. To the extent that the magnitude of the reversals matters—with higher reversals being more costly—the coefficient of this interacted term should be significantly negative. The results obtained from this analysis indicate that the estimated coefficient was indeed negative, with a point estimate of –0.015. However, it was not significant (z-statistic equal to –0.21), indicating that once reversals reach a certain level, their effects on growth are similar.

IV. Concluding Remarks

In this paper I have analyzed the anatomy of current account imbalances in the world economy during the past three decades. The analysis proceeded from a general picture of the distribution of deficits and surpluses, to a detailed investigation of the most important characteristics of major current account adjustments. The approach followed has been a combination of graphical displays, tabulation tables, nonparametric tests, and treatment effects regressions. I believe that by combining these different tools, I have been able to convey a clear and broad picture of the main characteristics of the adjustment process.

The main findings of the analysis of the anatomy of current account imbalances may be summarized as follows: (i) throughout the sample period the vast majority of countries have run current account deficits. Only in three regions has the median of current account balances been a surplus—industrial countries, the Middle East, and Asia—and in all of them this surplus has been small. (ii) *Large* current account deficits have not had a significant degree of persistence through time. Only a few countries have run persistently large deficits. (iii) The degree of persistence of *large surpluses* has been higher. A larger number of countries have run persistently large surpluses, indicating that under the current "rules of the

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game" the nature of the adjustment process is asymmetrical. (iv) Major reversals in current account deficits have tended to be persistent through time, and strongly associated with sudden stops of capital inflows. (v) There is a high probability that reversals lead to an exchange rate crisis; the evidence also indicates that countries that try to face reversals by running down reserves significantly usually do not succeed. (vi) There has been no statistically significant relationship between reversals and banking crises. (vii) Within a three-year window there has been no statistically significant relation between reversals and IMF programs.

The main results from the econometric analysis of the probability of countries experiencing a reversal, and of their effects on real economic activity may be summarized as follows. (i) The probability of a country experiencing a reversal is appropriately captured by a small number of variables that include the (lagged) current account to GDP ratio, the external debt to GDP ratio, the level of international reserves, domestic credit creation, and debt services. (ii) Current account reversals have had a negative effect on real growth that goes beyond their direct effect on investments. (iii) There is persuasive evidence indicating that the negative effect of current account reversals on growth will depend on the country's degree of openness. More open countries will suffer less—in terms of lower growth—than countries with a lower degree of openness. (iv) I was unable to find evidence supporting the hypothesis that countries with a higher degree of dollarization are more severely affected by current account reversals than countries with a lower degree of dollarization. And, (v) the empirical analysis suggests that countries with more flexible exchange rate regimes are able to accommodate the shocks stemming from a reversal better than countries with more rigid exchange rate regime.

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APPENDIX

Table A.1. List of Countries by Region

		Industrial countries		
Australia	Finland	Ireland	New Zealand	Switzerland
Austria	France	Italy	Norway	United Kingdom
Belgium	Germany	Japan	Portugal	United States
Canada	Greece	Malta	Spain	
Denmark	Iceland	Netherlands	Sweden	
		Latin America and Caribbean		
Antigua and Barbuda	Brazil	El Salvador	Mexico	St. Vincent and the Grenadines
Argentina	Chile	Grenada	Nicaragua	Suriname
Aruba	Colombia	Guatemala	Panama	Trinidad and Tobago
Bahamas, The	Costa Rica	Guyana	Paraguay	Uruguay
Barbados	Dominica	Haiti	Peru	República Bolivariana de Venezuela
Belize	Dominican Republic	Honduras	St. Kitts and Nevis	
Bolivia	Ecuador	Jamaica	St. Lucia	
		Asia		
Bangladesh	Hong Kong SAR	Lao P.D.R.	Pakistan	Solomon Islands
Bhutan	India	Malaysia	Papua New Guinea	Sri Lanka
Cambodia	Indonesia	Maldives	Philippines	Thailand
China	Kiribati	Nepal	Singapore	Vietnam
Fiji				
		Africa		
Angola	Comoros	Guinea-Bissau	Mozambique	Sudan
Benin	Congo, Rep. of	Kenya	Namibia	Swaziland
Botswana	Côte d'Ivoire	Lesotho	Niger	Tanzania
Burkina Faso	Djibouti	Madagascar	Nigeria	Togo
Burundi	Ethiopia	Malawi	Rwanda	Tonga
Cameroon	Gabon	Mali	Senegal	Tunisia
Cape Verde	Gambia, The	Mauritania	Seychelles	Uganda
Central African Republic	Ghana	Mauritius	Sierra Leone	Zimbabwe
Chad	Guinea	Morocco	South Africa	
		Middle East		
Bahrain	Iran, I.R. of	Kuwait	Oman	Syrian Arab Republic
Cyprus[1]	Israel	Lebanon	Saudi Arabia	Yemen
Egypt	Jordan			
		Eastern Europe		
Albania	Czech Republic	Latvia	Romania	Turkmenistan
Armenia	Estonia	Lithuania	Russian Federation	Ukraine
Azerbaijan	Hungary	Moldova	Slovak Republic	Uzbekistan
Belarus	Kazakhstan	Mongolia	Slovenia	
Bulgaria	Kyrgyz Republic	Poland	Turkey	

[1]Although Cyprus is considered a European country by the IMF, the author has listed it under Middle East in an effort to present more accurately the country's current level of economic development.

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Table A.2. Mean Current Account to GDP Ratios by Region, 1970–2001

Year	Industrial	Latin America	Asia	Africa	Middle East	Eastern Europe	Total
1970	−0.05	7.52	0.26	0.90	6.67	…	2.62
1971	−0.28	5.53	0.64	5.25	2.23	…	2.05
1972	−1.50	3.78	2.43	6.20	−3.40	…	0.75
1973	−1.17	3.33	1.35	7.20	0.23	…	1.13
1974	2.97	3.26	4.56	−3.07	−8.04	1.50	0.44
1975	1.47	2.36	5.44	4.35	−8.62	3.50	2.17
1976	2.16	1.48	0.25	5.55	−9.78	3.80	1.46
1977	1.82	4.05	−0.74	3.88	−5.25	5.19	2.09
1978	0.50	3.70	1.85	8.53	0.80	1.90	4.23
1979	1.40	4.51	−1.57	6.44	−8.16	1.50	2.76
1980	2.16	7.05	7.74	7.21	−9.02	0.10	4.92
1981	2.39	10.05	11.64	10.00	−8.00	1.05	7.35
1982	2.36	9.10	11.01	11.01	−1.68	0.97	7.82
1983	1.20	6.33	8.44	8.25	1.63	1.26	5.91
1984	0.98	4.14	3.69	5.88	1.34	0.15	3.78
1985	1.15	2.72	5.32	5.90	1.45	1.60	3.79
1986	0.96	5.44	4.02	6.28	1.30	3.09	4.41
1987	1.03	5.36	3.25	4.75	0.48	0.08	3.59
1988	0.91	4.42	2.73	6.01	−0.10	−1.30	3.63
1989	1.18	5.35	3.82	4.52	−4.36	0.04	3.21
1990	1.18	4.25	4.31	4.39	−4.13	3.00	3.04
1991	0.67	7.29	2.48	5.08	28.84	2.67	6.24
1992	0.43	5.55	3.25	6.34	9.29	0.10	4.45
1993	−0.46	6.01	4.94	6.58	8.13	1.98	4.71
1994	−0.35	4.36	2.52	6.77	2.87	1.08	3.52
1995	−0.85	4.83	3.31	8.84	1.39	2.90	4.30
1996	−0.78	6.12	3.42	8.71	0.32	7.09	5.09
1997	−1.18	7.34	4.00	4.80	−0.09	6.97	4.20
1998	−0.33	7.22	−0.63	6.71	6.16	9.66	5.12
1999	−0.13	4.81	−2.99	5.16	−2.40	6.14	2.76
2000	−0.57	2.76	−3.77	4.23	−9.22	2.66	0.84
2001	−0.45	3.32	−3.51	5.95	−4.16	3.31	1.98
Total	0.62	5.36	3.19	6.34	−0.04	3.87	3.96

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Table A.3. Median Current Account to GDP Ratios by Region, 1970–2001

Year	Industrial	Latin America	Asia	Africa	Middle East	Eastern Europe	Total
1970	–0.40	4.10	0.90	0.90	5.90	…	0.90
1971	–0.50	4.60	1.00	5.25	7.25	…	1.05
1972	–1.00	1.45	1.55	6.20	1.25	…	0.40
1973	0.15	1.05	0.70	7.20	2.25	…	0.85
1974	2.90	4.00	3.00	2.40	–0.80	1.50	2.90
1975	1.35	4.10	3.65	6.50	–3.80	3.50	3.30
1976	2.65	1.40	0.20	5.05	–3.20	3.80	3.30
1977	2.05	3.95	–0.70	4.10	–1.65	5.20	2.80
1978	0.65	3.95	2.55	9.90	3.00	1.90	3.50
1979	0.70	4.70	2.70	6.40	–8.90	1.50	3.20
1980	2.30	5.55	4.80	8.40	–3.95	0.10	4.35
1981	2.70	9.05	8.55	10.00	1.45	1.05	6.85
1982	1.95	7.60	7.80	9.50	–1.55	1.50	6.55
1983	0.90	4.70	7.30	6.40	5.10	0.90	4.30
1984	0.25	3.30	2.10	4.10	4.90	0.65	2.50
1985	1.00	2.10	3.85	4.20	2.60	1.70	2.95
1986	–0.10	3.00	2.40	3.60	2.30	3.30	2.85
1987	0.40	4.15	1.70	5.00	2.45	0.90	2.60
1988	1.15	2.25	2.75	6.00	1.55	1.30	2.60
1989	1.50	4.40	3.45	3.65	–0.50	1.70	2.80
1990	1.40	2.80	4.45	3.80	–1.00	3.65	2.80
1991	0.90	4.80	3.20	3.70	10.10	0.70	3.10
1992	0.80	4.40	2.00	5.80	9.30	–0.10	3.25
1993	0.50	4.70	4.50	6.60	7.15	1.95	3.45
1994	–0.40	3.50	4.60	5.70	4.70	1.60	2.90
1995	–0.75	3.20	4.65	5.50	0.60	1.85	2.70
1996	–0.95	4.60	3.90	4.60	–0.35	5.40	3.65
1997	–0.65	4.90	4.10	5.20	–0.20	6.20	3.60
1998	0.20	4.90	0.70	5.60	3.30	7.00	3.80
1999	–0.50	3.60	–1.60	4.15	–0.30	4.30	2.70
2000	0.50	3.40	–1.75	3.30	–7.30	4.20	2.80
2001	–0.05	3.30	–2.60	3.95	–4.80	4.60	2.10
Total	0.70	4.10	2.70	5.30	1.40	3.00	3.10

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Table A.4. Third Quartile Current Account to GDP Ratios by Region, 1970–2001

Year	Industrial	Latin America	Asia	Africa	Middle East	Eastern Europe	Total
1970	0.60	6.90	1.30	1.90	11.50	…	4.10
1971	0.40	7.80	1.70	8.30	9.30	…	5.70
1972	0.30	2.40	3.60	12.00	4.15	…	2.50
1973	1.30	4.10	1.30	10.00	5.75	…	2.90
1974	4.40	10.00	5.60	4.60	12.40	1.50	5.30
1975	4.40	6.80	9.40	8.40	14.80	3.50	7.60
1976	4.30	4.00	6.20	8.35	3.30	3.80	5.40
1977	3.60	7.30	4.15	7.70	2.60	5.20	5.90
1978	2.50	7.60	3.85	12.40	9.20	1.90	8.90
1979	2.70	6.70	5.80	12.30	5.30	1.50	7.10
1980	3.60	11.60	10.90	13.00	2.60	5.00	10.50
1981	4.30	13.45	13.00	12.90	5.90	2.70	12.20
1982	4.00	11.75	13.10	13.70	8.30	2.30	10.70
1983	2.40	7.45	11.00	12.40	7.70	3.10	8.10
1984	3.00	6.60	4.95	8.80	8.20	1.95	6.35
1985	3.60	6.40	6.65	8.40	7.50	2.05	6.60
1986	3.30	7.80	5.70	8.20	9.40	5.20	6.40
1987	3.20	8.75	5.60	9.65	5.40	2.50	6.30
1988	3.00	7.65	5.80	9.75	4.10	1.70	6.60
1989	3.60	7.10	7.90	7.25	5.20	2.00	5.70
1990	3.40	7.65	6.85	9.00	2.15	8.30	6.40
1991	2.80	12.40	6.75	9.60	20.00	3.50	7.70
1992	2.70	8.00	4.70	8.90	17.20	3.50	7.10
1993	1.70	8.90	7.90	8.30	13.00	4.20	7.90
1994	1.70	7.30	6.20	9.20	6.70	3.70	6.30
1995	1.15	5.50	7.95	11.20	5.05	5.65	7.10
1996	1.85	7.80	7.50	10.40	4.20	9.20	8.10
1997	2.10	10.50	8.10	7.85	2.10	10.80	7.20
1998	2.50	8.90	5.40	10.15	12.35	11.30	8.90
1999	2.80	5.60	2.10	10.75	1.90	8.00	5.90
2000	3.10	5.20	0.60	8.50	1.20	5.90	5.50
2001	2.60	4.65	1.70	8.30	0.00	6.60	4.80
Total	3.00	8.00	6.40	9.90	6.40	6.10	7.20

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Table A.5. First Quartile Current Account to GDP Ratios by Region, 1970–2001

Year	Industrial	Latin America	Asia	Africa	Middle East	Eastern Europe	Total
1970	–0.70	2.80	0.10	–0.10	2.60	…	0.76
1971	–1.30	0.10	0.10	2.20	–4.85	…	0.08
1972	–1.70	0.60	–1.20	0.40	–10.95	…	–1.27
1973	–2.70	–0.20	–0.70	4.40	–5.30	…	0.28
1974	–0.10	2.80	0.90	–17.40	–10.90	1.50	–4.75
1975	–0.30	1.30	0.70	0.40	–30.80	3.50	–1.57
1976	0.75	–1.10	–3.40	3.05	–12.90	3.80	–0.39
1977	–0.10	0.40	–4.95	0.60	–12.80	5.20	–0.95
1978	–1.40	0.25	–0.35	4.20	0.70	1.90	1.26
1979	0.00	0.40	–4.40	0.00	–13.70	1.50	–1.58
1980	0.50	0.55	1.20	2.20	–15.80	–4.80	–0.93
1981	–0.40	5.35	2.70	5.40	–17.00	–0.60	1.50
1982	–1.00	5.00	3.40	4.70	–6.50	–0.90	2.08
1983	–0.40	1.70	0.90	3.40	–2.70	–0.20	1.12
1984	–0.80	1.20	0.50	0.10	–3.40	–1.65	–0.26
1985	–1.60	–0.50	1.95	1.10	–1.10	1.15	0.38
1986	–1.60	0.60	–0.15	0.60	0.60	1.00	0.22
1987	–1.00	1.25	0.20	0.45	0.20	–0.20	0.26
1988	0.10	0.50	–2.15	1.65	1.40	–1.80	0.07
1989	–0.20	0.70	0.25	0.95	–12.40	–0.90	–0.71
1990	–1.00	–1.65	2.15	0.90	–12.40	–1.10	–1.00
1991	–1.50	0.75	1.10	0.40	2.10	–1.20	0.25
1992	–2.00	–0.30	0.40	1.60	1.30	–0.90	0.15
1993	–3.10	0.60	1.30	1.80	–0.10	–0.95	0.27
1994	–2.80	0.20	0.30	0.30	–4.25	–2.00	–0.83
1995	–2.95	1.55	1.85	2.10	–4.05	0.15	0.48
1996	–3.55	1.60	0.40	1.30	–3.20	2.40	0.31
1997	–4.15	2.60	1.80	1.35	–1.35	2.50	0.84
1998	–3.20	2.40	–3.00	1.80	0.35	2.50	0.37
1999	–2.60	2.50	–7.10	0.25	–4.80	1.90	–1.15
2000	–2.90	3.00	–6.55	0.10	–22.40	2.80	–2.34
2001	–2.80	1.95	–6.75	0.05	–11.70	1.20	–1.93
Total	–1.45	1.22	–0.58	0.95	–6.75	0.56	–0.28

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A Gravity Model of Sovereign Lending: Trade, Default, and Credit

ANDREW K. ROSE and MARK M. SPIEGEL*

One reason why countries service their external debts is the fear that default might lead to shrinkage of international trade. If so, then creditors should systematically lend more to countries with which they share closer trade links. We develop a simple theoretical model to capture this intuition, then test and corroborate this idea. [JEL F15, F33]

While the age of gunboat diplomacy as a mechanism of credit enforcement has long passed, sovereign default is still an exceptional event. This stylized fact indicates that while the source of a sovereign default penalty is still controversial, sovereigns behave as if they consider default costly. Many models of sovereign debt in the literature (e.g., Bulow and Rogoff, 1989a, 1989b) introduce explicit default penalties to rationalize this fact. These sanctions are primarily considered to be methods of inhibiting trade. Bulow and Rogoff (1989a) discuss the difficulties countries would experience in their trade subsequent to default, including complications associated with avoiding seizure and the interruption of short-term trade credit.

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Nevertheless, there are a number of reasons why one might doubt the existence of default penalties. Bulow and Rogoff (1989b) themselves admit that it is unclear whether private creditors enjoy the ability to induce their governments to enforce claims on sovereign borrowers. Kletzer and Wright (2000) argue that most penalties in models of sovereign lending are not "renegotiation-proof." That is, Kletzer and Wright argue that both parties could do better subsequent to a full or partial sovereign default, if the creditor resists levying a destructive penalty from which (s)he would receive no immediate benefit. In brief, there is considerable uncertainty concerning the viability of penalties for sovereign default. Thus, empirical evidence regarding such penalties warrants attention.

Unfortunately, there are only a limited number of empirical studies concerning such penalties. Ozler (1993) provides evidence of positive, albeit small, premia charged to countries with default histories. Cline (1987) notes that Bolivia and Peru experienced interruptions in their flows of short-term trade credits subsequent to debt renegotiation. In a recent paper, Rose (2002) provides empirical support for the role of trade as a sovereign enforcement mechanism. His paper shows that sovereign Paris Club reschedulings are followed by economically and statistically significant reductions in international trade.

The evidence of Cline and Rose centers on the interruption of international trade as a mechanism for sovereign debt repayment. If one believes that the primary penalties for enforcing sovereign debt obligations are trade related, then creditors originating from nations with strong bilateral trade ties with a debtor nation should have a comparative advantage in lending to that nation.

In this short paper, we explore this idea. We first present a theoretical model of international lending where a debtor optimally chooses its borrowing from different creditors. These creditors are identical except that they are located in countries that differ by the strength of their bilateral trade ties with the debtor. We show that in equilibrium, the pattern of borrowing favors the creditor with higher bilateral trade volume with the debtor. We then test and corroborate this idea using an annual panel data set including bilateral trade and international banking claims from 20 creditor and 149 debtor countries from 1986 through 1999. Using instrumental variable (and other) techniques, we find a significantly positive effect of bilateral trade on bilateral lending patterns. That is, debtors tend to borrow more from creditors with whom they share more international trade ties.

While our empirical results support the trade sanction sovereign debt model derived in the paper, the evidence does not necessarily refute pure "reputation-based" models of sovereign debt in which the penalty for default is exclusion from access to future borrowing (e.g., Eaton and Gersovitz, 1981; Kletzer and Wright, 2000; or Wright, 2002), or with mixed models where some combination of direct sanctions and reputational penalties are applied, such as Kehoe and Levine (1993).[1] However, it appears that reconciling reputation-based models with the data without introducing new inconsistencies requires the introduction of some friction,

[1]While the Kehoe and Levine model allows for asset seizure, it does not consider interruptions of trade in spot markets, which might be considered analogous to the direct trade sanctions in our model below.

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such as superior information sets to creditors from those countries engaged in greater bilateral trade.[2]

Our theoretical model is presented in the next section. We then present the data set and methodology and test the model. The paper ends with a brief summary.

I. A Model of Sovereign Borrowing with Trade-Related Default Penalties

In this section we develop a simple borrowing model in which a sovereign debtor allocates its borrowing across different creditor nations, when default penalties are based on proportional losses in bilateral gains from trade.

We assume that there are three countries: one borrower country, *i,* and two creditor countries, *a* and *b.* Let *r* represent one plus the world risk-free interest rate. All countries are assumed to be small and therefore take *r* as given. Lending banks in the creditor countries are risk-neutral and therefore willing to extend unlimited funds at levels consistent with an expected return equal to *r*.

The model has two periods. In the first period, the representative agent in lender country j ($j = a, b$) extends a loan of magnitude L_{ij} in return for the promise of a fixed payment D_{ij} in the second period. In the second period, the agent in debtor country i makes its default decisions. If the debtor chooses to service its country j debt it pays D_{ij}. If the debtor defaults, it suffers a penalty equal to a fraction θ of its gains from bilateral trade with country j, where $0 < \theta < 1$.

Bilateral gains from trade are exogenous and equal to γT_{ij}, where γ is a positive constant and T_{ij} is a random variable reflecting total trade between country i and country j in the second period. Expectations of T_{ij} are unbiased and satisfy

$$T_{ij} = E_1(T_{ij}) + \varepsilon_i, \tag{1}$$

where $E_1(T_{ij})$ represents the period one expected value of T_{ij} and ε_i is an i.i.d. disturbance term with expected value 0 and a symmetric and single-peaked distribution on the interval $\varepsilon_i \in [\underline{\varepsilon}, \bar{\varepsilon}]$. Let $F(\varepsilon)$ represent the distribution of ε, that is, the probability that $\varepsilon_i \leq \varepsilon$, and $f(\varepsilon)$ represent its density. The creditor nations are assumed to only differ in their expected trade volume with the debtor country, with $E_1(T_{ia}) > E_1(T_{ib})$.

The expected utility function of the representative agent in country i satisfies

$$E_1(U_i) = U(C_{i1}) + \beta E_1(C_{i2}), \tag{2}$$

where $U' > 0$, $U'' < 0$, C_{it} represents consumption in country i in period t ($t = 1,2$), and β represents the debtor's discount rate. The specification that debtor utility is linear in expected second-period consumption is made for analytic simplicity, but drives none of our results.

[2]See Wright's (2003) comments on our paper below. Wright argues that the assumption of superior information sets held by primary trading partners may give those partners comparative advantages in lending in pure reputation models with the additional assumption of continuous trade in goods to avoid the "excessive gross flows" problem.

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Debtor income, Y_{it}, is exogenous in both periods. Debtor first-period consumption satisfies

$$C_{i1} = Y_{i1} + L_{ia} + L_{ib}. \tag{3}$$

Since no new funds are obtained in period 2, the debtor's default decision on debts from each creditor nation is based on maximizing expected second-period consumption. Conditional on service on its debt obligations to country *j,* debtor second-period consumption satisfies

$$C_{i2} = Y_{i2} + \gamma T_{ij} - D_{ij} - g(D_{ik}, \varepsilon_i), \tag{4}$$

where $j \neq k$ and $g\ (D_{ik}, \varepsilon_i)$ represents the gains from trade net of the cost of debt service on the debtor's country k debt obligations given that the debtor makes its utility-maximizing default decision on its obligations to that country.

Similarly, conditional on default on obligations to country *j,* debtor second-period consumption satisfies

$$C_{i2} = Y_{i2} + (1 - \theta)\gamma T_{ij} - g(D_{ik}, \varepsilon_i). \tag{5}$$

It follows that the debtor chooses to default on country j when $D_{ij} > \theta\gamma T_{ij}$.

Define ε_{ij}^* as the realization of ε_i that leaves the debtor indifferent between default and repayment. ε_{ij}^* satisfies

$$\varepsilon_{ij}^* = \frac{D_{ij}}{\theta\gamma} - E_1(T_{ij}). \tag{6}$$

Equilibrium in the model is defined as the pair of debt obligations (D_{ia}, D_{ib}) that maximize expected debtor utility subject to both creditors' zero-profit conditions. The creditors' zero profit conditions satisfy

$$D_{ij} = \frac{rL_{ij}}{1 - F\left(\varepsilon_{ij}^*\right)}, \tag{7}$$

where $j=a,b$.

Utility maximization for the debtor can be characterized in terms of two decisions, the overall borrowing level, L_i, and the allocation of debt across the two creditors, D_{ia} and D_{ib}. Consider first the allocation decision. Given total borrowing L_i, maximizing expected utility subject to the creditors' zero-profit conditions yields the first-order condition

$$\frac{L_{ia}}{L_{ib}} = \left[\frac{1 - F\left(\varepsilon_{ia}^*\right)}{1 - F\left(\varepsilon_{ib}^*\right)}\right]^2 \left(\frac{f\left(\varepsilon_{ib}^*\right)}{f\left(\varepsilon_{ia}^*\right)}\right). \tag{8}$$

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Equation (8) demonstrates that the debtor skews its borrowing allocation toward the nation from which the impact of a marginal increase in borrowing on its probability of default is smaller. Since the creditors' risk premia are symmetric functions of default risk, equalizing the marginal cost of the last dollar borrowed in each country implies borrowing more from the country that would have a lower probability of default if borrowing levels were equal. Of course, doing so pushes up the probability of default in this country relative to the other, and narrows the difference between these probabilities.

This result implies that the optimal allocation of borrowing across countries mitigates the disparities in default risk across countries. This result fits well with historical experience, as countries typically default on all of their creditors simultaneously, or not at all. It should be stressed, however, that the result is an equilibrium outcome of the model, rather than simply assumed.[3]

Totally differentiating (8) with respect to L_{ia} and $E(T_{ia})$ yields

$$\frac{\partial L_{ia}}{\partial E(T_{ia})} = -\frac{r\left[E(T_{ia}) + \varepsilon^*_{ia}\right]\left\{\left[1 - F\left(\varepsilon^*_{ia}\right)\right]f'\left(\varepsilon^*_{ia}\right) + f\left(\varepsilon^*_{ia}\right)^2\right\}}{\frac{\partial^2 E(C_{i2})}{\partial L^2_{ia}}\left\{\left[1 - F\left(\varepsilon^*_{ia}\right)\right] - f\left(\varepsilon^*_{ia}\right)\left[E(T_{ia}) + \varepsilon^*_{ia}\right]\right\}^2} > 0, \tag{9}$$

where the denominator can be signed as negative by the debtor's second-order condition.

Equation (9) yields our first result. Holding total lending constant, the share of lending originating in country a is increasing in the expected volume of trade with country a.

We can now confront the debtor's overall borrowing decision. Maximizing expected utility in equation (2) over the choice of L_i subject to the creditors' zero-profit conditions and the debtor's optimal debt allocation rule yields the first-order condition

$$U' - \beta\left\{r + \theta\gamma\left\{\left[E(T_{ia}) + \varepsilon^*_{ia}\right]f\left(\varepsilon^*_{ia}\right)\frac{\partial \varepsilon^*_{ia}}{\partial L_{ia}}\right\}\right\} = 0, \tag{10}$$

where by (6) and (7), the partial term satisfies

$$\frac{d\varepsilon^*_{ia}}{dL_{ia}} = \frac{r}{\theta\gamma\left\{\left[1 - F\left(\varepsilon^*_{ia}\right)\right] - f\left(\varepsilon^*_{ia}\right)\left[E(T_{ia}) + \varepsilon^*_{ia}\right]\right\}} > 0. \tag{11}$$

Totally differentiating with respect to L_i and $E_1(T_{ia})$ yields

$$\frac{\partial \bar{L}}{\partial E(T_{ia})} = -\frac{\beta r\left[E(T_{ia}) + \varepsilon^*_{ia}\right]\left[f'\left(\varepsilon^*_{ia}\right)\left[1 - F\left(\varepsilon^*_{ia}\right)\right] + f\left(\varepsilon^*_{ia}\right)^2\right]}{\left[U'' + \beta\frac{\partial^2 E(C_{i2})}{\partial \bar{L}^2}\right]\left\{\left[1 - F\left(\varepsilon^*_{ia}\right)\right] - f\left(\varepsilon^*_{ia}\right)\left[E(T_{ia}) + \varepsilon^*_{ia}\right]\right\}^2} > 0, \tag{12}$$

[3]In the limiting case where the ε_{ij}'s are distributed uniformly, the equilibrium borrowing allocation results in the debtor defaulting on both creditors or none.

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where the denominator can be signed as negative by the debtor's second-order condition.

Our results demonstrate that an increase in the expected volume of bilateral trade with an individual country is associated with both an increase in overall borrowing and an increase in the share of overall borrowing originating in that country. Consequently, the model predicts a positive correlation between expected bilateral trade volumes and bilateral lending. In the next section, we test this prediction.

II. Empirics

Gravity Methodology

We are interested in estimating the effect of international trade on international debt. However, international borrowing may itself encourage trade; alternatively, both borrowing and trade may be jointly driven by common factors. That is, it is important for us to consider the possibility that international borrowing and trade are simultaneously determined.

We solve this problem using instrumental variables. The popular "gravity" model of bilateral international trade provides a wealth of potential instrumental variables. Many variables that are known to be important determinants of international trade are unlikely to be important determinants of international lending patterns. For instance, a pair of landlocked countries engages in less international trade, while a pair of physically large countries or those that share a common land border trade more. But international lending patterns are unlikely to be affected by such features.[4] We use such variables as instrumental variables for trade in a model of bilateral lending.

Since conditions that lead two countries to be more integrated are likely to lead to more financial activity between them, our specification for bilateral international borrowing levels follows the gravity model of international trade closely:

$$\begin{aligned}\ln(C_{ijt}) = {} & \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(Y_i Y_j / Pop_i Pop_j)_t + \beta_3 \ln D_{ij} + \beta_4 Lang_{ij} \\ & + \beta_5 Cont_{ij} + \beta_6 FTA_{ijt} + \beta_7 Landl_{ij} + \beta_8 Island_{ij} \\ & + \beta_9 \ln(Area_i Area_j) + \beta_{10} ComCol_{ij} + \beta_{11} CurCol_{ijt} \\ & + \beta_{12} Colony_{ij} + \beta_{13} ComNat_{ij} + \beta_{14} CU_{ijt} \\ & + \gamma_\tau \cdot T_{\tau t} + \varphi \ln(X_{ijt}) + \varepsilon_{ijt}\end{aligned} \tag{13}$$

where i and j denotes countries, t denotes time, and the variables are defined as:

- C_{ijt} denotes the value of real lending from i to j at time t,
- X_{ijt} denotes the average value of real bilateral trade between i and j at time t,
- Y is real GDP,
- Pop is population,
- D is the distance between i and j,

[4]If bank lending reflects trade credits, coefficient estimates from our IV estimation may be biased upwards. As our estimated effect is large, however, it is unlikely that correction for this bias would eliminate our results.

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- *Lang* is a binary variable that is unity if *i* and *j* have a common language,
- *Cont* is a binary variable that is unity if *i* and *j* share a land border,
- *FTA* is a binary variable that is unity if *i* and *j* belong to the same regional trade agreement,
- *Landl* is the number of landlocked countries in the country pair (0, 1, or 2).
- *Island* is the number of island nations in the pair (0, 1, or 2),
- *Area* is the land mass of the country,
- *ComCol* is a binary variable that is unity if *i* and *j* were ever colonies after 1945 with the same colonizer,
- *CurCol* is a binary variable that is unity if *i* and *j* are colonies at time *t,*
- *Colony* is a binary variable that is unity if *i* ever colonized *j* or vice versa,
- *ComNat* is a binary variable that is unity if *i* and *j* remained part of the same nation during the sample (e.g., the United Kingdom and Bermuda),
- *CU* is a binary variable that is unity if *i* and *j* use the same currency at time *t,*
- $T_{\tau t}$ is a comprehensive set of year-specific intercepts,
- β and γ are vectors of nuisance coefficients, and
- ε_{ij} represents the myriad other influences on bilateral credit, assumed to be well behaved.

The coefficient of interest to us is φ, the effect of bilateral trade between countries *i* and *j* on commercial bank claims by creditor country *j* on debtor nation *i.*

We estimate the model with a number of techniques below. We begin by using ordinary least squares (OLS) with standard errors that are robust to clustering (since pairs of countries are likely to be highly dependent across years). We then use instrumental variables, dropping some of the regressors from the right-hand side of the equation and using them as instrumental variables. Finally, we employ fixed- and random-effects panel data estimators, with and without instrumental variables. We use both fixed- and random-effects estimators extensively below.

The Data Set

We use a subset of the panel data set of Glick and Rose (2002); the interested reader is referred to Glick and Rose for more details.

For the regressand we use consolidated foreign claims of reporting banks on individual countries.[5] These bank loans are provided by the Bank for International Settlements (BIS) in millions of U.S. dollars for 20 creditor countries and almost 150 borrowing countries.[6] Not all of the areas covered are countries in the conventional sense of the word; we use the term "country" simply for convenience.

[5]Our measurement of cross-border obligations may contain errors from a number of sources. First, the use of consolidated data may not correctly assign the risk of banks' foreign branches. Second, "outward risk transfers" are sometimes used to transfer risks to residents of other countries, and our data set would not pick these up. Still, as these errors fall in the regressand of our model they only make the effect of trade harder to find and do not appear to introduce any bias issues.

[6]These data are available via the Internet at: *http://www.bis.org/publ/qcsv0206/hanx9b.csv* and are part of the International Banking Statistics published regularly in the *BIS Quarterly Review.* For technical reasons we usually ignore a few observations from Ireland and Spain; adding these makes little difference in general to our results.

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Table 1. OLS Estimates of Effect of Trade on Claims

	φ
Default	0.54 (0.04)
Without controls	0.75 (0.02)
Levels	0.0001 (0.00003)
Levels without controls	0.0001 (0.00003)
1990	0.51 (0.05)
1995	0.53 (0.07)
Only industrial debtors	0.74 (0.04)

Equation estimated is $Claims_{i,j,t} = \varphi Trade_{i,j,t} + \beta X_{i,j,t} + \varepsilon_{i,j,t}$.
Robust standard errors (clustered by country-pairs) recorded in parentheses.
Intercepts and year effects not recorded.

(The creditor countries and debtor countries are listed in the appendix.) The data are provided semi-annually from 1986; we average the data to annual series by simple averaging. We convert nominal bank claims to a real series by deflating by the U.S. CPI (1982–1984 = 1). Almost half the claims are reported to be zero. This makes the log transformation potentially important and questionable; we investigate it further below.

The most important regressor is the level of international trade. We use bilateral trade flows taken from the IMF's *Direction of Trade Statistics* data set, deflated by the U.S. CPI.[7] To this we add population and real GDP data (in constant dollars).[8] We exploit the CIA's *World Factbook* for a number of country-specific variables. These include: latitude and longitude, land area, landlocked and island status, physically contiguous neighbors, language, colonizers, and dates of independence. We use these to create great-circle distance and our other controls. We obtain data from the World Trade Organization to create an indicator of regional trade agreements, and we include: EEC/EC/EU, US-Israel FTA, NAFTA, CACM, CARICOM, PATCRA, ANZCERTA, ASEAN, SPARTECA, and Mercosur. Finally, we add the Glick and Rose (2002) currency union dummy variable.

Descriptive statistics for the data set are tabulated in the appendix.

Results

We begin our investigation by estimating equation (12) with OLS. Our results appear in Table 1.

[7]Bilateral trade on FOB exports and CIF imports is recorded in U.S. dollars; we deflate trade by the U.S. CPI. We create an average value of bilateral trade between a pair of countries by averaging all of the four possible measures potentially available.

[8]Wherever possible, we use *World Development Indicators* (taken from the World Bank's *WDI 2000* CD-ROM) data. When the data are unavailable from the World Bank, we fill in missing observations with comparables from the Penn World Table Mark 5.6, and (when all else fails) from the IMF's *International Financial Statistics.* The series have been checked and corrected for errors.

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Our default estimates include the entire set of regressors (i.e., all 14 coefficients are estimated, as well as the set of time-specific intercepts). In this specification, the estimate of the all-important φ coefficient is 0.54, with a robust standard error of 0.04. This elasticity is not only consistent with our theory, but is highly significant. With a *t*-statistic of over 15, the coefficient is different from zero at any reasonable level of statistical significance. The effect is also economically significant; an increase in trade of 1 percent is associated with an increase in bilateral lending of over 0.5 percent, all other things being equal. Of course, since there are capital flows above and beyond the bank lending that we consider (through, for example, stock and bond markets, as well as foreign direct investment), even this considerable elasticity should probably be considered a lower bound.

The rest of the table provides a series of robustness checks. For instance, the second row reports φ if the other controls are dropped from the equation (i.e., we set $\beta = \gamma = 0$); in this case, the effect is even more significant. Since many of the creditor countries have not extended loans to some of the debtor countries, many observations of the dependent variable are zero and are thus dropped from the equation estimated in natural logarithms. Therefore, the third and fourth rows of the table report comparable estimates of φ when both trade and bank claims are included in untransformed levels. Yet φ remains statistically significant when the key relationship is estimated in levels.[9]

The fifth and sixth rows of the table move away from panel data analysis to cover only cross sections for two years in the middle of the sample, 1990 and 1995. However, the results are essentially unchanged from the default specification. The seventh and final row includes only observations between industrial countries (i.e., those with IFS country codes less than 200). If anything, the results become mysteriously larger; they certainly remain positive and highly significant in both the economic and statistical senses.[10]

To summarize, the effect of international trade on bank claims seems positive, significant, and robust in simple OLS estimation. The question is whether this result stands up to greater econometric scrutiny.

III. Results

We now proceed to instrumental variables estimation. We use five instrumental variables for (the log of) trade: (the log of) distance between the countries; the land border dummy; the number of landlocked countries; the number of island nations; and the log of the product of the countries' area. We accordingly set the appropriate β coefficients to zero (i.e., drop them from the equation, leaving the remaining variables as controls). The estimates are tabulated in Table 2a.

Despite the use of instrumental variables that are both plausibly exogenous and correlated with trade, the key results do not change with IV estimation. The

[9]Box-Cox tests imply that the natural logarithmic transformation is quite reasonable, and that the level transformation is rejected in favor of the log transform.

[10]Though if we include only developing country borrowers, our estimate remains significant at 0.53 (standard error of 0.04).

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Table 2a. IV Estimates of Effect of Trade on Claims, Geographic Instruments

	φ
Default	0.41 (0.07)
Without controls	0.50 (0.04)
Levels	0.00006 (0.00001)
Levels without controls	0.00007 (0.00002)
1990	0.52 (0.10)
1995	0.40 (0.10)
Only industrial debtors	1.03 (0.07)

Equation estimated is $Claims_{i,j,t} = \varphi Trade_{i,j,t} + \beta W_{i,j,t} + \varepsilon_{i,j,t}$.
Robust standard errors (clustered by country-pairs) recorded in parentheses.
Intercepts and year effects not recorded.
Instrumental variables for trade are: distance; land border; number landlocked; number of island nations; log of area.

Table 2b. IV Estimates of Effect of Trade on Claims, Excludable Instruments

	φ
Default	0.80 (0.40)
Without controls	0.83 (0.07)
Levels	0.00004 (0.00001)
Levels without controls	0.00005 (0.00001)
1990	0.59 (0.37)
1995	1.13 (0.49)
Only industrial debtors	0.79 (0.29)

Equation estimated is $Claims_{i,j,t} = \varphi Trade_{i,j,t} + \beta Z_{i,j,t} + \varepsilon_{i,j,t}$.
Robust standard errors (clustered by country-pairs) recorded in parentheses.
Intercepts and year effects not recorded.
Instrumental variables for trade are: common language; regional trade agreement; same nation.

default estimate is somewhat smaller, averaging perhaps 0.4. But it remains economically and statistically significant; it is also robust to a number of econometric perturbations.[11]

Table 2b reports sensitivity analysis with respect to the set of instrumental variables. Instead of the five geographic variables, we use three whose coefficients are usually insignificant in OLS estimates of equation (14): the common language dummy; the regional trade agreement dummy; and the same nation dummy. Again, the estimates of φ seem economically and statistically significant.[12]

[11]Again, if we include only developing country borrowers, our estimate remains significant at 0.38 (standard error of 0.08).

[12]If we use lags (e.g., of the GDP terms) as instrumental variables, our key result of a positive effect of trade on borrowing is not changed.

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Table 3. IV Estimates of Effect of Trade on Claims, Controlling for Total Claims/Debt

Control	Total Claims	Total Debt
Default	0.40 (0.07)	0.42 (0.07)
Without controls	0.42 (0.04)	0.27 (0.04)
Levels	0.00005 (0.000004)	0.00006 (0.00002)
Levels without controls	0.00005 (0.000006)	0.00006 (0.00002)
1990	0.47 (0.10)	0.56 (0.09)
1995	0.37 (0.10)	0.42 (0.10)
Only industrial debtors	0.48 (0.23)	1.10 (0.20)
OLS	0.29 (0.03)	0.39 (0.02)

Equation estimated is $Claims_{i,j,t} = \varphi Trade_{i,j,t} + \beta W_{i,j,t} + \varepsilon_{i,j,t}$.
Robust standard errors (clustered by country-pairs) recorded in parentheses.
Intercepts and year effects not recorded.
Instrumental variables for trade are: distance; land border; number landlocked; number of island nations; log of area.

The middle column of Table 3 adds a control for the (log of the) total credit extended by the creditor country, as suggested by our theoretical analysis; the right-hand column controls for the (log of) total debt incurred by the debtor country. Again, the results remain economically and statistically significant.

Finally, Table 4 reports results when panel estimators are used instead of more traditional regressions. The middle columns report OLS fixed- and random-effects estimates of φ for a variety of different specifications. The former takes into account all country-pair factors that influence trade whether measured or not, and is thus an exceptionally good robustness check. The right-hand column reports instrumental variables estimates using a random effects estimator (the fixed-effect estimator is infeasible since the geographic variables are time-invariant). Yet despite all the econometric firepower, the estimate of φ remains significant; it has a *t*-statistic of almost 9 and an economically large effect.[13]

We conclude that our hypothesis that bank credit is extended across international borders along the lines of international trade is corroborated.

IV. Summary

It is plausible to believe that countries service their foreign debts at least in part to avoid the reduced trade that typically follows international default. If so, sovereign borrowers will enjoy superior credit terms from creditor countries for which this

[13]Lending may be motivated by servicing FDI, rather than the sovereign risk issues considered in the theory above. To test this, we add a control in the form of the natural logarithm of FDI sourced from the creditor country. We obtained the bilateral FDI data from the OECD's *International Direct Investments Yearbook 1980–2000.* This data set is annual and unavailable for many countries in our sample, containing only some 2,600 observations. When we add this control to our default IV regression (in logs, with controls) its coefficient is indeed positive and significant. Still, the log of trade retains an economically and statistically significant coefficient of 0.62 (with a robust standard error of 0.11).

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Table 4. IV Estimates of Effect of Trade Level on Claims, Panel Estimators

Estimator	OLS, RE	OLS, FE	IV, RE
Default	0.31 (0.01)	0.19 (0.02)	0.52 (0.06)
Without controls	0.38 (0.01)	0.19 (0.01)	0.52 (0.03)
Levels	0.00003 (0.000001)	0.00002 (0.000001)	0.00006 (0.00001)
Levels without controls	0.00003 (0.000001)	0.00002 (0.000001)	0.00007 (0.000003)
Only industrial debtors	0.46 (0.06)	0.28 (0.07)	0.96 (0.19)

Equation estimated is $Claims_{i,j,t} = \varphi Trade_{i,j,t} + \beta W_{i,j,t} + \varepsilon_{i,j,t}$.
Robust standard errors (clustered by country-pairs) recorded in parentheses.
Intercepts and year effects not recorded.
Instrumental variables for trade are: distance; land border; number landlocked; number of island nations; log of area.

penalty is disproportionately high. In this paper we have provided a simple theoretical model that formalizes this intuition. We have also empirically investigated and confirmed the hypothesis that international trade patterns determine lending patterns.

In future work it would be interesting to extend this analysis to other forms of international lending, above and beyond bank loans. We think this is a good place to pass the torch to others.

APPENDIX
Descriptive Statistics

	Sample	Mean	Std. Dev.	Min	Max
Claims	31,787	561	3529	0	146061
Log real claims	19,769	3.69	2.53	–1.20	11.5
Log real trade	28,809	11.6	2.81	–0.55	20.3
Controls: Log distance	28,809	8.32	0.59	5.37	9.41
Log real GDP	25,126	49.6	2.50	42.3	58.0
Log real GDP per capita	25,102	17.3	1.07	14.1	21.1
Common land border	28,809	0.003	0.053	0	1
Common language	28,809	0.173	0.379	0	1
Log areas	28,809	23.8	3.25	12.20	32.3
Number landlocked	28,809	0.286	0.496	0	2
Number of islands	28,809	0.301	0.489	0	2
Regional trade agreement	31,787	0.009	0.094	0	1
Same nation	28,809	0.003	0.054	0	1
Colonial history	28,809	0.051	0.221	0	1
Current colony	28,809	0.003	0.057	0	1
Currency union	28,809	0.003	0.055	0	1

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Creditor Countries with Claims Reported

United States	United Kingdom	Austria	Belgium
Denmark	France	Germany	Italy
Netherlands	Switzerland	Sweden	Canada
Japan	Finland	Greece	Iceland
Ireland	Malta	Portugal	Spain

Debtor Countries with Claims Reported

Afghanistan, Islamic State of	Ecuador	Madagascar
Albania	Egypt	Malawi
Algeria	El Salvador	Malaysia
Angola	Equatorial Guinea	Maldives
Argentina	Ethiopia	Mali
Australia	Falkland Islands	Malta
Bahamas, The	Fiji	Mauritania
Bahrain	French Polynesia	Mauritius
Bangladesh	Gabon	Mexico
Barbados	Gambia, The	Mongolia
Belize	Ghana	Morocco
Benin	Gibraltar	Mozambique
Bermuda	Greece	Myanmar
Bhutan	Grenada	Namibia
Bolivia	Guatemala	Nauru
Botswana	Guinea	Nepal
Brazil	Guinea-Bissau	Netherlands Antilles
Brunei Darussalam	Guyana	New Caledonia
Bulgaria	Haiti	New Zealand
Burkina Faso	Honduras	Nicaragua
Burundi	Hong Kong SAR	Niger
Cambodia	Hungary	Nigeria
Cameroon	Iceland	Oman
Cape Verde	India	Pakistan
Cayman Islands	Indonesia	Panama
Central African Republic	Iran, Islamic Republic of	Papua New Guinea
Chad	Iraq	Paraguay
Chile	Israel	Peru
China	Jamaica	Philippines
Colombia	Jordan	Poland
Comoros	Kenya	Portugal
Congo, Dem. Rep. of	Kiribati	Qatar
Congo, Rep. of	Korea, Rep. of	Romania
Costa Rica	Kuwait	Rwanda
Côte d'Ivoire	Laos	São Tomé and Príncipe
Cuba	Lebanon	Saudi Arabia
Cyprus	Lesotho	Senegal
Djibouti	Liberia	Seychelles
Dominica	Libya	Sierra Leone
Dominican Republic	Macau SAR	Singapore

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Solomon Islands	Syrian Arab Republic	Uruguay
Somalia	Tanzania	Vanuatu
South Africa	Thailand	Venezuela, República Bolivariana de
Sri Lanka	Togo	Vietnam
St. Lucia	Tonga	Western Samoa
St. Vincent	Trinidad and Tobago	Yemen, Republic of
St. Helena	Tunisia	Yugoslavia, Federal Republic of
Sudan	Turkey	Zambia
Surinam	Uganda	Zimbabwe
Swaziland	United Arab Emirates	

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New Empirical Results on Default: A Discussion of "A Gravity Model of Sovereign Lending: Trade, Default and Credit"

MARK L.J. WRIGHT*

Sovereign default, while by no means ubiquitous, is still all too common. Moreover, as illustrated in Figure 1, sovereign debt *crises,* in which multiple debtor countries get into payments difficulties at roughly the same time, occur with surprising regularity. When this is combined with the fact that defaults appear to be very costly, to both the creditors who lose money on their investments and also to the defaulting country itself, it is natural that discussion turns to questions such as if and how the international financial system might be "reformed" to minimize the incidence and costs of these crises.

However, before policymakers can talk sensibly about "reforming the international financial architecture," it is necessary that they have a clear understanding of both the incentives faced by creditors and defaulting countries, and the ways in which institutions and governments affect these incentives. In this regard, economists have developed no shortage of interesting and clever *theories,* both formal and informal, of the incentives governing the default process. Much has been written about the incentives of defaulting countries to repay their debts, and about the punishments creditors can use to deter default, including the use of legal sanctions since the passage of the (U.S.) Foreign Sovereign Immunities Act in 1976, the loss of access to credit markets (the so-called "reputation" models of Eaton and Gersovitz, 1981, and many others), the loss of a country's reputation

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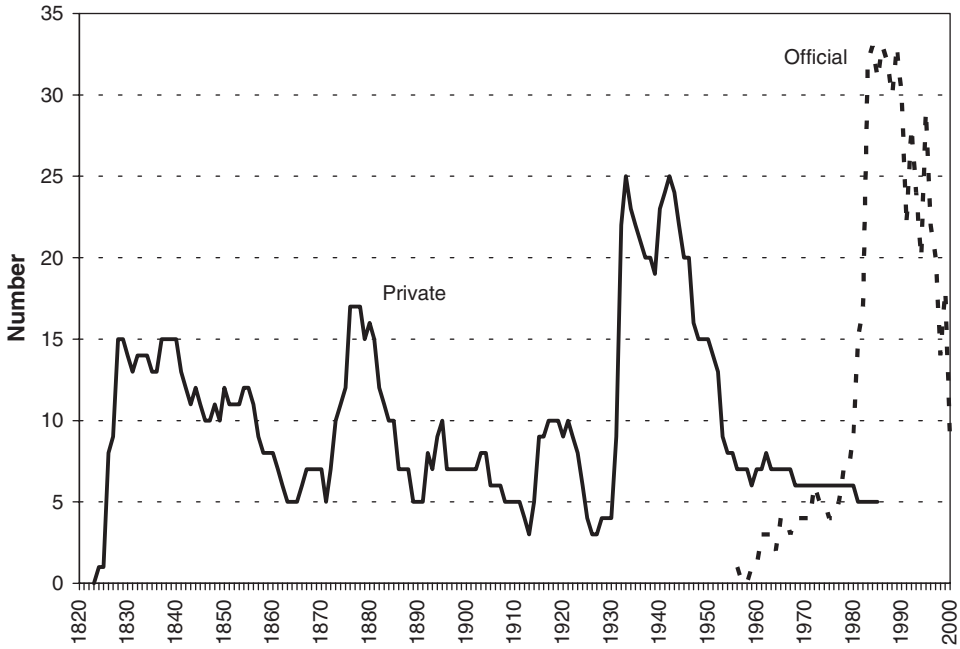
Figure 1. Two Centuries of Default and Rescheduling



Source: See Appendix.

outside of the credit market (Cole and Kehoe, 1998), and the imposition of trade and trade credit sanctions (Bulow and Rogoff, 1989; Kaletsky, 1985; and Rose, 2002). There has also been some theoretical work on incentives of creditors, chiefly focusing on the credibility of coordinated lending embargoes (Bulow and Rogoff, 1989; Kletzer and B. Wright, 2000; and M. Wright, 2003a), and on the operation of institutions aimed at facilitating cooperation among creditors (Eichengreen and Portes, 1989; Mauro and Yafeh, 2003; and M. Wright, 2003c). However, there has, on the whole, been much less *empirical* work aimed at disentangling the importance of these various theories.

Viewed from this perspective, the contribution of Rose and Spiegel (2004) is especially welcome. Together with a small number of other recent papers, Rose and Spiegel are contributing toward constructing a body of evidence about the nature and form of sovereign lending and default that can be used to, first, discriminate between theories and, second, to build a framework within which potential reforms can be assessed. In particular, their finding that bilateral bank debt stocks are larger between countries that have larger bilateral trade flows, even after controlling for the usual suspects, is consistent with an important role for trade and/or trade credit sanctions in enforcing repayment by sovereign debtors along the lines of the model outlined in their paper.

This discussion, after critically reviewing the methodology and findings of Rose and Spiegel, takes these findings as given and asks the question: to what extent

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do these results allow us to distinguish between different theories of default? To answer this question, we write down a simple off-the-shelf model of sovereign lending in which repayment is enforced by threatened loss of future capital market access (that is, the loss of the debtor's reputation) and show that this model makes similar predictions for the direction of lending as does a model in which trade sanctions enforce repayment. However, we go on to show that this prediction depends crucially on the assumed nature of the trading environment and that it comes at the cost of dramatically underpredicting the level of gross capital flows. In summary, the Rose and Spiegel finding on the direction of lending, should it prove to be robust and *when combined with evidence about the level of gross capital flows,* constitutes a substantial challenge for reputation models of repayment. The discussion concludes by speculating as to how this challenge may be answered and by outlining some open empirical questions on default that await answers.

I. Trade, Default, and Credit

The centerpiece of the Rose and Spiegel empirical strategy is to estimate a gravity equation. However, unlike the typical gravity equation in which the dependent variable is bilateral flows of *real trade,* in this implementation it becomes the bilateral stock of financial assets held by banks. The data come from the Bank for International Settlements data on bank balance sheets on a consolidated basis. The independent variables in the analysis span the usual range of variables. In addition, the flow of bilateral real trade is added as an independent variable. The key result is the finding that the higher the flow of real trade between two countries, the higher the stock of bilateral assets held by banks in the creditor country. The result is both statistically and economically significant—typically on the order of a 5 percent increase in stocks resulting from a 10 percent increase in trade—and is robust across a number of specifications, possible sets of instruments, and robustness checks.

What is interesting, and perhaps a little surprising, about this result is that it holds despite controlling for the usual list of gravity variables. One might certainly have expected two large neighboring countries to have substantial cross holdings of assets/liabilities due, among other reasons, to the fact they had more real trade and hence more trade credit. They may also have had greater cross holdings of assets—in particular equities—due to better flows of information, as suggested by Portes, Rey, and Oh (2001). However, the results suggest that trade is important above and beyond that component that is suggested by the usual explanators of trade. The question then becomes to what extent is this extra importance evidence of the importance of trade and trade credit sanctions in enforcing repayment?

Before turning to a direct discussion of this question, it is first useful to note a couple of potentially important caveats to the empirical analysis. One question concerning the implementation of the strategy is whether or not the focus upon bank debt, as opposed to the assets and liabilities of a country more generally, affects the results? The lack of good data for other forms of assets and liabilities makes this impossible to answer definitively—Rose and Spiegel had to look where the

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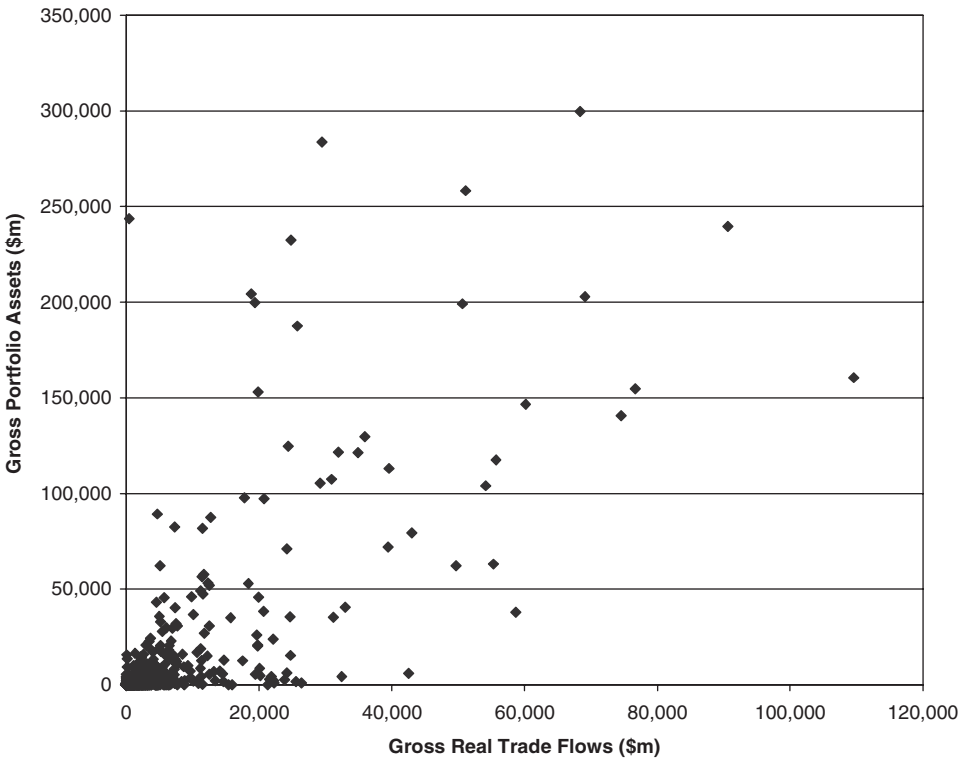
light was shining—but it begs the question of whether other forms of capital flows have very different patterns. Moreover, this issue is becoming increasingly important due to the increasing shift of sovereign lending away from bank loans and toward bonds, and the recent rise in private foreign direct investment. The usage of bank lending is perhaps most troubling because it has the potential to be contaminated by trade credit extended by these banks, a feature that quite reasonably could be expected to be correlated with trade patterns, even after controlling for the usual explanators of trade: a pair of countries that trades an unusually high amount might also be expected to have an unusually high amount of trade credit.

One way to assess the importance of the above criticism empirically is to examine data on other forms of international investment. A first cut at such an exercise is contained in Figure 2, which plots an estimate of the stock of bilateral portfolio investment assets in 2001 from the IMF's *Coordinated Portfolio Investment Survey* against bilateral trade flows for almost 2,000 country pairs. As was the case for bank debt stocks, the figure shows that there is a positive correlation between the two series, with a correlation coefficient of roughly 0.75. This is comforting, and suggests that portfolio investments such as equities behave roughly similarly to bank debt. Perhaps foreign direct investment does as well?

Figure 2. Bilateral Portfolio Assets, 2001



Source: See Appendix.

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A second caveat associated with the implementation concerns the usage of the bank loan data on a consolidated basis. These data allocate bank assets to the country within which the bank is headquartered. The trade sanction story advanced by Rose and Spiegel postulates that a country will restrict trade as a punishment against any country that defaults on loans made by its citizens. But in this age of multinational banking, a default on loans made by the foreign branch of a British bank could plausibly have its largest effect upon foreign depositors. If so, should we expect British trade to decline? If not, then why is British trade (and not the trade of the foreign country in which the branch is located) the relevant determinant of lending flows?

As regards the interpretation of the results, one question that arises concerns the estimates that result when attention is restricted to industrial countries. If, as seems plausible, the risk of default in lending to an industrial country is much lower than for emerging market economies—say because of superior institutions, the availability of other diplomatic punishments, or what have you—one might have expected that the relationship between trade and lending would be weaker for the industrial countries. The results, however, are often stronger.

Another obvious objection to the hypothesis that it is trade sanctions (although perhaps not *trade credit* sanctions) that enforce repayment is that we do not seem to observe trade sanctions being imposed in any instances of default. Moreover, it is not obvious whether international obligations through the World Trade Organization would allow the usage of trade sanctions in the event of a default today. The idea that trade sanctions were important in history, and in particular in averting a possible default in Argentina in the 1930s, also seems doubtful, especially in the light of recent work by Tomz (2003). Finally, debt settlements in practice do not seem to discriminate between groups of creditors on the basis of trading relationships, in contrast to the model put forward in the paper.

All of the above questions, in principle, cast some shadows on the thesis put forward by Rose and Spiegel. But all of them are very hard to answer in light of the available data. The rest of this discussion punts on these questions entirely, takes the Rose-Spiegel result at face value, and proceeds to ask whether this fact can be explained by a model of credit market reputation. The answer, it will turn out, is yes, although possibly not without creating further problems for the reputation story.

II. A Simple Model

To explore the ability of a reputation-based model of repayment incentives to match this fact, we will begin with a version of the well-known model of Kletzer and B. Wright (2000), although in fact the results hold for a much broader class of models. In this version of the model there are two risk-neutral creditor countries (indexed by $j = 1,2$) and one risk-averse debtor country with utility function U and discount factor β. International capital flows occur to smooth consumption and to reallocate consumption over time at a price q, defined to be the inverse of the gross international interest rate R. The absence of any international system of contract enforcement means that in equilibrium, lending patterns must be designed to reduce (in fact, eliminate) the possibility of default.

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The key to the result is, intuitively, that in this model, default possibilities are minimized by keeping gross capital flows as small as possible, and in fact equal to net capital flows. Loosely speaking, the reason is that if gross flows are larger than net flows, the debtor can strategically default at the point when the most resources are under its control: default has become more tempting. But this implies that financial flows (and hence their corresponding stocks) should follow trade flows, which is enough to give us the direction of lending result discussed above.

To see this result, let y_t be the identically and independently distributed level of the endowment that the debtor country receives at the start of the period. The nature of the interaction between the debtor and the two creditors is modeled as a game in which, at the start of each period and after observing the level of the debtor's endowment, the debtor and creditors simultaneously make transfers of goods to each other. As there are no gains from trade between creditors, we can without loss focus on transfers of goods to the debtor $\{\tau_t^{C_j}\}$ from each creditor $j = 1,2$, and from debtor $\{\tau_t^{D_j}\}$ to each creditor $j = 1,2$.

It is by now well known that there are many subgame perfect equilibria of such a game, the worst of which is autarky and produces an expected welfare for the debtor of V^A. Because autarky is the worst possible outcome, a threat to place the debtor in autarky—that is, exclude the debtor from financial markets—is the worst possible threat that can be made, and so serves to support the most lending possible. It then follows that any equilibrium level of transfers $\{\tau_t^{C_j}, \tau_t^{D_j}\}$ must satisfy

$$U\left(y_t + \sum_{j=1,2} \left(\tau_t^{C_j} - \tau_t^{D_j}\right)\right) + \beta V_{t+1} \geq U\left(y_t + \sum_{j=1,2} \tau_t^{C_j}\right) + BV^A$$

$$\left(\tau_t^{D_j} - \tau_t^{C_j}\right) + q\Pi_{t+1}^j \geq -\tau_t^{C_j}$$

for all j and t, where V_{t+1} denotes the expected future welfare of the debtor under the equilibrium strategies, and $q\Pi_{t+1}^j$ denotes the expected present value of any future profits that the jth creditor expects to make in the future. That is, $q\Pi_{t+1}^j$ denotes the net (and as we will see below, also gross) value of any assets held by creditor country j against the debtor.

If we restrict attention to those equilibria that are constrained efficient (that is, efficient but for the threat of default, which is the convention) and in which default is tempting for the agents (so that the constraints bind), then it is easy to show that the equilibrium features a minimal level of gross capital flows: in equilibrium, if the debtor makes a transfer (that is, if $\tau_t^{D_j} > 0$ some j), then no creditor makes a transfer ($\tau_t^{C_j} = 0$ all j). In other words, gross flows are equal to net flows, which are defined as the current account deficit of the country. The proof follows from the above equations: if the debtor transfers resources and the constraint binds, the constraint can be made less binding, and hence efficiency can be increased, by reducing the transfers from the creditors on the right hand side of the inequality.

This result is sufficient to imply that the countries with the largest asset holdings are also the countries with the largest trade flows. This follows from the second sequence of equations: in a constrained efficient equilibrium at which the

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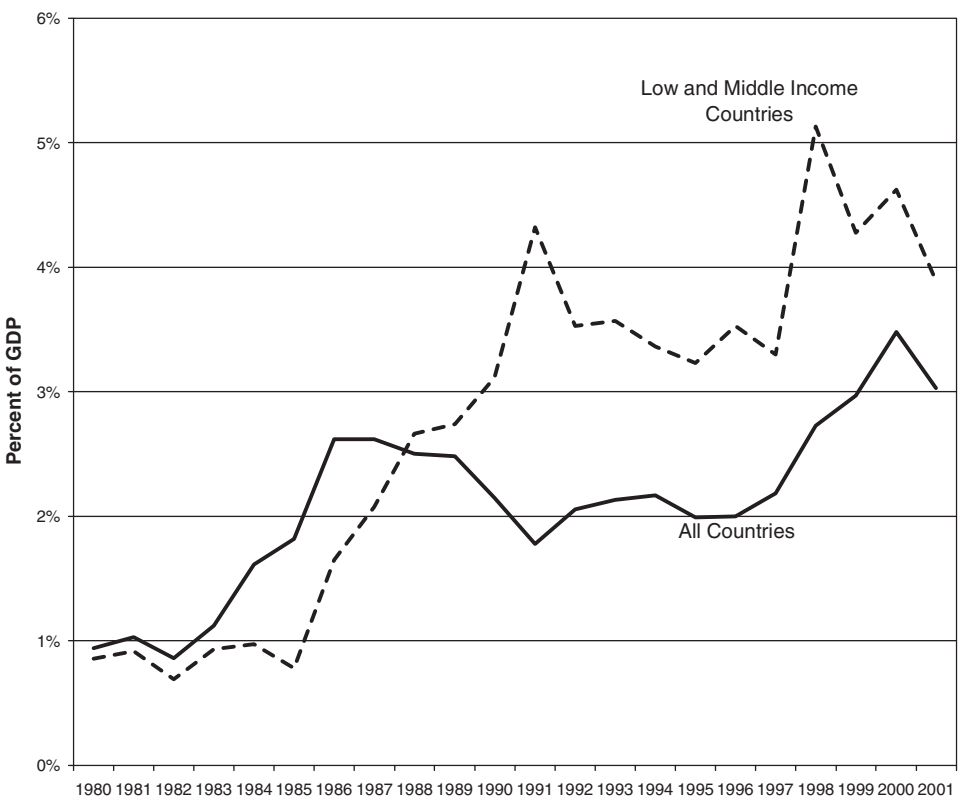
constraints bind, the larger is current bilateral exports to the debtor (that is, the larger is $\tau_t^{C_j}$), the larger is the present value of bilateral assets $q\Pi_{t+1}^j$. Again the intuition is straightforward: for a given value of trade, the larger are gross asset holdings, the more tempted some party will be to default. This temptation is minimized by keeping gross assets equal to net assets, which in turn requires that the largest traders hold the most assets.

The above model of sovereign debt enforced by a country's concern for its reputation, is thus able to produce the result found by Rose and Spiegel. However, the result comes at a price: it also predicts that gross capital flows should be small and, in fact, no larger than net capital flows. As can be seen in Figures 3 and 4, whereas gross capital flows to developing countries in 1980 were not much larger than net capital flows, today they are almost five times larger. A related observation for developed economies is often cited (see, for example, Obstfeld and Rogoff, 2000) as evidence against the importance of default risk for these countries.

This begs the question of whether or not a reputation model can explain simultaneously both the level of gross capital flows, and the direction those flows (and hence corresponding asset stocks) take. One avenue that could be taken would be

Figure 3. Net Capital Flows



Source: See Appendix.

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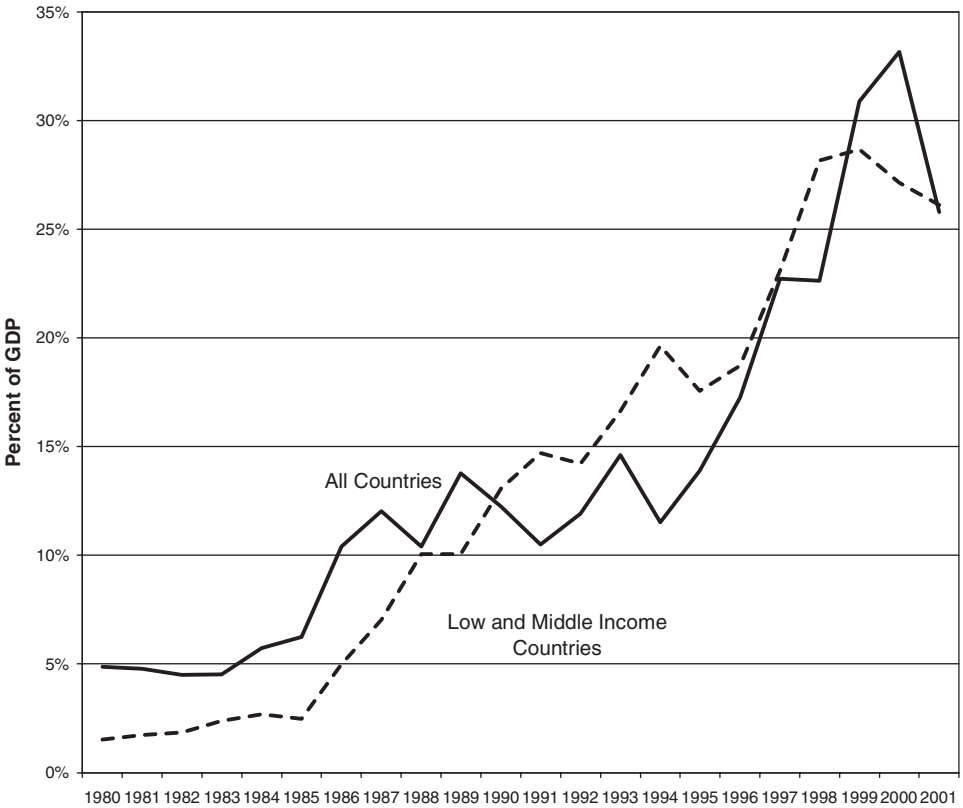
Figure 4. Gross Capital Flows



Source: See Appendix.

to abandon the focus on constrained efficient allocations. When allocations are not even constrained efficient, then gross flows can exceed net flows. However, the level of net capital flows that can be sustained declines in the amount by which gross capital flows exceed net flows. Consequently, it is difficult to see how such an explanation could explain simultaneous increases in both net and gross capital flows displayed in Figures 3 and 4. Another possibility is that default is not really a constraint, so that like any other complete markets model we are free to "gross up" portfolios in any way we choose. But such an approach places no restriction on the direction of gross flows and, moreover, begs the question of why we should be concerned about default in the first place.

Yet a third response is to note that it is not default and reputations per se, but rather their interaction with the trading technology, that produces the result that gross flows must be small in the face of default risk in this model. In particular, the above results were all derived under a specification of trade that involves all countries simultaneously exchanging goods. Suppose instead that trade takes place continuously throughout a period, and that a default consists of an early termination of the period of trade. To be concrete, suppose that trade takes place continuously

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over an interval of time normalized to length one, and that either a creditor or a debtor can terminate trade at any point $s \in [0,1]$ along that interval.

Under these assumptions, the relevant participation constraints become

$$U\left(y_t + \sum_{j=1,2}\left(\tau_t^{C_j} - \tau_t^{D_j}\right)\right) + \beta V_{t+1} \geq U\left(y_t + s\sum_{j=1,2}\left(\tau_t^{C_j} - \tau_t^{D_j}\right)\right) + BV^A$$

$$\left(\tau_t^{D_j} - \tau_t^{C_j}\right) + q\Pi_{t+1}^j \geq s\left(\tau_t^{D_j} - \tau_t^{C_j}\right)$$

for all $s \in [0,1]$ all j and t. Then, with a little work, it can be shown that gross capital flows are unconstrained for any level of net capital flows: simply fix the net level of transfers $\sum_{j=1,2}\left(\tau_t^{C_j} - \tau_t^{D_j}\right)$ and vary the level of gross transfers keeping the level of net transfers constant. In this case, default is always most tempting to an agent at the start of a period (that is, $s = 0$) and the temptation to default is invariant to the level of gross flows. This shows that a reputation model can produce arbitrarily high levels of gross flows. Moreover, the implications of this model for net capital flows, consumption, default, and welfare are exactly the same as for the earlier model presented above. However, now it is also true that there is no reason for gross asset positions to be correlated with gross trade flows: the argument used before now only works for net trade flows and net asset positions.

To summarize: a reputation model of debt is capable of explaining the Rose and Spiegel finding that gross asset positions are correlated with gross trade flows. Such a model is also capable of explaining arbitrarily large gross capital flows. However, the versions of these models that have presently been devised are not capable of simultaneously explaining both of these facts. The Rose and Spiegel finding on the direction of debts, in combination with the presence of large gross capital flows, therefore constitutes a challenge to reputational models of debt.

IV. Concluding Remarks

This discussion began by arguing that economists and policymakers still lack answers to some of the most fundamental questions concerning the incentives of debtors and creditors in the repayment of debt. In terms of providing answers to these questions, theory is still ahead of empirical work. However, thanks to the work of Rose and Spiegel, empirical work is catching up. In particular, their finding that bilateral asset holdings follow bilateral trade flows, should it prove to be robust, and when combined with evidence about the magnitude of gross flows, is a substantial challenge to the traditional reputation models of debt.

This does not necessarily constitute the final word on reputation models. As the discussion in the last section shows, the implications of reputation models for the level and direction of asset flows depend not only on the nature of contract enforcement but also on the details of the trading environment. Indeed, the discussion of the last section hints that a resolution of the two facts may lie in the way in which trade and financial frictions interact. In some recent work, M. Wright (2003b) shows that when default is deterred by a concern for preserving one's reputation,

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and that when a country's trading partners have an information advantage in reacting to a default, a model of this sort can produce large gross flows that closely follow trade patterns. Whether similar models of both trade and financial frictions can explain this and other facts about debt and repayment remains an open question.

Nor does this constitute the final empirical word on default. Not only are there many other aspects of the default process that are not well understood, but economists still lack good answers to the other question posed at the beginning: how do changes in government policy and institutions affect the incentives to repay debts? In part, the lack of good answers to this question reflects the fact that a study of variations in institutions of this scope inevitably involves studying the behavior of sovereign debt over the course of many decades, if not centuries. Some recent work by Klingen, Weder, and Zettelmeyer (2003), which examines rates of return on lending over three decades from 1970 to 2000, finds that returns on sovereign debt following the Brady restructuring deals were abnormally high, which is consistent with a positive role for some types of government intervention in resolving default. However, the interventions in the early years of the 1980s debt crisis were associated with very low returns. One thing is certain: with further empirical and theoretical work, the prospects of realizing positive welfare gains from the reform of the international financial system become stronger.

APPENDIX

Two Centuries of Default

Data on the incidence of default are taken from Suter (1992) up to 1989, and are extrapolated forward to 2000 using data from various issues of the World Bank's *Global Development Finance.*

Portfolio Assets

Data on bilateral holdings of portfolio investment assets for 2001 come from the IMF's *Coordinated Portfolio Investment Survey.* Bilateral pairs for which data were not available were omitted. The corresponding real trade flows data come from the IMF's *Direction of Trade Statistics.*

Gross and Net Capital Flows

Gross capital flows are notoriously difficult to measure. The measure we construct is no more than a coarse lower bound, and is based on summing the absolute value of each debit and credit category within the capital and financial account for each country, and then aggregating over countries. These data came from the IMF's *International Financial Statistics.* Note that not all countries report capital flows at the same level of disaggregation. For the purpose of constructing this series, the level of disaggregation was to include data from the capital account, for which credits and debits are recorded separately, as well as credits and debits from within the financial account for direct investment, portfolio investment, financial derivatives, and other investments. That is, the breakdown of portfolio investment into equity and debt, and of other investments by sector (central bank, government, banks, and other), was not included. The subset of developed economies was defined as the membership of the OECD in 1991, excluding Turkey. Net capital flows are defined as the average current account deficit of a country, in absolute value.

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Monetary Sovereignty, Exchange Rates, and Capital Controls: The Trilemma in the Interwar Period

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The interwar period was marked by the end of the classical gold standard regime and new levels of macroeconomic disorder in the world economy. The interwar disorder often is linked to policies inconsistent with the constraint of the open-economy trilemma—the inability of policymakers simultaneously to pursue a fixed exchange rate, open capital markets, and autonomous monetary policy. The first two objectives were linchpins of the pre-1914 order. As increasingly democratic polities faced pressures to engage in domestic macroeconomic management, however, either currency pegs or freedom of capital movements had to yield. This historical analytic narrative is compelling—with significant ramifications for today's world, if true—but empirically controversial. We apply theory and empirics to the interwar data and find strong support for the logic of the trilemma. Thus, an inability to pursue consistent policies in a rapidly changing political and economic environment appears central to an understanding of the interwar crises, and the same constraints still apply today. [JEL F33, F41, F42, N10]

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In the present era of globalization, one of the most difficult challenges for governments—and for those who advise them—is to understand the constraints under which policies must be designed in a world of increasing economic interdependence. Nowhere are these constraints more pressing than in the arena of monetary policy design in open economies, where the recent spate of economic crises in developing countries, from Mexico in 1994 to East Asia in 1997 to Argentina in 2001, highlighted the costs to be paid when the exchange rate regime unravels. In this paper we place the current quandary in a longer run context, and ask what lessons history has for contemporary problems. Our approach brings together theory, empirics, and history.

The theoretical foundation of this paper casts the choices faced by policymakers in terms of the classic macroeconomic trilemma: the idea that of the three policy objectives of a fixed exchange rate, open capital markets, and autonomous monetary policy, only two can be mutually consistent and, hence, tenable as stable features of the policy regime. The intuition is simple: when a country credibly and permanently pegs its exchange rate to some base country, and when capital is freely mobile, simple interest parity pins down the domestic interest rate, forcing it to be equal to the interest rate in the base country. We do not study what might be driving the intent of the authorities to manipulate nominal interest rates in the short run, but we take as given their desire to engage in active macroeconomic management over the business cycle and their belief that, due to short-run nominal rigidities, such intervention might be effective.

We will also take it as given—even uncontroversial—that the defining role of a sovereign monetary authority is that it will exercise such powers, when feasible and desirable, and this will affect liquidity, and hence interest rates, at the short end of the market. Some deeper questions intrude, however, especially with regard to feasibility and desirability. On feasibility, in contrast to the stark prescriptions of the trilemma, we know that intervention can be more continuous than dichotomous, sometimes as a result of authorities' decisions not to peg to a fixed rate, but instead to limit exchange rate movements to a band or "target zone." As has been recognized in the literature at least since the writings of Goschen (1861), this can leave some wiggle room for monetary policy—but how much? On desirability, we also have to be careful about the intent (or objectives) of policymakers, versus their constraints (or choice set). Under some policy systems, such as the gold standard, intent was not really a matter of debate in theory, although economic historians have noted that substantial deviations were witnessed in practice (Bloomfield, 1959; and Scammell, 1965). Under alternative systems, such as inflation targeting or other nominal anchors, authorities may have varying degrees of freedom depending on the regime in place, and depending on the regime of the partner country. Thus convergence, or divergence, from international monetary regimes or operating rules—a function of history, politics, and ideology—may lead to greater or lesser degrees of synchronization in policymakers' actions.

Our approach to these difficulties is to develop a formal model as a benchmark to guide our interpretation of the empirical findings. Using a target-zone model, one can compute the extent to which policymakers create a divergence between

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short-term domestic and base-country interest rates under various policy scenarios. Different parameterizations allow such a model to capture both tight pegs (a narrow band) and nonpegs (an infinite band width), as well as varying degrees of activism on the part of policymakers as they seek to smooth out, or reinforce, monetary shocks from abroad.

The goal of the subsequent empirical work is to measure the extent to which changes in the relevant foreign "base" nominal interest rate pass through into the domestic nominal interest rate. The data provide some challenges. Sometimes care is needed to ensure that the correct base country is chosen, because at certain times in history this choice is not necessarily obvious. Furthermore, the status of a country with respect to the fixity of its exchange rate against any base currency is not always clear. Another difficulty arises from the near-nonstationarity of nominal interest rates in many historical periods. That feature of the data narrows our choice of techniques for both time series and panel estimation. With these problems addressed, however, the empirical method allows us to concentrate on the central predictions of the trilemma. To what extent do countries that peg and have open capital markets lose their monetary sovereignty? And do they recoup it when they resolve the trilemma in other ways—either by allowing the exchange rate to float, or by imposing capital controls? By dividing our sample according to exchange rate regime and capital control criteria, we can examine these questions.

The trilemma is not necessarily an easy proposition to test, but we view our approach as one of the more direct ways to explore its validity. Previous empirical tests of the trilemma have produced mixed results. Often the test has been indirect, as with the literature on the so-called "exchange rate disconnect" (Baxter and Stockman, 1989; and Flood and Rose, 1995). These authors saw very little difference in the statistical properties of real and nominal economic fluctuations in fixed versus floating rate episodes, *except* for the volatility and comovement of real and nominal exchange rates. As a corollary it could be inferred that the trilemma trade-offs might not impinge so tightly. Yet such an inference would clearly depend on additional maintained assumptions, in particular about the horizon over which autonomy can be presumed to have an effect. Further, since the data used for these analyses was of low frequency, it could very well understate the ability of monetary authorities to exert some high-frequency autonomy, even if they are subject to other constraints, such as real interest rate equality, at longer horizons.[1]

A more direct approach to testing the trilemma was taken by Rose (1996) who compared the predictions of a monetary model of exchange rates, based on money aggregates and outputs, with actual exchange rate movements, conditional on capital controls and the exchange rate regime. His results were somewhat consistent with the trilemma, but still weak. It could be argued that one source of weakness was the use of the monetary model, which seems to perform poorly at higher frequencies,

[1]Indeed, the one "robust result" cited by Flood and Rose is a negative relationship between exchange rate and output variability (Flood and Rose, 1995, p. 18). That pattern is consistent with a role for exchange rate flexibility in dampening output fluctuations.

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due to unstable money demand, and which is therefore unable to cleanly capture the high-frequency content of the trilemma. A natural alternative is to measure monetary policy not by a quantity, money stocks, but by a price, namely the actual instrument used by most central banks to impose their policy—the short-term interest rate. Ours is one of several recent studies to follow this tack (Frankel, Schmukler, and Servén, 2002; Obstfeld, Shambaugh, and Taylor, 2004; and Shambaugh, 2004).

We choose to bring these theoretical and empirical tools to bear on one of the most turbulent periods in the history of the international macroeconomy—the interwar period. In the next section we explore the history of that period, where the narratives tell of a crisis in which the implications of the trilemma were suddenly more apparent than ever before. Subsequent sections discuss our theoretical simulations, describe the data we employ, and present the empirical results. A concluding section sums up the lessons learned and their relevance today.

I. Trilemma in the Interwar Period

After introducing our footholds in theory and empirics, we now turn to history and the interwar period, which is the object of study in this paper. The period's relevance is clear: arguably it was in this epoch that the trilemma forcefully made its presence felt for the first time in the great debate over the political economy of macroeconomics. For that reason, the trilemma idea resonates strongly with economic historians, who tend to understand the evolution of the global macroeconomic order in those terms. In the interwar period, all the key ingredients of the trilemma came into collision (Eichengreen, 1996; and Obstfeld and Taylor, 1998, 2004).

In 1913, the ideology of the classical gold standard still held sway, and international capital market integration had reached its zenith, leaving the authorities with little room for maneuver. The rise of more democratic polities led policymakers to seek greater autonomy than the old "rules of the game" permitted. Conventional wisdom argues that such a combination of inconsistent elements set the gold standard up for its swift demise following a brief reconstruction in the 1920s, a key part of the wider collapse of globalization seen during the interwar years (Temin, 1989; and James, 2001). Some have further argued that this crisis reflected a fundamental conflict between economic globalization, or at least its macroeconomic manifestation in the gold standard, and the advance of democracy, a tension that would perhaps henceforth place limits on the role of markets under the modern nation-state, although the recent so-called return to globalization has seemingly reversed that trend (Polanyi, 1944; Yergin and Stanislaw, 1998; Lindsey, 2002; and Tortella, 2003). This is the history, therefore, not of a far-removed past but a close precursor of the present, and the same trilemma clearly has relevance for the choices facing policymakers today. Once again, capital markets are increasingly fluid, an air of experimentation surrounds exchange rate regime choice, and the loss of monetary sovereignty is an issue of burning interest, especially to emerging-market countries.

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Thus, the interwar period stands as a defining moment in the history of modern political economy and macroeconomics, and the trilemma was the issue at the very center of events. The historical record provides plenty of examples and anecdotes consistent with this story. Witness the heated debate over gold resumption at par in Britain, pitting Keynes against conventional opinion, as general labor unrest simmered in the background; or, under conditions of equal or greater social foment, consider the tortured compromises by French politicians in the run-up to Poincaré's resumption at a devalued parity, and the continuing policy uncertainty as France clung to gold until 1936. Yet, despite all of this suggestive evidence, we are unaware of any research that formally and directly tests for the presence of the trilemma, and examines its potency, in the macroeconomic crucible of the interwar years.

Unfortunately, this is to some degree understandable given the chaotic nature of the period. Serious empirical work of the kind we envisage requires high-frequency data collection for interest rates and clear records of the capital control and exchange rate regimes for each country. The task is daunting for the years between the wars, as data can be collected only with difficulty and with substantial noise. Regime definition is often imprecise and certainly volatile. Many countries changed their peg and capital control status several times. Some countries were off gold but really "shadowing" the gold standard in a desperate attempt eventually to rejoin. Capital control policies varied by country in their degree of strictness. Our own work has previously examined the trilemma empirically in the pre-1914 and post-1945 periods, where the empirical challenges are somewhat fewer (Obstfeld, Shambaugh, and Taylor, 2004). We have since, however, constructed an interwar database that allows us to put the trilemma to the test at perhaps its most critical historical moment.

Looking on the bright side, the extreme variation in conditions during the interwar sample period is, of course, good news from the econometric standpoint. Whereas our previous work compared economic experiences separated by many decades, and sometimes a century or more, the interwar period supplies all the variation we could hope for in the space of 10 or 15 years. In that brief window, fixes and floats, controls and free markets were all tried here and there. We therefore find ample power to identify the effects we study, although sometimes the extremely short duration of peg and float episodes makes univariate time-series analysis difficult. The interwar period also follows hard on the heels of an ideal benchmark era against which we can compare our results—the classical pre-1914 gold standard. Accordingly, we shall refer back to results for that period as a basis for judging the behavior of the interwar regimes. Along the way, we also gain an opportunity to consider some related hypotheses, for example, the much-discussed switch of the world financial center from London to New York after World War I, considered essential to the hegemony theory of an evolution from a British- to a U.S.-led world order (Kindleberger, 1986).

The central aim, however, is to test the power of the trilemma as an explanatory tool. To lay the groundwork for that test, we now turn to some important theoretical considerations that help buttress our econometric approach and subsequent interpretations of the results.

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II. Empirical Methodology and Rationale

The starting point for our econometric analysis is a panel regression of the form

$$\Delta R_{it} = \beta \Delta R_{bit} + u_{it}, \tag{1}$$

where R_{it} is the nominal interest rate in country i on date t, R_{bit} is the interest rate in the "base" country, and u_{it} is a random shock.[2] Under perfect international capital mobility and an exchange rate credibly pegged with a zero fluctuation band, we would expect to find ordinary least squares (OLS) estimates of $\hat{\beta} = 1$ and $R^2 = 1$. In practice, however, the actual estimates differ from this hypothetical benchmark case, and we wish to know if there are systematic differences in the size of $\hat{\beta}$ between pegged exchange rate regimes and nonpegs. Our claim is that such divergences inform us about the scope for interest rate management, and therefore for monetary policy independence, under alternative exchange rate regimes. As an alternative way to measure the impact of a peg on the sensitivity of domestic to foreign interest rates, we pool data from peg and nonpeg regimes and look at the magnitude of $\hat{\beta}_2$ in the regression

$$\Delta R_{it} = \beta_1 \Delta R_{bit} + \beta_2 (\Delta R_{bit} \times PEG_{it}) + u_{it}, \tag{2}$$

where PEG_{it} takes the value 1 if country i pegs to the base currency at time t and 0 otherwise.

We focus our theoretical discussion on the key slope coefficient β in equation (1), though we also consider the fit of that equation in our empirical results. A convenient starting point for interpreting estimates of equation (1) is the generalized uncovered interest parity relationship

$$R = R_b + \varepsilon + v, \tag{3}$$

where ε is the expected depreciation rate of the domestic currency (over a horizon corresponding to that of the interest rates R and R_b) and v is a random, mean-zero, excess return or risk premium that, for convenience, we take to be exogenous. Given the model of equation (3), the OLS estimate of β in the difference regression (1) satisfies

$$\begin{aligned} \text{plim}\, \hat{\beta}_{\text{DIFFS}} &= \text{plim} \frac{\sum_t (\Delta R_t \cdot \Delta R_{bt})}{\sum_t (\Delta R_{bt})^2} = 1 + \text{plim} \frac{\frac{1}{T}\sum_t (\Delta \varepsilon_t \cdot \Delta R_{bt})}{\frac{1}{T}\sum_t (\Delta R_{bt})^2} \\ &= 1 + \rho(\Delta \varepsilon_t, \Delta R_{bt}) \frac{\sigma(\Delta \varepsilon_t)}{\sigma(\Delta R_{bt})}, \end{aligned} \tag{4}$$

[2]Variants of this methodology are followed in the precursor papers by Frankel, Schmukler, and Servén (2002), Obstfeld, Shambaugh, and Taylor (2004), and Shambaugh (2004). We omit fixed effects from the preceding equation on the grounds that deterministic trends in nominal interest rates are implausible; and, in practice, when we include such fixed effects they are estimated to be indistinguishable from zero.

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where ρ is a correlation coefficient, σ is a standard deviation, and T is sample size. The second term on the right-hand side of equation (4) captures the average response of exchange rate expectations to changes in the base interest rate. Under interest parity, if a rise in the foreign base interest rate is accompanied by a smaller absolute rise in the domestic interest—as would be the case under a system of domestic interest rate smoothing by the monetary authority—then the expected rate of currency depreciation, ε, must simultaneously *fall.* This could be accomplished by allowing the domestic currency to depreciate sufficiently in the foreign exchange market to induce a higher expected rate of future appreciation (that is, a lower expected rate of future depreciation). In that case, the average $\Sigma_t(\Delta\varepsilon_t \cdot \Delta R_{bt})/T$ is negative for large enough T, as is the correlation coefficient $\rho(\Delta\varepsilon_t, \Delta R_{bt})$, and $\hat{\beta} < 1$. Alternatively, were the home monetary authority to reinforce the effect of foreign interest shocks, one would expect $\hat{\beta} > 1$. Thus, the coefficient β measures the extent to which domestic monetary policy has (and uses) the scope to respond to foreign interest rate shocks.

An alternative specification would be the analog of equation (1) in interest rate *levels* rather than differences,

$$R_{it} = \alpha + \beta R_{bit} + \eta_{it}. \tag{5}$$

Such a strategy seems inadvisable in light of the persistence of nominal interest rates in our data. For the interwar period, the monthly series of U.S. interest rates displays an autocorrelation coefficient of 0.99 in monthly data, and for the vast majority of other interest rates in our sample the presence of a unit root cannot be rejected statistically.[3] Thus, the assumption of a unit root in interest rates is a good approximation to the data.

Under a unit root, however, estimation in levels of interest rates yields

$$\text{plim}\,\hat{\beta}_{\text{LEVELS}} = \text{plim}\,\frac{\sum_t (R_t \cdot R_{bt})}{\sum_t (R_{bt})^2} = 1 + \text{plim}\,\frac{\sum_t (\varepsilon_t \cdot R_{bt})}{\sum_t (R_{bt})^2} = 1,$$

assuming the expected depreciation rate is statistically stationary. Because the stochastic trends in the interest rates dominate, levels estimates are not well suited to yield information about interest rate independence. If international interest rates are not cointegrated, the spurious regression problem stressed by Shambaugh (2004) can arise. In the data, we find that the residual terms in equation (1) are approximately serially uncorrelated.

To evaluate these claims, as well as to aid in interpreting the empirical results, we perform Monte Carlo experiments using simulated data based on a formal model of exchange rate target zones. The basic model comes from Krugman (1991) and has been extended by Flood and Garber (1991), Froot and Obstfeld (1991), Svensson (1991), and others. To generate interest rates of noninstantaneous maturity, we utilize Svensson's (1991) account of the term structure of interest rates

[3]In contrast, under the pre-1914 gold standard, nominal interest rates appear stationary. Apparent nonstationarity is the rule after World War II, as during the interwar period.

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within a target zone. We compare the results of interest rate regressions under a narrow target zone (bands of ±1 percent) and a freely floating exchange rate.

It is helpful to give a brief description of the model that we use in these simulations.[4] The time-t log exchange rate, $e(t)$, is defined as the home price of foreign currency. It is determined by the forward-looking pricing equation

$$e(t) = x(t) + \eta \frac{\mathrm{E}_t\{\mathrm{d}e(t)\}}{\mathrm{d}t},$$

where $x(t)$ is a "fundamental" economic variable driving currency value (for example, the home less the foreign money supply) and $\eta > 0$. The fundamental x follows a mean reverting process of the form

$$\mathrm{d}x = -\xi x \mathrm{d}t + \sigma \mathrm{d}z, \tag{6}$$

where $\mathrm{d}z$ is Gaussian noise.[5] Under these assumptions, and an allowable (reflecting) fluctuation band $[\underline{e},\bar{e}]$ for the exchange rate, there is a unique price solution $e = s(x)$, from which the expected depreciation rate of the domestic currency,

$$\frac{\mathrm{E}_t\{\mathrm{d}e\}}{\mathrm{d}t} = -\xi x s'(x) + \frac{\sigma^2}{2} s''(x),$$

follows from Itô's Lemma.[6]

The preceding equation defines an *instantaneous* expected depreciation rate. The interest rates available for empirical analysis apply, however, to finite maturities. Svensson (1991) shows that when uncovered interest rate parity holds, we can approximate the international interest differential at maturity m by

$$\delta(m,x) = \frac{f(m,x) - s(x)}{m},$$

where $f(m,x)$ is the exchange rate expected to prevail after an interval of positive length m has elapsed.[7] We specify the base foreign interest rate R_b^m of the relevant maturity to follow a random walk, constrained only by a lower bound of zero. In

[4]A more detailed description of the model and methodology can be found in Obstfeld, Shambaugh, and Taylor (2004).

[5]In Krugman's (1991) original model, $\xi = 0$. Under that assumption, however, exchange rates would follow a random walk under a free float, minimizing international interest differentials. To get a better sense for the scope for interest rate independence under a float, we therefore consider the case $\xi > 0$ in our simulations, following Froot and Obstfeld (1991).

[6]The exchange rate solution under a free float, such that $[\underline{e},\bar{e}] \to [-\infty, +\infty]$, is simply:

$$e = \frac{x}{1 + \eta\xi}.$$

[7]Of course, $f(0,x) = s(x)$. Think of m as a fraction of a year.

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line with equation (3), which incorporates a deviation v from interest parity, the domestic nominal interest rate of maturity m is then modeled as

$$R^m = R_b^m + \delta(m,x) + v.$$

We interpret the error v as an empirical, serially uncorrelated and exogenous departure from the underlying economic model. Svensson (1991) shows how to solve for the term expected depreciation rate $\delta(m,x)$. In our simulations, R^m has a lower bound of zero. We further constrain the noise v to preclude pure arbitrage profits in the target zone case (that is, we rule out interest differentials larger than the maximum capital loss allowed by the bands). That further constraint is necessary when the bands are permanent and fully credible, as we are assuming.

In practice we approximate equation (6) by a discrete-time process sampled at intervals of $h = 10$ minutes. The base interest rate's level is generated as a random walk modified by a nonnegativity constraint. Innovations in the base interest rate and the domestic fundamentals are drawn from a bivariate normal distribution. A key parameter in the simulated data is $\rho(\Delta z,\Delta R_b)$, defined as the instantaneous correlation between the innovation in the base interest rate $R^m_{bi,t} - R^m_{bi,t-h}$ and the innovation in fundamentals, $z_t - z_{t-h}$. To interpret $\rho(\Delta z,\Delta R_b)$, think again of $z_t - z_{t-h}$ as the innovation in the home less foreign money supply (in logs). In that case, a positive $\rho(\Delta z,\Delta R_b)$ signifies a tendency for domestic money to increase relative to foreign money when the foreign interest rate rises, an outcome that would dampen the response of the home to the foreign interest rate. In contrast, when $\rho(\Delta z,\Delta R_b) = 0$ that response is one-for-one, whereas for $\rho(\Delta z,\Delta R_b) < 0$, instead of interest rate smoothing by the domestic central bank, we have the opposite: policy action to reinforce the domestic impact of the foreign interest rate movement.

Because expected depreciation ε is *decreasing* in the fundamental x,[8] the correlation coefficient $\rho(\Delta\varepsilon,\Delta R_b)$ in equation (4) is an *inverse* function of $\rho(\Delta z,\Delta R_b)$. As a result, setting $\rho(\Delta z,\Delta R_b) > 0$ results in $\rho(\Delta\varepsilon,\Delta R_b) < 0$ and, by equation (4), in $\hat{\beta} < 1$. Conversely, setting $\rho(\Delta z,\Delta R_b) < 0$ yields $\hat{\beta} > 1$.

Table 1 shows the mean estimates and dispersion based on 1,000 replications of a 30-year history. We consider both a target zone with quite narrow bands (±1 percent, that is, $[\underline{e},\bar{e}] = [-0.01,0.01]$) and a floating regime.[9] The simulation analysis produces three-month rates of interest under alternative policy settings of $\rho(\Delta z,\Delta R_b) = 0.8$, 0.5, 0, and –0.5.[10]

[8]The validity of the last claim follows from both the mean reversion in the fundamentals process and the curvature of the exchange rate solution function, $s(x)$.

[9]We note that a target-zone width of ±1 percent corresponds to the Bretton Woods fluctuation bands against the U.S. dollar, and is considerably narrower than the bands that have characterized the European Exchange Rate Mechanisms. A band width of ±1 percent also is not far off estimates of the target zone induced by gold points prior to 1914.

[10]Table 1 reports results for three-month rates because that maturity is typical in our empirical analysis. We examined overnight rates in simulations that are not reported here. At that maturity the international linkage is somewhat weaker, as one would expect, although the differences from the numbers in Table 1 are not huge. For the simulations, we calibrate the annual standard deviation of the innovation in R_b^m to that in the annual average end-of-month Federal funds rate (1975–2001). We calibrate the annual standard deviation of the innovation in fundamentals, x, to that in the annual average end-of-month dollar-

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Table 1. Simulated Estimates of β and θ
(Three-month interest rates)

Regime	$\hat{\beta}_{DIFFS}$	R^2_{DIFFS}	$\hat{\beta}_{LEVELS}$	R^2_{LEVELS}	$\hat{\theta}$
$\rho(\Delta z, \Delta R_b) = 0.8$					
Target Zone (±1%)	0.50	0.13	0.83	0.83	–0.22
	(0.07)		(0.12)		(0.07)
Float	0.16	0.02	0.61	0.52	–0.10
	(0.07)		(0.22)		(0.05)
$\rho(\Delta z, \Delta R_b) = 0.5$					
Target Zone (±1%)	0.69	0.20	0.89	0.84	–0.21
	(0.08)		(0.12)		(0.06)
Float	0.46	0.05	0.76	0.49	–0.09
	(0.08)		(0.26)		(0.04)
$\rho(\Delta z, \Delta R_b) = 0$					
Target Zone (±1%)	0.99	0.33	1.00	0.86	–0.20
	(0.08)		(0.13)		(0.06)
Float	0.97	0.27	0.98	0.67	–0.09
	(0.10)		(0.26)		(0.04)
$\rho(\Delta z, \Delta R_b) = -0.5$					
Target Zone (±1%)	1.28	0.43	1.10	0.86	–0.20
	(0.10)		(0.13)		(0.06)
Float	1.44	0.47	1.19	0.77	–0.10
	(0.17)		(0.25)		(0.04)

For policy regimes ranging from $\rho(\Delta z, \Delta R_b) = 0.5$ (partial interest rate smoothing) to $\rho(\Delta z, \Delta R_b) = 0.8$ (more aggressive interest rate smoothing), Table 1 shows that the mean slope estimate $\hat{\beta}_{DIFFS}$ from the differences specification, equation (1), is in a range of 0.7 to 0.5. An intermediate figure is 0.6—far below unity despite the rather narrow target zone. In the corresponding floating-rate regimes, $\hat{\beta}_{DIFFS}$ is considerably below its value in the target-zone cases, suggesting substantially more interest rate independence at the short end. For $\rho(\Delta z, \Delta R_b) = 0.8$ the mean estimate is only 0.16. Nonetheless, for $\rho(\Delta z, \Delta R_b) = 0.5$, the mean estimate of $\hat{\beta}_{DIFFS} = 0.46$ under a float remains sizable. As expected, the average measure of fit, R^2_{DIFFS}, also varies across regimes with target zones generating a range of 0.13 to 0.20 and floats 0.02 to 0.05. The fact that these are so far from the predicted value of 1 if there is no smoothing provides important context for the empirical results.

When $\rho(\Delta z, \Delta R_b) = 0$, meaning that interest rates are not smoothed at all, the estimate of $\hat{\beta}_{DIFFS} \approx 1$ reflects that domestic interest rates now are moving basically in tandem with the base rate, under both the target zone and the float. For $\rho(\Delta z, \Delta R_b) = -0.5$, $\hat{\beta}_{DIFFS}$ exceeds 1 because foreign interest rate movements are reinforced, not

mark (starting in 1999, dollar-euro) exchange rate (1975–2001). Finally, we take the standard deviation in the exogenous noise v to be 20 basis points for interest rates expressed on an annual basis. The behavioral parameter η, the implicit (absolute) interest semielasticity of money demand, is set to 4. At a nominal interest rate of 5 percent per year, the implied interest elasticity of money demand would be –0.2, the value cited by Romer (2001, p. 470). We set $\xi = 1.5$.

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offset, by domestic policy. The effect is stronger under a float than under a target zone. Under a float, the effects of fundamentals on the exchange rate, and hence, the interest rate responses, are not muted by expected intervention at the band edges.

The results of estimating the levels specification, equation (5), are reported in the column of Table 1 labeled $\hat{\beta}_{\text{LEVELS}}$. These results are as expected when the base interest rate, R_{bit}, has a unit root. The levels estimates $\hat{\beta}_{\text{LEVELS}}$ are much closer to unity than $\hat{\beta}_{\text{DIFFS}}$ under all policy settings, and as a result, the estimated differences between the target zone and the float are much less evident than in the less compressed differences estimates. We have experimented with simulated sample periods out to 100 years and find that while the differences estimates remain quite stable, the levels estimates (as one would expect) move markedly in the direction of unity as the sample period is lengthened. The levels estimates obscure the contrasts between regimes in finite samples, and will hide them entirely as the time-series sample grows arbitrarily long. The values of R^2_{LEVELS} are high due to the common trend in foreign and domestic interest rates.

In practice we estimate equation (1) on a panel of annual year-average interest rate changes, so as to minimize international asymmetries caused by different short-term dynamic adjustment patterns to foreign interest rate changes. We pursue an additional estimation strategy, however, that focuses directly on the dynamics of adjustment. If the interest rate data are indeed statistically nonstationary, an error-correction specification can be used to analyze the dynamics of monthly data. In practice one cannot be sure the data are $I(1)$ rather than $I(0)$. To maintain an agnostic view on stationarity, we employ a technique proposed by Pesaran, Shin, and Smith (2001), henceforth PSS, in which an error-correction form is estimated but different critical values are applied to the $I(1)$ and $I(0)$ cases.[11] Only when test statistics lie in an intermediate range must inference rely on an assumption about the order of integration.

The PSS technique relies on the specification

$$\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \theta(c + R_{it-1} - \gamma R_{bi,t-1}) + u_{it}, \tag{7}$$

where lags of ΔR_{it} and ΔR_{bit} are included as necessary and γ is a cointegrating coefficient. The significance and absolute magnitude of the coefficient θ, which we expect to be *negative,* if local interest rates adjust back toward the base rate after a shock, reflect the strength of the adjustment forces. In the monthly data we use, a coefficient of $\theta = -0.5$ would imply a half-life of one month. Other things being equal, faster adjustment is an indicator of a less autonomous monetary policy. For nonstationary data we would expect $\gamma = 1$, in which case one could impose that equality on the equation before estimating θ.

The final column of Table 1 reports mean simulated values of the estimate $\hat{\theta}$ from equation (7). The estimates average to around –0.2 under a target zone and about –0.1 under a float, with the result fairly insensitive to the extent of short-run interest rate smoothing. The implied half-lives of shocks are under three months for a target zone but roughly seven months for floats.

[11]This technique is also used by Frankel, Schmukler, and Servén (2002).

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III. Data

Interest Rate Data

To test the trilemma's predictions, we must describe the different policy options countries are pursuing. As noted above, we view the short-term nominal interest rate as the instrument of a country's monetary policy and the extent of comovement of the local nominal interest rate with a nominal base-country interest rate as an (inverse) expression of monetary policy autonomy.

Our core data are all monthly. Short-term nominal interest rates for 16 countries in the years 1919–38 come from Global Financial Data (GFD, *www.globalfindata.com*). In general these data were originally reported in League of Nations sources. The data are listed as "bills" or "banker's bills" (typically of three-months' maturity). We add data for Switzerland, available in the Federal Reserve's *Banking and Monetary Statistics* (1943). The League of Nations *Statistical Yearbooks* reported annual averages of monthly interest rates for Chile and Denmark, and we use these data as well. All three added series are market rates of discount. When available in both sources, the GFD interest rate series match almost exactly the data for private discount rates listed in the Federal Reserve's *Banking and Monetary Statistics.* As noted earlier, in the differences regressions, monthly interest rates for a particular year are averaged to yield annual observations. Table 2 lists the countries and data that are available.

All interest rates are expressed in the form $\ln(1 + R)$. While this transformation has a trivial impact for moderate interest rates, it does shrink the impact of

Table 2. Countries in Sample

	Frequency	Dates Available	
Austria	monthly	1/1923	6/1931
Belgium	monthly	5/1919	12/1938
Bulgaria	monthly	1/1928	12/1938
Chile	annual	1929	1936
China	monthly	1/1928	12/1938
Czechoslovakia	monthly	1/1926	12/1938
Denmark	annual	1926	1938
France	monthly	1/1922	12/1938
Germany	monthly	1/1919	12/1938
Hungary	monthly	7/1924	12/1938
India	monthly	4/1921	12/1938
Italy	monthly	1/1922	12/1938
Japan	monthly	1/1919	12/1938
Netherlands	monthly	1/1919	12/1938
Romania	monthly	1/1929	12/1938
Sweden	monthly	1/1926	12/1938
Switzerland	monthly	1/1924	12/1938
United Kingdom	monthly	1/1919	12/1938
United States	monthly	1/1919	12/1938

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outliers. In addition, the German hyperinflation is removed to prevent the massive interest rate swings during that relatively short episode from overwhelming the rest of the data. Thus, observations for Germany from 1923–25 are eliminated.

Because we are interested in comovements with the base interest rate, an important choice is that of the center-country or base nominal interest rate. Under typical post–World War II fixed exchange rate regimes, countries have pegged to other countries, thereby revealing their particular bases. In theory, however, a multilateral gold standard regime differs, in that monetary changes in any country affect the system as a whole, and there is symmetric adjustment. More practically, however, one thinks of a de facto center country, namely, Great Britain, at least under the pre-1914 gold standard. In contrast to the classical gold standard, though, there is no clear base country for the system as a whole during the interwar years. While the United States returned fully to the gold standard immediately after World War I, it is not clear that the United States was the sole base for the system. Indeed, the U.S. dollar itself did not remain fixed against gold throughout the entire era (Franklin Roosevelt devalued the dollar-gold exchange rate in 1933). Sterling was not convertible into gold for much of the period; Britain remained on gold only for about 77 months, so Britain is not an ideal base country either. France played a major role in the setting of policies because of its successful attempt to amass large quantities of gold reserves, but it did not repeg to gold on a de jure basis until 1928, two years after the Poincaré macroeconomic stabilization, making it an inappropriate choice as a base country early on in the time period that we study. Because the United States and France held the majority of gold reserves, our default procedure is to use the U.S. interest rate for the early and late periods, and a combination of U.S. and French rates for the years France is on a de jure gold standard.[12] This base interest rate will be referred to below as the *gold interest rate.*[13]

Due to the lack of a clear center country, we consider a variety of base country interest rates as robustness checks. We checked all cases using the U.S. interest rate alone, as well as considering the British interest rate as the base rate, as a way of checking the assumption that Britain had ceased to be the center country. We also tried varying the base by local country to allow for the fact that, especially after 1931, the system broke down into smaller spheres of influence. We followed the coding that Eichengreen and Irwin (1995) use to describe currency blocs, dividing countries into Sterling countries (Denmark, India, Japan, and Sweden, using Britain as the base), Gold Bloc countries (Belgium, Italy, Netherlands, and Switzerland, using France as the base), Reichsmark countries (Austria, Bulgaria, Czechoslovakia, Hungary, and Romania, using Germany as the base), and other countries (China and Chile, using the United States as base).[14] While the cross-base

[12]Mouré (2002) discusses how many view France's gold policies as having had a strong impact on the system as a whole. This source also reports that France and the United States had the two largest national gold reserves and that, combined, they held 50 to 60 percent of the world's total stock of gold reserves.

[13]For annual differences regressions, this is simply the average of the change in the U.S. and French rates. For the levels analysis on monthly data, the U.S. rate is used up to 1928, and then that rate is adjusted going forward by the average change in the U.S. and French rates until 1936, after which it is adjusted by changes in the U.S. rate alone.

[14]In addition, we tried both simply eliminating the base countries or including them using the United States as the base rate for France, Germany, and Britain.

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comparisons are discussed below, we feel in general that the gold interest rate is the most appropriate choice for the base rate.

Exchange Rate Regime Coding

The exchange rate regimes are classified based on both the legal commitment of countries to gold (the de jure status) as well as the de facto behavior of the exchange rate. De jure coding is based on the dates given by Obstfeld and Taylor (2003). The de jure status is in some sense a combination of the exchange rate regime and capital control regime sides of the trilemma as countries are considered to be off gold if they restricted convertibility in any way. The de facto standard follows the coding for the post–Bretton Woods era developed in Shambaugh (2004). We ask whether the monthly exchange rate stayed within ±2 percent bands over the course of a year. In addition, single realignments are not considered breaks in the regime as long as the transition is immediate from one peg to another. Finally, single-year pegs are dropped as they are quite likely a simple lack of volatility and it is unlikely that there exists either commitment on the government's part or confidence in the market that the rate will not change.[15] We use the categories "peg" and "nonpeg" to classify currency regimes so as to emphasize that countries without pegged rates may not be "pure" floats in which exchange rate management is eschewed. Countries with nonpegs simply do not peg completely (according to our metric).

Because there is no single base country to which countries peg, exchange rates are tested for stability against gold by examining the exchange rate against the dollar during the dollar's peg to gold, and against the French franc in the two-year period (1933–34) of dollar instability against gold. This provides a full series of codes for the countries that stayed pegged to gold on a de facto basis.[16] Exchange rate data come from GFD.

Capital Control Status

To conduct our empirical analysis of the trilemma, we also need to code countries as to their use of capital controls. As mentioned, the de jure exchange rate regimes automatically incorporate this criterion. De facto capital control classifications have been created for more recent eras, but most are available only for a limited number of countries and a limited amount of time. Furthermore, some measures rely on interest differentials (the variable upon which we focus) and thus are not appropriate for the present study. No other clear source has been used to describe

[15]When pursuing differences regressions, we also drop the first year of a peg to avoid differencing interest rates across nonpegged and pegged observations. Shambaugh (2004) provides an extensive discussion of different de facto classifications. Recent work by Reinhart and Rogoff (2004), which uses data on parallel exchange rates, is not directly relevant to the present paper. Countries with parallel exchange markets employ capital controls to separate commercial from financial transactions, and for that reason alone are likely to enjoy some degree of monetary independence.

[16]As an alternative, we also looked at the years the League of Nations listed a country as pegging to gold. The results are consistent with those reported below.

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capital controls in this era before. We turn to two sources to generate our own coding of capital controls. The League of Nations publication *Legislation on Gold* (1930) gives a history of when countries returned to gold convertibility, so we are able to code at what point after World War I countries opened their capital markets to gold flows. In addition, the League of Nations' *Monetary Review* (1938) provides a table that describes when countries put in place exchange controls in the 1930s (Appendix Table 1, p. 107). Combining these sources gives us our measure of capital controls. Clearly, this binary measure is imperfect in capturing the range of effectiveness that various controls may have had, but we feel that it provides a useful indication of the countries trying to create breathing room by limiting cross-border financial flows.

Individual Country Episodes

For the dynamic time-series analysis based on specification (7), we study monthly data on individual country/regime episodes. Two types of episodes are examined. First we look at the de jure coding, which gives us 13 pegged episodes and 21 nonpegged episodes (half of them occurring prior to the reconstituted gold standard, and half after). We also use our exchange rate regime coding methodology to generate a monthly classification of the currency regime in effect. We follow much the same method as for annual data, checking that the exchange rate has stayed within ±2 percent bands over the preceding 12 months. We then combine this information with our dates for capital controls to generate four types of episode: open pegs, closed pegs, open nonpegs, and closed nonpegs. Brief episodes of less than three years are excluded as too short to allow informative time-series inference. There are 11 open pegs, 3 closed pegs, 4 open nonpegs, and 3 closed nonpegs.

Unit Roots in Interest Rates

While the methodology section considers the fact that many time series of nominal interest rate data are difficult to distinguish from unit roots, this is not necessarily true for the classical gold standard era. While showing persistence, the British interest rate, the clear base rate under the classical gold standard, is relatively stable as are the interest rates of most other gold standard countries. On the other hand, the interwar years appear to resemble the Bretton Woods or post–Bretton Woods eras, in that the interest rates of most countries show very strong serial correlation. Figures 1a, 1b, and 1c show the interest rates for the United States, France, and the combined gold interest rate. For comparison, Figure 1d shows Britain's interest rate during the classical gold standard.

Simple tests on monthly base and local interest rates back up this ocular evidence that interwar interest rates are highly persistent. The autocorrelation coefficient for the U.S. rate is 0.99. The average autocorrelation coefficient for the other countries is 0.96. More formally, we apply the unit root test suggested by Elliott, Rothenberg, and Stock (1996), using the modified Akaike Information Criterion of Ng and Perron (2001) to determine the appropriate number of lags to include. In addition, we test for stationarity using the KPSS test of Kwiatkowski, Phillips,

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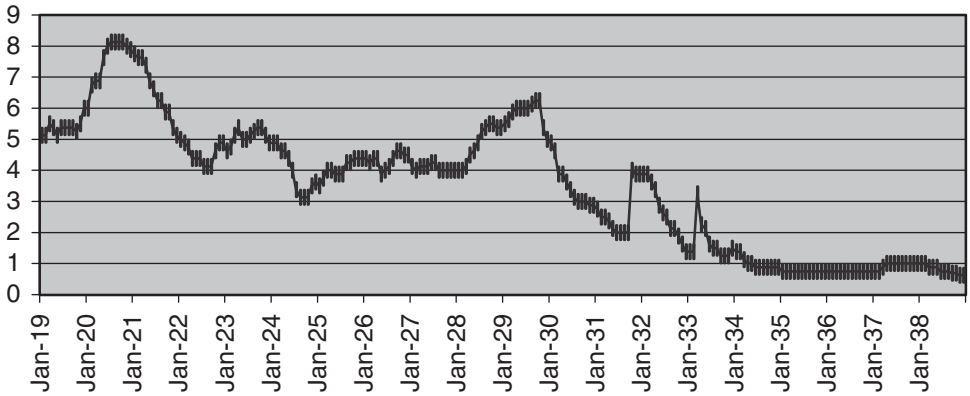
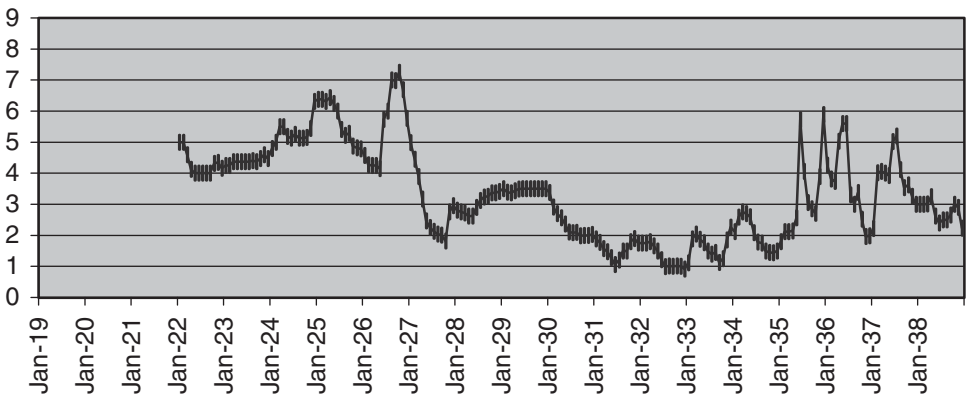
Figure 1a. United States' Interest Rate in the Interwar Years



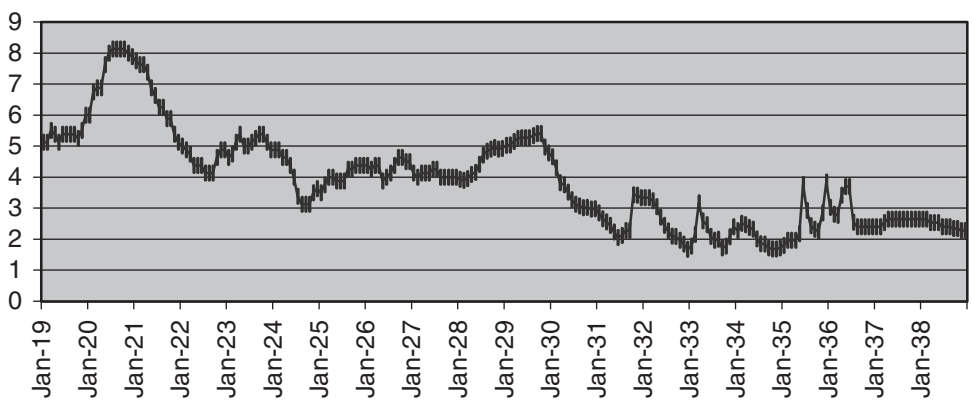
Source: Global Financial Database.

Figure 1b. French Interest Rate in the Interwar Years



Source: Global Financial Database.

Figure 1c. "Gold Interest Rate" (Gold R) in the Interwar Years



Source: Global Financial Database and author's calculations (described in text).

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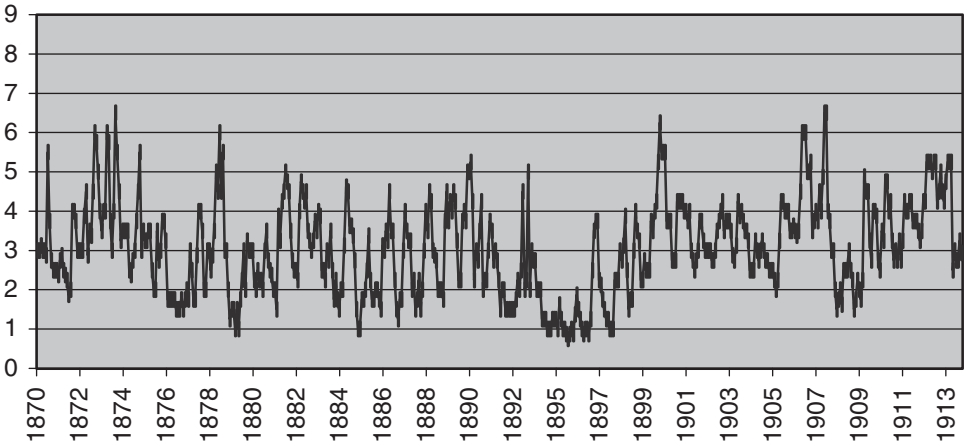
Figure 1d. United Kingdom Interest Rate in the Classical Gold Standard



Source: Neal and Weidenmier (2003).

Schmidt, and Shin (1992), in which the null is stationarity rather than nonstationarity. For 12 countries, we cannot reject a unit root, but we can reject stationarity, implying that the interest rates are either nonstationary or very close. For three countries the data reject a unit root and cannot reject stationarity, while in one case the data can reject both, and in one case neither. As a general conclusion, the very high persistence in the data suggests that inference will be more reliable if they are treated as if they contain unit roots.

IV. Results

Results Based upon Pooled Differences

We begin by presenting results for the differences equation (1), based on the de facto currency regime coding and using the gold interest rate as the base rate. Additional specifications show results for alternative classifications and alternative base interest rates.

The core empirical result of the paper is shown in Table 3, which reports estimates of equation (1). The results are obtained by OLS, using robust standard errors clustered at the country level. This procedure, along with the use of differenced data, removes problems of both serial correlation and heteroskedasticity that could be present in the panel. Also, because the data are in panel form, one may consider using fixed effects; but as the data are differenced, a constant fixed effect would imply an implausible constant rate of change over time. In any event, allowing for fixed effects has no impact on the estimates in practice, and the estimated fixed effects are always zero.[17] Examining Table 3, we see a difference between the way pegged

[17]Observations for France are dropped for years in which its interest rate is a component of the base interest rate. Dropping France altogether has no substantial impact on the results. The United States is dropped in all years, as its rate is always a component of the base interest rate.

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Table 3. Core Results
(Uses gold interest rate as the base interest rate)

Dependent Variable: ΔR_{it}

	1 Full	2 df Pegs	3 df Nonpegs	4 dj Pegs	5 dj Nonpegs
β ($\Delta goldR_{it}$)	0.300	0.567	0.128	0.720	0.072
std error	(0.116)*	(0.134)**	(0.178)	(0.144)**	(0.185)
Observations	240	109	106	66	163
R-squared	0.04	0.16	0.01	0.33	0.00

Notes:
df = de facto classification, dj = de jure classification.
Robust standard errors in parentheses.
*significant at 5 percent; **significant at 1 percent.

countries and those that are not pegged react to the base interest rate. Countries, on average, move with the base interest rate to some degree: β equals 0.30. However, pegs shadow the base rate much more closely than nonpegs: β for pegs is 0.57 (0.13) versus 0.13 (0.18) for nonpegs. These results are quite similar to the results for the classical gold standard, where the coefficient on pegs and nonpegs are, respectively, 0.52 (0.04) and 0.05 (0.09) (see Table 4). The estimates also are quite close to the earlier simulation results for the $\rho(\Delta z, \Delta R_b) = 0.8$ case (recall Table 1).

There is also a difference in the R^2 for pegs and nonpegs during the interwar years, as one would expect. The R^2 for the pegged sample is 0.16 versus 0.01 for the nonpegs. This difference matches the predictions of the trilemma, as the base country interest rate is a more important factor determining the local country inter-

Table 4. Results for Other Eras

Dependent Variable: ΔR_{it}

	Gold Standard Pegs	Gold Standard Nonpegs	Post BW Pegs	Post BW Nonpegs
β ($\Delta baseR_{it}$)	0.52	0.05	0.46	0.27
std error	(0.04)**	(0.09)	(0.04)**	(0.08)**
Observations	399	85	748	1103
R-squared	0.41	0.00	0.19	0.01

Notes:
Robust standard errors in parentheses.
*significant at 5 percent; **significant at 1 percent.

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est rate for pegs than for nonpegs. Again, these differences in R^2 are quite close to those in the simulation results.

While the coefficients are somewhat close in the two gold standard eras, there is a clear difference in the explanatory power of the regressions. The difference in R^2 across pegs and nonpegs is far less striking than the classical gold standard (0.41 versus 0.00), and is much closer to the results found in the post–Bretton Woods era (0.19 versus 0.01). This difference is likely in part a result of the increasing use of capital account restrictions in the interwar years, perhaps partly a result of the very large shocks hitting interwar economies, and also possibly a result of countries' taking more interest in using monetary policy for domestic stabilization.

The results are further bolstered by looking at the alternative definitions of the gold standard described earlier. The de jure classification, which essentially only codes countries as pegged if the currency is fully convertible, shows stronger results. These pegs are the countries operating under the full constraints of the trilemma, ones we would expect to have very little autonomy. Here, the β coefficient for pegs is even larger than during the classical gold standard [0.72 (0.14)], and the β coefficient for nonpegs is essentially zero [0.07 (0.18)]. The R^2 on the pegged group also goes up to 0.33, suggesting that during the relatively well-functioning portion of the interwar gold standard, gold adherence did operate as a strong constraint, nearly as strong as during the classical period.

We also separate out the two legs of the trilemma, exchange rate regimes and capital controls, again using de facto exchange rate regimes, but now combined with our capital control measure. As expected, the group of observations that represents pegs with open capital markets shows the strongest connection to the base country (see Table 5). No other group generates a β significantly different from zero or an R^2 even half the size of the open market pegs. The R^2 suggests that over 20 percent of the movement in local interest rates can be tied to the base rate.

Table 5. Splitting Sample by Exchange Rate Regime and Capital Controls
(Using de facto coding)

Dependent Variable: ΔR_{it}

	1 Peg Open	2 Peg Closed	3 Nonpeg Open	4 Nonpeg Closed
β ($\Delta goldR_{it}$)	0.647	0.183	–0.315	0.307
std error	(0.153)**	(0.349)	(0.277)	(0.21)
Observations	79	30	40	66
R-squared	0.21	0.02	0.03	0.07

Notes:
Robust standard errors in parentheses.
*significant at 5 percent; **significant at 1 percent.

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Thus, we see it is the combination of a fixed exchange rate and open capital markets that seems to generate the loss of autonomy. When countries either float or close their capital markets, they cease to follow the base as closely.[18]

Our interpretation is not without caveats, however. We cannot state clearly that the trilemma is forcing countries to follow the base because these results could be the consequence of pegged countries simply choosing to follow the base or experiencing shocks highly correlated with those hitting the base country. Previous work on the post–Bretton Woods era assumes a variety of base interest rates in a given time period, and thus allows the inclusion of time controls; distance and trade-share controls have been included as well. The currency regime and capital control regime variables still show strong impacts on the degree to which a country follows the base (Shambaugh, 2004).

Table 5 contains an apparent anomaly, though. The closed capital market nonpegs should be the group with the greatest monetary freedom. While all groups except open pegs should be able to pursue autonomous monetary policy to some degree, both conventional wisdom and results from other eras (see Obstfeld, Shambaugh, and Taylor, 2004) would suggest that the closed market nonpegs should be the *least* linked to the base. There should be very little pressure on them to respond to the base interest rate, as they should have achieved substantial autonomy both through shutting capital markets and by not pegging. We find, though, that this group has a larger (though still statistically insignificant) estimated β coefficient than do open nonpegs or closed pegs, and an R^2 of 0.07. This pattern indicates a stronger connection for this group than for the closed pegs or the open capital market nonpegs, and it is robust across a wide variety of base interest rate definitions and regime classifications. We return to this curious finding when we examine different time periods within the interwar sample.

We can further explore the results by pooling the data across regimes and including an interaction term for pegging times the change in the base interest rate (see equation (2), p. 80). The coefficient on peg times the change in the base rate is both large (0.43) and statistically significantly different from zero at the 95 percent level (see Table 6, column 1). The coefficient is even larger under the de jure coding (0.62 (0.22)). This pooled estimation procedure allows us to show that the results across samples are statistically significant, though it removes the ability to test differences in the explanatory power of the regression across subsamples. The procedure also summarizes the results in a more compact manner, allowing us to display sensitivity across a variety of base interest rates.

Results using the U.S. interest rate instead of the gold interest rate are similar on the whole, but weaker. Results using the British interest rate are weaker still, with relatively low and insignificant coefficients on the sterling interest rate alone or when interacted with the peg dummy. Given the importance of France in the

[18]The results on this point are even stronger than for other eras (see Obstfeld, Shambaugh, and Taylor, 2004). A similar table, pooling data across the gold standard, Bretton Woods, and post–Bretton Woods eras, generates significant coefficients for both pegs with capital controls and nonpegs without, though in both cases the coefficients are smaller and the R^2 much lower than for open pegs. In those results, it seems that either closing capital markets or eliminating a peg restores some autonomy, but not as much as doing both. In the interwar years, either action seems to restore autonomy.

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Table 6. Pooling Across Pegs and Nonpegs

Dependent Variable: ΔR_{it}

	1 DF/GoldR	2 DJ/GoldR	3 DF/USR	4 DF/UKR	5 Bloc
β1 ($\Delta goldR_{it}$)	0.134	0.076	0.206	0.098	0.129
std error	(0.177)	(0.185)	(0.148)	(0.145)	(0.134)
β2 ($peg\Delta goldR_{it}$)	0.425	0.62	0.217	0.18	0.219
std error	(0.174)*	(0.217)*	(0.135)	(0.178)	(0.144)
Observations	215	229	224	207	219
R-squared	0.08	0.1	0.09	0.06	0.09
β1+β2	0.559	0.696	0.423	0.278	0.348

Robust standard errors in parentheses.
*significant at 5 percent; **significant at 1 percent.
DF = de facto coding; DJ = de jure coding; bloc = different bases using currency bloc coding.

system and the fact that the United States broke from gold at one point, it is not surprising that the gold interest rate shows a stronger sway over pegged countries' interest rates than does the dollar rate alone. Likewise, given Britain's relatively brief tenure in the interwar gold standard, it is not surprising that the country does not appear to have provided a base interest rate for the system. The weak international connections to Britain's interest rate do, however, support the view that after World War I, London was no longer the unrivaled center of global financial power. This finding is therefore consistent with Kindleberger's (1986) argument that a shift in hegemonic financial power was in progress during the interwar years. The regressions breaking the base interest rate into different rates for different countries are reported in column 5 of Table 6. It seems that either the U.S. rate alone or the U.S.-French rate in combination holds a much stronger sway over countries than the various bases that may have been regional or historical leaders.[19] With each interest rate base, the divided sample results (analogous to those in Table 3) yield a significant coefficient on the peg sample and an insignificant one on the nonpeg sample. The coefficients on nonpegs are sometimes estimated so imprecisely, however, that the differences across groups are not statistically significant for every different base interest rate when the data are pooled.

Next, we may wonder whether the system behaved differently before and after its descent into crisis. We use 1931 as the watershed year, as it featured the departure of sterling from the system. We thus divide our sample into pre-1931 and post-1931. Table 7 shows that the pre-1931 results (the first three columns) look much like our results for the overall sample, reported in the first table. Pegs generate

[19]Using the U.S. rate for the first half of the sample and the bloc-based interest rates after Britain's 1931 departure from gold yields even weaker results than in column 5 of Table 6. Thus, one cannot attribute the results to the fact that regionalization did not become pronounced until the system started to break down.

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Table 7. Examining Pre- and Post-1931
(Uses de facto coding and gold interest rate as base)

Dependent Variable: ΔR_{it}

	Pre31 Full	Pre31 Pegs	Pre31 Nonpegs	Post31 Full	Post31 Pegs	Post31 Nonpegs	Post31 Nonpeg clsd
$\beta(\Delta goldR_{it})$	0.292	0.576	0.122	1.146	1.218	1.304	1.353
std error	(0.147)	(0.144)**	(0.220)	(0.206)**	(0.483)*	(0.359)**	(0.341)**
Observations	111	56	46	112	42	54	35
R-squared	0.05	0.21	0.01	0.14	0.15	0.19	0.23

Notes:
Robust standard errors in parentheses.
*significant at 5 percent; **significant at 1 percent.

higher coefficients and higher R^2 than nonpegs and the predicted target-zone coefficients in the neighborhood of 0.6 still arise. On the other hand, the post-1931 results are radically different. Both pegs and nonpegs show coefficients significantly different from zero and in fact greater than 1, although we cannot reject that they are different from the frequently seen baseline estimate of 0.6. In addition, the source of the anomaly in Table 5, which we discussed earlier, comes to light. The closed capital market nonpegs show a coefficient significantly different from zero, indeed well above 1, and an R^2 exceeding 0.2. When splitting the data into such narrow groups, we arrive at a small number of observations (35 in the case of the closed nonpegs after 1931). Still, despite the small number of observations, this result is statistically significant at the 99 percent level.

As for the question of why closed nonpegs would follow the base so closely, one may hypothesize that the shock of the depression provoked similar responses in all countries, and thus all countries show a strong correlation with the gold interest rate.[20] Alternatively, one might think that the chaos of the era left countries desperate to cling to any anchor they could find in order to restore stability. One strategy might have been to close off capital markets to avoid further attacks while following the base interest rate zealously in the hope of regenerating credibility. As it turns out, this latter explanation seems to have some plausibility, as all the countries that are closed market nonpegs repeg relatively quickly. Ten countries produce observations in this group, and all of them repeg before the end of the sample. Thus, at least for some countries, the 1930s seem not so much an era of pure monetary nationalism, as a time of desperate attempts to repeg. Table 8 shows the countries in this group and the years they are considered closed nonpegs. None stays nonpegged straight through

[20]Results on individual countries, presented next, show that not all countries moved together. That finding suggests that not all the results are due simply to common shocks. The results are not driven strictly by the choice of a base country. Results for pre- and post-1931 look broadly similar for the U.S. interest rate as a base. Using the British interest rate as a base, though, shows very weak results, with pegs generating a coefficient of 0.25 (0.11) versus 0.27 (0.16) for nonpegs.

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Table 8. Observations That Are Closed Nonpegs Post-1931

Country	Years
Bulgaria	1933–36
China	1934–35, 1938
Czechoslovakia	1933–36
Germany	1933
Hungary	1933, 1936
Italy	1934–36
Japan	1932–35, 1938
Romania	1933–36
Chile	1932–36
Denmark	1932–34, 1938

to 1938; all restore a peg at some point. Many—for example, Czechoslovakia—appear to be freer than they were in reality, as they peg briefly during some of the years they are listed as nonpegs, but not consistently enough to be considered a peg in those years. We return to these questions in the levels analysis.

Time-Series Levels Analysis

We can explore these issues further by examining individual country relationships with the base interest rate. To do so we use the PSS methodology to test for the existence of levels relationships between interest rates, simultaneously examining the dynamics of adjustment.

Table 9 shows the individual results grouped by type of episode. The de jure results have the advantage of only having to group countries by one measure. We examine 3 groups, pegs, nonpegs before 1931, and nonpegs starting in 1931. It appears that the relationship seen at the pooled panel level still holds at the individual level. By and large, the pegs seem to follow the base rate (Table 9a shows the gold interest rate results). Six out of the 13 episodes are significant at both the $I(1)$ and $I(0)$ critical values, the average cointegrating coefficient is 0.53 and the average half-life of adjustment is 5 months. In addition, only 1 episode (Germany) has a backwards level relationship (that is, $\gamma < 0$) and only one other (Italy) has a half-life of over 12 months. Nine out of the 13 have a levels relationship of the correct sign and half-lives below six months.

Nonpegs do not show such a close relationship. Of the pre-1931 nonpegs, only 1 has a levels relationship that is both significant and in the correct direction. The average coefficient is –0.01, and the average adjustment half-life is 29 months. Also, 2 of the 8 cases have backwards levels relationships, and 3 more, have adjustment half-lives in excess of 12 months. Only China and the United Kingdom show much of a connection to the base rate. Post-1930 nonpegs show almost no connection at all with the gold interest rate. While 2 of the 11 have significant levels rela-

(*text continues on page 104*)

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Table 9a. De Jure Pegs to Gold Interest Rate

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Austria 3/25–9/31	1	–0.10	0.31	–3.47	1	1	6.31	0	1	0	76
Belgium 10/26–2/35	1	–0.23	0.61	–5.14	1	1	2.71	1	0	0	101
Bulgaria 4/28–12/31	0	–0.12	0.60	–1.64	0	0	5.37	0	1	0	44
Czechoslovakia 1/29–12/31	5	–0.72	0.40	–2.81	0	0	0.54	1	0	0	36
Germany 10/24–6/31	3	–0.18	–0.75	–4.48	1	1	3.51	0	1	0	81
Hungary 4/25–7/31	0	–0.12	0.43	–4.10	1	1	5.47	0	1	0	76
India 3/27–8/31	1	–0.30	0.72	–3.76	1	1	1.97	1	0	0	54
Italy 2/28–11/34	1	–0.05	1.18	–1.76	0	0	13.24	0	0	1	83
Netherlands 4/25–8/36	2	–0.23	1.03	–3.39	1	1	2.69	1	0	0	137
Romania 1/29–12/32	0	–0.16	0.98	–2.08	0	0	3.98	0	1	0	44
Sweden 3/24–8/31	0	–0.26	0.53	–2.72	0	0	2.32	1	0	0	67
Switzerland 1/25–12/36	1	–0.06	0.52	–2.31	0	0	11.20	0	1	0	144
United Kingdom 4/25–8/31	0	–0.15	0.40	–1.81	0	0	4.36	0	1	0	77
Averages		–0.21	0.53	–3.03	0.46	0.46	4.90	0.38	0.54	0.08	78.46

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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Table 9b. De Jure Pre-1931 Nonpegs

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Belgium pre-10/26	0	–0.02	0.17	–0.68	0	0	29.79	0	0	1	88
China pre-1931	0	–0.16	0.79	–1.20	0	0	3.95	0	1	0	35
India up to 2/27	1	–0.24	–0.54	–3.86	1	1	2.49	1	0	0	69
Italy up to 1/28	1	–0.03	–1.78	–1.50	0	0	25.32	0	0	1	70
Japan up to 12/29	0	–0.01	0.20	–0.28	0	0	138.28	0	0	1	131
Netherlands up to 3/25	1	–0.41	0.13	–5.05	1	1	1.32	1	0	0	73
Switzerland up to 12/24	0	–0.03	0.29	–2.07	0	0	22.01	0	0	1	71
United Kingdom up to 3/25	0	–0.08	0.58	–1.33	0	0	8.77	0	1	0	74
Averages		–0.12	–0.02	–2.00	0.25	0.25	28.99	0.25	0.25	0.50	76.38

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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Table 9c. De Jure Post-1930 Nonpegs

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Bulgaria post-12/31	0	–0.03	0.53	–2.14	0	0	22.76	0	0	1	84
China post-12/30	0	–0.16	–0.14	–2.77	0	0	4.03	0	1	0	96
Czechoslovakia post-12/31	8	–0.08	–0.25	–3.50	1	1	8.65	0	1	0	84
Germany post-6/31	1	–0.07	–2.45	–1.59	0	0	9.14	0	1	0	90
Hungary post-7/31	6	–0.08	–0.27	–2.93	1	0	8.42	0	1	0	89
India post-8/31	6	–0.36	–0.04	–2.87	1	0	1.53	1	0	0	88
Italy post-11/34	1	–0.19	0.42	–3.56	1	1	3.39	0	1	0	49
Japan post-11/31	3	–0.09	0.16	–4.30	1	1	7.71	0	1	0	85
Romania post-12/32	0	–0.09	–1.54	–2.60	0	0	7.26	0	1	0	72
Sweden post-8/31	2	–0.06	–0.44	–1.84	0	0	11.81	0	1	0	88
United Kingdom post-8/31	2	–0.10	–0.62	–4.00	1	1	6.58	0	1	0	88
Averages	2.64	–0.12	–0.42	–2.92	0.55	0.36	8.30	0.09	0.82	0.09	83.00

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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Table 9d. De Facto Open Capital Market Pegs

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Austria 1/24–9/31	5	–0.03	1.15	–1.36	0	0	20.04	0	0	1	90
Belgium 8/27–2/33	0	–0.12	0.57	–2.00	0	0	5.33	0	1	0	67
Czech 2/27–9/31	1	–0.14	0.10	–1.46	0	0	4.70	0	1	0	56
France 8/28–9/36	0	–0.06	0.47	–1.79	0	0	11.40	0	1	0	98
Germany 11/25–6/31	0	–0.21	0.15	–3.89	1	1	2.88	1	0	0	68
Hungary 11/26–6/31	6	–0.38	0.87	–3.45	1	1	1.45	1	0	0	56
India 12/25–8/31	2	–0.34	0.89	–4.51	1	1	1.68	1	0	0	69
Italy 12/28–3/34	1	–0.05	1.50	–1.24	0	0	12.98	0	0	1	64
Netherlands 10/25–9/36	2	–0.22	1.00	–3.21	1	0	2.82	1	0	0	132
Sweden 1/26–8/31	0	–0.26	0.53	–2.72	0	0	2.32	1	0	0	67
Switzerland 8/25–8/36	1	–0.05	0.44	–1.85	0	0	14.09	0	0	1	134
United Kingdom 1/26–8/31	0	–0.12	0.16	–1.37	0	0	5.52	0	1	0	68
Switzerland (orig) 8/25–9/36	3	–0.06	0.14	–2.25	0	0	10.65	0	1	0	134
Averages	1.64	–0.17	0.67	–2.46	0.36	0.27	6.71	0.45	0.27	0.27	79.18

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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Table 9e. De Facto Other Regimes

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Closed nonpegs											
Belgium 1/20–7/26	6	0.03	−1.27	0.43	0	0	−27.00	1	0	0	79
Japan 12/23–4/27	5	0.07	−4.01	1.01	0	0	−10.24	1	0	0	41
United Kingdom 1/20–11/24	0	−0.12	0.92	−1.86	0	0	5.47	0	1	0	59
Closed pegs											
Bulgaria 1/28–3/33	0	−0.10	0.90	−1.84	0	0	6.38	0	1	0	62
Germany 8/34–12/38	7	−0.08	0.36	−2.33	0	0	7.90	0	1	0	53
Romania 6/29–3/33	0	−0.16	0.91	−2.14	0	0	4.03	0	1	0	46
Open nonpegs											
India 9/31–11/34	3	−0.49	0.62	−3.57	1	1	1.03	1	0	0	39
Italy 1/22–11/27	1	−0.03	−1.86	−1.47	0	0	24.41	0	0	1	69
Sweden 9/31–11/34	0	−0.07	0.47	−0.76	0	0	10.15	0	1	0	39
United Kingdom 9/31–11/34	2	−0.09	−1.20	−1.21	0	0	7.62	0	1	0	39

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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Table 9f. French Episodes with the United States As a Base Interest Rate

	Lag	θ	γ	tstat θ	sig at 0	sig at 1	half-life	<3	3 to 12	>12	#obs
Open peg/de jure peg											
France 8/28–9/36	7	−0.06	−0.41	−1.02	0	0	11.40	0	1	0	98
Closed Nonpeg											
France 1/22–11/26	0	−0.08	−1.28	−1.41	0	0	8.42	0	1	0	58

Notes:

Lag	lag chosen based on Akaike information criteria
θ	the adjustment speed to shocks in the levels relationship
γ	the levels relationship
tstat θ	the t-stat on the adjustment speed, which is used to determine the significance of the levels relationship
sig at 0	signifies whether we can reject no levels relationship if we assume stationary data
sig at 1	signifies whether we can reject no levels relationship if we assume nonstationary data
half-life	the half-life of the shock based on the adjustment speed
#obs	number of observations for the episode

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tionships in the expected direction, 8 of the 11 have levels relationships that imply they move against the base country interest rate.[21]

While the results for pegs and the results for pre-1931 nonpegs are broadly the same if one uses the U.S. interest rate instead of the gold interest rate, the post-1930 nonpeg results look quite different based on the U.S. interest rate.[22] Three of the 11 have a significant levels relationship in the expected direction and another 4 have insignificant relationships in the expected direction, with adjustment half-lives below 7 months, leaving only 4 rates that run opposite to the U.S. rate. This pattern suggests that by the end of the era, when the gold standard had largely fallen apart, France's role as a center country had diminished. As discussed above, we are not surprised to see some of the de jure nonpegs follow the United States from 1931 on. Many of these countries are in the process of reestablishing their exchange rate pegs or at the very least are in desperate straits, struggling for some credibility. On the other hand, some countries clearly are not following the United States, so it seems that common global shocks are not the sole factor behind the strong post-1931 relationships seen in the pooled data. Britain, China, India, and Romania all have negative relationships with the United States in their nonpegs of the 1930s.

When we classify the episodes by both exchange rate regime and capital control status, we have 11 open pegs, 4 open nonpegs, 3 closed pegs, and 3 closed nonpegs. Thus, there are too few country episodes to speak meaningfully about averages across groups, but we do see some suggestive patterns. By and large, the open pegs show a fairly strong connection with the gold interest rate. Three of the 11 show statistically significant positive relationships with an overall average of 0.67 and an adjustment half-life of 7 months. No episodes show a negative levels relationship and only 2 have adjustment half-lives above 12 months. Once again, it appears that the countries we expect to be constrained by the trilemma show evidence of that constraint.

Alternatively, in the episodes of closed nonpegs, countries do not appear to follow the Unites States. Two of the 3 show negative levels relationships. Only Britain prior to its return to gold shows a strong connection at all, with an insignificant (but close to unity) levels relationship and an adjustment half-life below 6 months. Britain in the years 1921–24 was intent on returning to gold and, thus, was following the United States quite closely; it was not trying to pursue an independent course, but it lacked credibility and reserves sufficient to rejoin the gold standard. The pre-1925 British result supports our contention that closed nonpegs in the post-1931 era show strong comovements with the base rate because they were hoping to repeg. Interestingly, there are no closed nonpegged episodes from the post-1931 era because no country in our sample maintained a nonpeg and

[21]The average adjustment speeds match our simulations as well, with mean θ equal to roughly –0.2 for pegs and –0.1 for nonpegs. However, the average θ for post-1931 nonpegs is not very informative regarding autonomy because in most cases, countries are adjusting interest rates away from the base.

[22]The results for the pegs are slightly weaker when using the U.S. rate, dropping the levels relationship to roughly 0.36 with an adjustment half-life of roughly 5 months. The pre-1931 nonpegs are as unconnected to the U.S. rate alone as to the gold interest rate, with a negative average levels relationship, an average adjustment half-life of over 28 months, 3 out of 8 with negative levels relationships, 2 more slower than 12 months, and only 1 significant positive relationship.

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closed capital markets for as long as three years (our criterion for consideration as a distinct "episode"). Countries either briefly returned to pegs to break up strings of nonpegging, or repegged within 3 years of leaving gold.

The results for the closed pegs are fairly close to those for open pegs, suggesting that perhaps closing capital markets does not entirely insulate a country if it intends to maintain a peg for a considerable length of time. None of the 3 levels relationships is significant, but they are all positive, and 2 are quite close to 1. The adjustment half-lives are all estimated to be between 4 and 8 months. Our data comprise only 3 examples, though, of countries that maintained closed pegs for any extended period, so it is difficult to conclude much about them. The open nonpegs are split, with 2 (Britain, 1931–34 and Italy, 1922–27) showing insignificant negative levels relationships; 1 (Sweden, 1931–34) showing an insignificant, slowly adjusting, positive relationship; and 1, (India, 1931–34) showing a significant positive relationship with an adjustment half-life of 1 month.[23]

A final point worth noting is that interest rates in France and the United States were never that closely related. Both during France's prepegging episode from 1922 to 1926, and during its peg from 1928 to 1936, a negative levels relationship prevailed. Thus, one sees part of the great tension in the system as a whole during this era: the 2 center countries with the bulk of the gold reserves were moving their interest rates independently, making it difficult for countries to follow a single base.

Summary

The 2 types of econometric analysis broadly support the predictions of the trilemma. The pooled analysis shows that short-run interest rate movements in the pegged countries, especially when they have open capital markets, follow the base interest rate. The levels analysis shows that on average, it is the open pegs or de jure pegs that follow the base the most closely over time. Notably, many nonpegs seem to show considerable independence from the base interest rate at many points in the sample. A number of countries that are briefly floating do combine to generate a high average response of closed nonpegs to the base rate during the Great Depression, but this is largely an anomaly in our sample and the result is not significant.

Thus, we see that "fear of floating" type of behavior, while present in some cases, was not at all universal in our sample period as a whole. Many nonpeg countries were able to move their interest rates in ways quite distinct from the base country. On the other hand, in times of crisis, more floating rate countries may have chosen to follow the base in an attempt to repeg, may have been forced to follow the base or risk further speculative attack, or may simply have been following the base because of globally synchronized responses to large common shocks.

The trilemma finds considerable empirical support in this era, and the empirics generate results that are numerically consistent with theoretical, model-based

[23]The patterns when the U.S. interest rate is the base are similar, with the open pegs showing similar results episode by episode, though with a slightly lower average half-life (in particular, Austria, Hungary, and India are somewhat weaker against the U.S. interest rate than against the gold interest rate). In other groups, Germany shows a weaker relationship to the dollar rate as compared with the gold interest rate. Sweden's interest rate during its open nonpeg has a significant levels relationship with the dollar rate despite its insignificant relationship with the gold interest rate.

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simulations. The trilemma was a constraint on policy for countries that fixed their exchange rate and maintained open capital markets. They lost much of their monetary autonomy compared with countries that adopted alternative regimes. The results also show why the architects of Bretton Woods were so concerned to create a system that would allow for some monetary autonomy notwithstanding stable exchange rates. The fact that some floaters did not pursue autonomy (as they could have), and instead managed interest rates with an eye toward returning to a peg, may have convinced contemporaries like Keynes and Nurkse that the potential instability of floating rates was not effectively compensated by any meaningful policy freedom. That view, in turn, led to the Bretton Woods consensus in favor of fixed exchange rates coupled with capital account control.

V. Conclusion

Up until now, the empirical content of the trilemma and, hence, its practical relevance, have remained largely untested. Our work seeks to show that the trilemma is a central feature of the macroeconomic world we have lived in for a century or more. Understood in a target-zone context, the real world content of the trilemma does deviate from the simplistic idea of full international interest rate equalization, but only in degree. It is true that this deviation confers a little independence on policymakers even under hard gold standard rules (Bordo, 2003; Bordo and Flandreau, 2003; and Bordo and MacDonald, 1997, 2003). But that independence is very limited indeed, we would argue. Under open capital markets and pegged exchange rates, the half-lives of interest rate deviations can be counted in months, and interest rate pass-through is very strong whether before or after World War I, or even today. It is not clear that such meager room for maneuver can offer any significant scope for purposeful macroeconomic management, especially when compared to the far slower adjustment and lower pass-through seen in floating or closed capital-market countries. Only a move to floating or the imposition of capital controls can free monetary policy to pursue domestic aims, and in practice they seem to do so.

Spanning, as it does, a century or more of experience, our empirical work in this and other papers highlights the enduring power of this principle. In this sense, we would argue that the trilemma is alive and well. As a working proposition, it merits attention from a wide audience, if our work is found to be persuasive. As a narrative hook, historians and political scientists have often invoked or criticized its applicability, but with little empirical evidence to guide interpretation. International economists will find an old familiar part of their toolkit now has been sharpened up by use in the field. Last, but not least, policymakers may better comprehend the true nature of the constraints under which they must operate in an open economy.

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Accounting for Consumption Volatility Differences

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In the wake of emerging market turmoil, the role and welfare consequences of volatility have attracted renewed attention. An emerging consensus points to various types of volatility being both a consequence and a determinant of longer-term growth performance. The linkages appear to be context dependent. This paper employs classification tree analysis to explore determinants of consumption volatility taking account of context dependence. The results suggest output volatility, measures of input volatility, and measures of economic development are best able to differentiate between countries with high and low consumption volatility. [JEL E21, E32]

Following the recent spate of emerging market turmoil, the role and welfare consequences of volatility have attracted renewed attention. While it may be too early to draw firm conclusions, an emerging consensus points to various types of volatility being both a consequence and a determinant of longer-term growth performance and of income distribution.

The academic and policy research has, with some exceptions, divided along this demarcation. A sizable literature, briefly summarized in Box 1, explores the role of volatility as a determinant of a variety of outcomes.[1]

A smaller literature, to which this papers belongs, examines the determinants of volatility in cross-country perspective. Among the core questions explored here are the impacts of economic development, increased trade, and financial integra-

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[1]See Aizenman and Pinto (2004), Buch (2002), and Prasad, Rogoff, Wei, and Kose (2003) for in-depth critical analyses.

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Box 1. Volatility As a Determinant of Growth

Early postwar macroeconomics, aiming to better understand business cycle fluctuations, treated (trend) growth and (business cycle) volatility as largely distinct fields of study (exceptions apply, as always). The distinction slowly softened over time to the extent that recent macro models treat both features as jointly determined.

A variety of channels potentially give rise to a growth-volatility linkage. Some of these suggest a positive relation. Thus a simple aggregation of project-specific risk-return tradeoffs leads to a prediction of positive association between average return (growth) and average risk (volatility). Dynamically, Schumpeterian "cleansing recessions" may generate faster growth following recessions, be it due to increased R&D or greater survival chances of stronger firms.

Other channels suggest a negative link, notably in emerging markets. In the absence of complete markets, notably for long-term domestic currency debt, recessions can lead to lower investment in physical and human capital and reduced long-term growth, or a preference toward less specialized (and lower return) investments. A different line of argument treats volatility as a proxy for uncertainty which, under some assumptions, maps into lower investment and thus, ceteris paribus, growth.

Theory thus does not provide a clear overall prediction on the link between (growth) volatility and growth itself. On the empirical side, a rich literature, invigorated by an influential paper by Ramey and Ramey (1995), has fairly consistently pointed to a negative and causal link between the volatility of GDP growth and the mean GDP growth rate in broad cross-country studies. The result may be specific, however, to the cross-country perspective: across sectors within countries, the positive risk-return association suggested by investment theory appears to emerge (Imbs, 2002). The elasticity of growth with respect to volatility also appears to vary across country groups; in particular the link appears to be much weaker for mature economies. The relative importance of alternative (likely complementary) explanations for such differences—ranging from structural characteristics, such as financial market development and international integration, to active policy measures and the role of the political system in aggravating or offsetting shocks—remains an active research agenda.

tion on volatility. Theory does not provide a clear answer to these questions as far as output volatility is concerned, though predictions for consumption volatility are clearer. On the empirical side, only few robust results have emerged. One possible explanation is the presence of nonlinearities in many of these linkages. This paper, focusing on consumption volatility, employs a classification tree methodology, particularly suited to detecting both context dependence and threshold effects, to explore these nonlinearities in depth.

I. A Capsule Literature Review

While the evidence increasingly points to a two-sided causality linking volatility and growth, and thus to the need for an integrative treatment, from a conceptual perspective it is useful to split the literature into studies using volatility as, respectively, an explanatory and as the dependent variable. The first literature was briefly summarized in Box 1 (above); the following analysis concentrates on some core issues explored in the literature on the determinants of volatility.

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A Framework

On the level of the individual household, the volatility of income depends on the size of shocks to which the economy or local area is exposed, on the steps the household has taken in anticipation of such shocks, and on public policies affecting the impact of shocks on household income, primarily the existence and structure of the social safety net. While all of these can be treated as given at a point in time, they become endogenous over time. Moving from household income to household consumption introduces another layer. Whether temporary income shocks map into consumption shocks depends on the ability and on the willingness of households to smooth consumption, and thus on a set of features ranging from private choices such as precautionary savings to public in-kind assistance programs.

The volatility of private consumption is thus driven by a complex array of factors. On a first level are the shocks influencing the national economy. On a second level are the determinants of the elasticity of household income to these shocks, and on a third level the determinants of the elasticity of household consumption with respect to household income shocks. Cross-country differences in aggregate consumption volatility can thus alternatively arise from differences in the size and frequency of shocks and from differences in the availability and usage of coping mechanisms, reflected in different elasticities of income and of consumption with respect to given shocks. The following paragraphs review some of the national features that have attracted particular attention in this context.

Economic Size

Large economies with diverse sectoral structures are more immune to both sector-specific shocks and—reflecting the negative association between size and openness—to external shocks, reducing aggregate output volatility. Domestic sectoral diversification also provides individuals with good domestic diversification options, potentially reducing consumption volatility even in the absence of international integration. Exploring this avenue, Crucini (1997) compares a sample of 68 smaller economies with the G-7 countries, finding the standard deviation of consumption rates to be significantly higher in the former group. Head (1995) and Kose and Prasad (2003) likewise detect a negative link between volatility and economic size.

Financial Deepening

Theory is ambiguous as to the linkage between financial development and output volatility. Empirical work (Denizer, Iyigun, Owen, 2002; and Buch and Pierdzioch, 2003) suggests that domestic financial development is associated with reduced output volatility. The link appears to be strongest for high-income countries and may depend on the extent of international financial integration. The link between financial development and consumption volatility is clearer: expanded diversification options suggest a negative link.

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Fiscal Policy

Fiscal policy can be used to offset shocks, smoothing aggregate consumption. Whether it is used in this manner in practice remains an active area of inquiry (Kose, Prasad, and Terrones, 2003; and Agénor, McDermott, and Prasad, 2000). While there is some evidence for a smoothing use of fiscal policy in mature economies, fiscal policy in some emerging markets appears to be procyclical, possibly reflecting a procyclical access to borrowing.

International Aspects

Theory suggests that the effect of shocks on macroeconomic volatility depends on the extent to which participation in international goods and asset markets allows for specialization and for risk diversification. Alas, this is where theoretical clarity ends; the exact nature of the linkages, and indeed their sign, are far from obvious, motivating a very active literature exploring these linkages (Kose, Prasad, and Terrones, 2003).

Financial linkages

The recent spate of emerging market crises renewed interest in the nexus between international financial integration and macroeconomic volatility. On the output side, theory suffers from an embarrassment of riches. Apart from its ambiguous effects on sectoral concentration—and thus exposure to sectoral shocks—integration creates new transition channels for external shocks and may, depending on the exact structure of financial markets, magnify or reduce the effect of domestic distortions.[2] The net effect likely depends on both country characteristics and on the nature of shocks.

As was the case with domestic financial development, the predictions for consumption volatility are clearer: enhanced diversification opportunities should permit a reduction of consumption volatility following financial integration. In line with the arguments discussed above, the effect should be most pronounced in smaller and in more specialized economies with fewer domestic diversification options.

To date, empirical evidence supporting the strong theoretical implication for consumption volatility across diverse country samples remains scarce, though some evidence points to the predicted negative link for higher-income countries. The unconditional correlation of consumption growth rates across countries does not appear to substantially exceed the correlation of output growth rates. The volatility of consumption growth does not appear to be substantially smaller than the volatility of output growth in a sizable number of countries.[3] Regression analysis has yielded diverse results: while some authors do not detect a stable link,

[2]Recent work in this field includes Sutherland (1996), Faia (2001), and Buch and Pierzioch (2003).

[3]See Kose, Prasad, and Terrones (2003) and Hnatkovska and Loayza (2003). Imbs (2003) shows that for financially integrated economies consumption patterns are more correlated; however, so are GDPs.

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others have found financial integration to be an important determinant of volatility.[4] The sample composition appears to matter. In particular, the predicted negative link appears to be stronger among OECD economies than among emerging markets.[5]

Trade linkages

The literature on trade openness and volatility likewise combines theoretical ambiguity with varied empirical findings. Enhanced real integration can lead to greater sectoral specialization but also provides greater diversification across demand sources.[6] On the empirical side, while a higher volatility of the terms of trade appears to be robustly linked to a higher volatility of output,[7] the relationship between generic measures of openness and output volatility is less settled.

Assessment

The brief review reveals that factors robustly linked to volatility across country samples are the exception rather than the rule; the most notable exception is country size. A number of studies have detected apparent breaks in the linkages. In particular, it appears that mature economies find it easiest to avail themselves of the diversification opportunities theory suggests will arise from greater financial development and international integration.

In principle, context dependence can be accommodated in the framework of regression analysis, in particular if theory yields guideposts as to the likely nature of such nonlinearities (Hnatkovska and Loayza, 2003). The challenge is, however, hard. There are rarely exact empirical guideposts even for first-level splits[8] while the ordering of splits for deep context dependence is often even outside the scope of educated guesses.

This paper sidesteps these problems, instead using classification tree analysis to explore patterns in consumption volatility. The results—essentially an in-depth description of the pattern linking the independent variables in the data set with the dependent variable—provide a complementary perspective to regression analysis. The next section briefly introduces the technique; the following sections present the results and conclude.

[4]Among the studies exploring these aspects are Razin and Rose (1994), O'Donnell (2001), Bekaert, Harvey, and Lundblad (2002), Kose, Prasad, and Terrones (2003), and Buch and Pierdzioch (2003).

[5]O'Donnell (2001), Bekaert, Harvey, and Lundblad (2002), Kose, Prasad, and Terrones (2003).

[6]See for example Krugman (1993), Razin and Rose (1994), Kraay and Ventura (2001), and Kose, Prasad, and Terrones (2003).

[7]See for example Mendoza, 1995; and Agénor, McDermott, and Prasad, 2000. One exception is Buch and Pierdzioch (2003), who find no significant effect though they employ real exchange rate variability as a proxy for the terms of trade.

[8]At what level does a country become a member of the "mature economy" club? If its GDP per capita (or output per worker) places it in the top 10/20/X percent of all countries? If its manufacturing share in GDP exceeds X percent? If more than X percent of its trade is intra-industry? If it becomes a member of the OECD? Each of these criteria is reasonable, yet yields different groupings.

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II. Methodology, Data and Caveats

A binary classification tree consists of a sequence of rules for allocating a binary dependent variable y to its two value-classes on the basis of a vector of explanatory variables x_j, $j = 1, \ldots . J$. In this application, the binary split is based on the recorded consumption volatility. Starting with a sample of 103 countries, the 35 countries with the highest consumption volatility are classified as belonging to the "high volatility" group ($VOL = 1$), while the 35 countries with the lowest volatility are classified as belonging to the "low volatility" group ($VOL = 0$). The middle 33 countries are discarded in order to create a discrete difference between the two groups. The binary dependent variable is thus given by *VOL,* taking the values of 0 and 1 respectively for "low" and "high" volatility observations.

A rule consists of an explanatory variable and a threshold. The rules are applied sequentially. The initial application generates the first rule, splitting the original sample into two subsamples. The algorithm is then applied separately to the two subsamples, and so on, resulting in a decision tree with multiple branches, each defined by an allocation rule. Specifically, a rule takes the following form:

> If, for a particular observation of the dependent variable y, the explanatory variable x is above threshold z, allocate the observation for the dependent variable y to the first binary class; otherwise allocate it to the second binary class.

At each node, there exists a large set of feasible rules, composed of all variables and all values each variable takes in the sample. The selection of the preferred rule among this set is based on the rule's ability to allocate observations correctly to the two classes. Rarely, particularly at the deeper nodes, a perfect rule may correctly allocate all observations to the correct value class. More typically, all candidate rules misallocate some observations. The rule chosen at a particular node is the candidate rule with the smallest error.[9] In principle, the process can continue until each observation is correctly classified, at the cost of highly complex trees. For the trees reported below, a depth of five to seven branches was used.[10]

The algorithm is particularly well suited to detecting both threshold effects and context dependence. As regards the former, the algorithm searches for the numerical value that, applied as a rule, minimizes the allocation error; it thus avoids the need to define groups such as high/low income a priori. The algorithm by construction also allows for a variable to become an important explanatory factor only once a number of prior conditions on other variables have been met, and thus automatically incorporates deep context dependence.

As the algorithm searches across all variables, it generates a ranking of each variable at each node in terms of its ability to split the observations at that node into the two groups. These rankings can in turn be used to compute an overall measure of the explanatory power of variables for the entire tree. This global

[9]Depending upon the question examined, different weights can be attached to type I versus type II errors. No such asymmetry arises in the present application; the errors are hence weighted equally.

[10]Alternatively, automatic termination rules based on a trade-off between the number of nodes and the fit can be selected.

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importance rank, which takes full account of context dependencies, will be the main empirical focus of the analysis reported below.[11] The classification trees were calculated using the CART® program of Salford Systems.

Data[12]

The private consumption data used to compute the dependent variable are taken from the Penn World Tables.[13] Countries are included if a complete data series from 1960/61 to 1999 is available.[14] The volatility measure, $VOL(C)$, is calculated as the standard deviation of the growth rate of real per capita consumption.[15] A number of studies suggest that volatility patterns may have changed over time.[16] To allow for time variation, the data, covering the period 1960 to 1999, are split into four equal-sized decade groups.

As the algorithm disregards variables that are not helpful in allocating observations to one of the two groups, a broad set of potential explanatory variables can be included. These divide into several broad categories. The first comprises a set of (relatively) time invariant "structural" features such as location, the export orientation of the economy, and the quality of institutions. A second group contains features with a somewhat faster rate of change, such as GDP per capita, enrollment ratios, the size of the labor force, life expectancy, and the urbanization rate; as a group, these variables aim to capture the broadly defined development level of the economy. The third group encompasses measures of openness to trade and finance, of financial development and monetary policy, and of the role of government spending. On the trade/external finance side, the group includes openness relative to the world and to the OECD, the presence of current and capital account restrictions, the level of external debt, the concentration of exports, the exchange rate regime, and the level of real overvaluation. On the financial side, it includes the ratio of M2 to GDP, the mean inflation rate, and the central banker turnover rate.

The fourth group comprises measures of the political system: the type of regime, a proxy for political instability, and the Freedom House measures for political rights and civil liberties. Finally, a fifth group contains direct proxies for volatility in inputs and output. Apart from the volatility of GDP per capita growth, this group includes the exposure of countries to banking and currency crisis and

[11]As the ranking takes account of the set of discriminants at all nodes, a variable that never appears as part of a rule may still rank high in terms of overall importance.

[12]See also the detailed data appendix.

[13]Alan Heston, Robert Summers, and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

[14]Data availability for the year 2000 remains spotty; hence, the sample was ended in 1999.

[15]Some authors (Agénor, McDermott, and Prasad, 2000) have used alternative detrending mechanisms. While different methods yield different numerical values, they do not in most cases appear to affect the ranking of countries substantially (Razin and Rose, 1994; and Hnatkovska and Loayza, 2003). As the volatility measure used in this paper takes just two values—high and low, with the middle group being dropped—the detrending method used is likely to be of secondary importance.

[16]Hnatkovska and Loayza (2003), Kose, Prasad, and Terrones (2003), and Buch (2002).

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the volatility of the terms of trade, of the real exchange rate, of the black market premium, of inflation, and of the government current expenditure share.

Caveats

The data and methodology are subject to several caveats. First, the focus is on aggregate private consumption in cross-country comparison. The mappings obtained will likely differ, possibly sharply, among groups within each country, a feature not captured here. Second, the results do not directly link to welfare. As the focus is on private consumption, no attention is given to the potential smoothing role played by public consumption (Kose, Prasad, and Terrones, 2003). Also ignored are consumption-leisure trade-offs and any issues arising from the distinction between durable and nondurable expenditures; furthermore, no distinction is made between consumption movements reflecting permanent shocks to income, and changes reflecting an inability (or unwillingness) to smooth in the face of temporary shocks.[17]

III. Results

For each of the four decades, two trees were calculated. The first tree is based on the full set of explanatory variables, including the various volatility measures. The second tree excludes all volatility measures. Trees were capped at five to seven branches unless a complete allocation was achieved with fewer nodes. Table 1 reports the ten explanatory variables with the highest explanatory power for the full data set.[18]

The volatility of GDP p.c. growth is the best discriminant for the volatility of consumption growth, placing in the top two for all decades. The result confirms prior findings. Despite the apparently much greater scope for domestic and international diversification provided by financial development and increasing financial integration, the volatility of consumption continues to be very closely associated with the volatility of national output.

Table 2 reports the number of times that each variable has appeared in the top five and top ten for the four decades (only variables with at least two appearances in the top ten are reported). Overall, the best explanatory variable for consumption growth volatility is output growth volatility, appearing three times at the first rank, once at second rank. Two measures of input volatility, the volatility of the terms of trade and of the black market premium, together enter a further six times.

Measures of economic development are also useful in distinguishing between high and low consumption volatility observations. GDP per capita and output per worker together appear seven times among the top ten; life expectancy and

[17]The problem can be partly addressed by looking at the volatility of consumption relative to income Kose, Prasad, and Terrones, 2003.

[18]As mentioned above, the coverage in terms of variables is comparable for the last three decades, while for 1960 several variables do not exist; differences between the 1960s and the other decades are thus less meaningful.

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Table 1. Ranking of Variables by Explanatory Power, All Variables

	1960s	1970s	1980s	1990s
1	Volatility (GDP Growth)	Volatility (GDP Growth)	Life Expectancy	Volatility (GDP Growth)
2	Urbanization	Vol. (Black Market Premium)	Volatility (GDP Growth)	Life Expectancy
3	Primary Enrollment	Urbanization	Vol. (Black Market Premium)	GDP p.c.
4	GDP p.c.	Volatility (ToT)	Gini Coefficient	Volatility (ToT)
5	Output per Worker	Vol. of Gov. Current Exp.	Political Rights	M2/GDP
6	Vol. (Black Market Premium)	Overvaluation	Civil Liberties	Vol. of REER
7	OECD Trade	Life Expectancy	GDP p.c.	Vol. (Black Market Premium)
8	Secondary Enrollment	Volatility of Inflation	Output per Worker	Banking Crisis
9	Labor Force Size	GDP p.c.	Debt to GDP	Exchange Rate Crisis
10	—	Output per Worker	—	Civil Liberties

urbanization another five times. Civil liberties rounds out the list, though at a low rank. Measures of the extent of trade and financial integration do not play an important role, though they are, of course, correlated with economic development.

Dropping the volatility indicators permits an assessment of the relative importance of structural factors. Tables 3 and 4 report, respectively, the ten most important discriminants for each of the four decades and the most frequently appearing discriminants across all four decades, analogous to Tables 1 and 2.

The tables are dominated by indicators of the development level: GDP p.c., life expectancy, output per worker, urbanization, and the enrollment ratios all appear repeatedly among the top ten. Measures of trade integration appear

Table 2. Frequency Among Top Five and Top Ten, All Variables

Discriminant	Occurrences in Top Five	Occurrences in Top Ten
Volatility (GDP p.c. Growth)	4	4
Volatility (Black Market Premium)	2	4
Volatility (Terms of Trade)	2	2
GDP per Capita	2	4
Output per Worker	1	3
Life Expectancy	2	3
Urbanization	2	2
Civil Liberties	0	2

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Table 3. Ranking of Variables by Explanatory Power, Tree 2

	1960s	1970s	1980s	1990s
1	Output/Worker	Avg. Gov. Cur. Exp.	Life Expectancy	Life Expectancy
2	GDP p.c.	Political Rights	GDP p.c.	M2/GDP
3	Life Expectancy	Military/Population	Output/Worker	Average Inflation
4	Secondary Enrollment	Life Expectancy	Civil Liberties	Political Rights
5	Primary Enrollment	Secondary Enrollment	Urbanization	GDP p.c.
6	Urbanization	Urbanization	Avg. Gov. Current Exp.	Overvaluation
7	Labor Force Size	Primary Enrollment	Political Rights	OECD Trade
8	OECD Trade	Overvaluation	Overvaluation	Debt/GDP
9	Openness	GDP p.c.	Linguistic Fragmentation	Capital Account Restrictions
10	Military/ Population	Output/Worker	Labor Force Size	Openness

somewhat useful, while measures of financial integration and crisis do not enter systematically.

In conjunction, the results point to the primary importance of output and input volatility in explaining consumption volatility in cross section, consistent with the prior literature. Beyond output volatility, the development level emerges as the second important discriminant between countries with high and low consumption

Table 4. Frequency Among Top Five and Top Ten, Excluding Volatility Measures

Discriminant	Occurrences in Top Five	Occurrences in Top Ten
Life Expectancy	4	4
GDP per Capita	3	4
Output/Worker	2	3
Urbanization	1	3
Secondary Enrollment	2	2
Primary Enrollment	1	2
Overvaluation	0	3
OECD Trade	0	2
Openness	0	2
Political Rights	2	3
Military/Population	1	2
Labor Force Size	0	2
Average Current Expenditure	1	1

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Figure 1. Tree for the Full 1990s Dataset

volatility.[19] Other features, notably real and financial openness, while of course correlated with development, appear to be of only secondary direct importance for the distinction between high and low consumption growth volatility.

Classification Trees

In terms of an aggregate measure of importance, the "top ten" lists presented above convey the most accurate impression, as they evaluate the relative importance of the variable at each node. While the trees themselves focus only on the best discriminant at each node, they convey additional information about the precise value of the threshold, and the sign of linkage. Space constraints prevent complete discussion of all eight trees. Figure 1 depicts the tree for the full data set for the 1990s.

The original sample divides equally into 35 high volatility (class = 0.01) and 35 low volatility (class 0) observations. The top box reports this split, with the number of observations as well as the percentages (here trivially 50 percent and 50 percent) and the total number of remaining observations (here $N = 70$). The first splitting rule is reported at the top of the box. In this case, the 26 observations ($N = 26$) for which the volatility of output growth is equal to or less than 0.03 are allocated to the left node; the 44 remaining observations ($N = 44$) are allocated to the right node.

Within the left node, the fit is perfect: all 26 observations are correctly classified as low volatility; the branch consequently ends at this node, yielding the first (unconditional) result: low output growth volatility is strongly associated with low

[19]As mentioned above, the first and second moment of output growth are themselves negatively related across broad country sets, with at least part of the causality apparently running from higher output volatility to lower output growth.

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consumption growth volatility, where the threshold for low output growth volatility is a standard deviation of output growth of 0.03 or less.

Within the right node, 35 out of the 44 observations fall into the high consumption growth volatility group, the remaining 9 observations into the low volatility group. While high output volatility is thus associated with a greater likelihood of high consumption volatility (almost 80 percent versus 50 percent for the full sample), the link is not perfect. Pushing the search one level deeper reveals that within the group of countries with high output growth volatility, the degree of monetization matters for allocating observations to the high versus the low consumption volatility group. Specifically, observations fulfilling the dual condition of output growth volatility above the threshold of 0.03 and monetization ratios below the threshold of 35 percent fall overwhelmingly into the high volatility group (27 of 29 observations).

The 15 countries characterized by output growth volatility above 0.03 and monetization ratios above 34.85 percent divide roughly equally into high and low volatility observations. Within this subgroup, all countries without exchange rate crisis experienced low volatility, versus only 27 percent of countries with at least some incidence of an exchange rate crisis. This finding illustrates the benefit of the context dependent search: based on the overall usefulness of the discriminants, the presence of an exchange rate crisis is an also-run, yet within the (sizable) subgroup of countries defined by relatively high output volatility and a relatively developed monetary system, it becomes an important discriminant.

IV. Conclusions and Outlook

The literature on the determinants of volatility suggests that linkages between particular variables and volatility may depend on other country characteristics. This paper employed classification tree analysis to delve more deeply into such context dependence. The results indeed suggest important context dependence; they also clearly establish output volatility and measures of input volatility, followed by measures of economic development, as the variables best able to account for the presence of high versus low consumption growth volatility. In contrast, financial development and integration, which on theoretical grounds might be expected to drive a wedge between income and consumption volatility, do not appear to play a prominent role beyond their link to the development level.

APPENDIX
Data

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Fixed Factors

Variable	Source		Note
Transition Country	ES	TRAN	0–1 dummy
Landlocked Countries	ES	LAND	0–1 dummy
Export Focus: Manufacturing	ES	EMAN	0–1 dummy
Export Focus: Non Fuel Primary	ES	ENFP	0–1 dummy
Export Focus: Fuels	ES	EFUE	0–1 dummy
Export Focus: Services	ES	ESER	0–1 dummy
Export Focus: Diversified	ES	EDIV	0–1 dummy
Ethnic Fractionalization	A	EFRA	0–1 range
Language Fractionalization	A	LFRA	0–1 range
Religious Fractionalization	A	RFRA	0–1 range
Institutional Quality	SW	IQUA	
Location: Tropical	ES		0–1 dummy

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Time-Varying Factors

Variable	Source	Name	Notes
Primary Enrollment	ES	PRIMxx[1]	1960, 1970, 1980, 1990, Year
Secondary Enrollment	ES	SECOxx	1960, 1970, 1980, 1990, Year
Life Expectancy at Birth	ES	LIFExx	1962, 1970, 1980, 1990, Year
Military/Population	ES	MILIxx	1960, 1970, 1980, 1980 data also used for 1990
Real GDP per Capita, Real U.S. Dollars, U.S. = 1	ES	GDPRxx	1960, 1970, 1980, 1990, Year
Workers (China = 1)	ES	WORKxx	1960, 1970, 1980, 1990, Year
Output per Worker, US$ U.S. = 1	ES	LRPOxx	1960, 1970, 1980, 1990, Year
Urbanization Rate	ES	URBAxx	1960, 1970, 1980, 1990, Year
Non-OECD Trade (percent of GDP)	ES	TRAAxx	1960, 1970, 1980, 1990, Year
Openness Total (percent of GDP)	ES	OPENxx	Decadal average 1960s, 1970s, 1980s, 1990s
External Debt (percent of GDP)	ES	DEBTxx	Decadal average 1970s, 1980s, 1990s (1960s: all NA)
Current Account Restrictions	GGW	CURRxx	Decadal average of dummy variable (0–1), 1970s, 1980s, 1990s only
Capital Account Restrictions	GGW	CAPRxx	Decadal average of dummy variable (0–1), 1970s, 1980s, 1990s only
Export Concentration (top 3)	GGW	TCONxx	Decadal average (2 obs/decade), 70s, 80s, and 90s
Fixed Exchange Rate Regime	GGW	PEGGxx	Fraction of decade spent under pegged regime
Intermediate Exchange Rate Regime	GGW	INTMxx	Fraction of decade spent under intermediate regime
Floating Exchange Rate Regime	GGW	FLOAxx	Fraction of decade spent under floating regime
Real Overvaluation	ES	OVERxx	Decadal average
M2/GDP	ES	MONExx	Decadal average
Average CPI Inflation	ES	MINFxx	Decadal average

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Central Bank Turnover Ratio	GGW	TURNxx	Decadal average
Government Current Exp. on Goods/Services (percent of GDP): Mean (82n)	ES	MGOVxx	Decadal average (1960s missing)
Regime Type 1: Civilian, 2: Military-Civilian, 3: Military, 4: Other	ES	REGIxx	1960, 1970, 1980, 1988 (used for 1990)
Political Instability X = Sum of # of coups, # of revolutions # of riots, # of purges, # of assassinations, # of gu. warfare activities	ES	PINSxx	= 0 if X = 0 = 1 if X = 1 or X = 2 = 2 if X = 3 or X = 4 or X = 5 = 3 if X > 5 1960, 1970, 1980, 1988 (used for 1990)
Political Rights 1 (lowest) to 7	FH	PRIGxx	Mid-decade, no data for 1960s
Civil Liberties 1 (lowest) to 7	FH	CLIBxx	Mid-decade, no data for 1960s
Volatility of Terms of Trade	ES	VTOTxx	Decadal SDEV, 1960s, 1970s, 1980s, 1990s
Volatility of Black Market Premium	ES	BLMKxx	Decadal SDEV, 1960s, 1970s, 1980s, 1990s
SD of REER	GGW	REERxx	Decadal average of the annual SDEVs of monthly obs.
Currency Crisis	GGW	ECRIxx	Fraction of decade with currency crisis
Volatility of CPI Inflation	ES	VINFxxx	By decade
Government Current Exp. on Goods/Services (percent of GDP): SDEV (82n)	ES	VGOVxx	By decade (1960s missing)
Banking Crisis	GGW	BCRIxx	Number of years in decade with banking crisis

[1]"xx" refers to the decade.

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Exchange Rate Policy and the Management of Official and Private Capital Flows in Africa

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During the 1990s a number of African central banks succeeded in bringing inflation to relatively low levels while maintaining a market-determined exchange rate. These central banks were generally reluctant to fully subordinate exchange rate targets to monetary targets, however, particularly in the face of large external shocks. We focus on the management of highly persistent shocks to aid flows, including PRSP-related increases in net flows, in the presence of currency substitution by the domestic private sector. Such shocks have beneficent long-run effects, but when currency substitution is high they can produce dramatic macroeconomic management problems in the short run. What is the appropriate mix of money and exchange rate targeting in such cases, and the role of temporary sterilization? We analyze these and related issues in an intertemporal optimizing model that allows a portion of aid to be devoted to reducing the government's seigniorage requirement. This creates a strong link between official aid flows and private capital flows, giving rise to trade-offs reminiscent of the literature on private capital inflows in emerging markets. When the credibility of policymakers' commitment to low inflation is firm, some degree of dirty floating, with little or no sterilization of increases in the monetary base, is the most attractive approach. [JEL D23, E52, F31, F35]

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Since the early 1990s, African central banks have struggled to find the appropriate mix of money and exchange rate targeting when faced with highly persistent shocks to aid inflows (including PRSP- and HIPC-related increases in net flows).[1] Such shocks have beneficent long-run effects, but when foreign currency balances compete actively with domestic currency they can produce dramatic monetary management problems in the short run. Thus a large inflow initially draws the central bank into foreign exchange intervention, in a pattern consistent with the "fear of floating" widely exhibited by countries operating nominally flexible exchange rate regimes (Calvo and Reinhart, 2000a). But the implied reserve accumulation then expands the monetary base, generating fears of inflation and "overheating." Bond sales may be used to sterilize the liquidity injection, but this leads to large increases in real interest rates. In the end, policymakers have to make a difficult decision: what combination of changes in inflation, nominal and real exchange rates, and real interest rates should be used to absorb the aid shock?

This paper develops a theoretical framework that can shed light on the tradeoffs associated with alternative policies for managing large official and private capital inflows to low-income African economies. Although a large literature relates to this topic, we believe it needs more work. The literature on capital inflows to emerging market economies has wrestled with many of the issues that concern us. Few precise results have emerged from this literature, however, and controversy persists regarding the efficacy of bond sterilization, the appeal of alternative approaches to absorbing domestic liquidity, and the relevance of underlying concerns about overheating. Moreover, in an African context, the problem has its own distinctive features: the initiating inflows are official rather than private; the "officially pronounced" nominal anchor is money rather than the exchange rate; and the economies in question are low-income rather than emerging-market economies, with correspondingly less developed financial markets. The problem requires a fresh analytical treatment, and one that is tailored to the particular circumstances of the countries at hand.

In the next section, we review recent experiences in Uganda, Tanzania, and Mozambique. As official inflows into these countries began to rise in the late 1990s, the policy dialogue between their central banks and the IMF focused increasingly on the appropriate path for domestic liquidity. On a continuum ranging in principle from full sterilization to full accommodation, the IMF consistently favored greater exchange rate flexibility and tighter bounds on liquidity expansion than did the central banks. In practice, the central banks chose to lean heavily against nominal appreciation and quickly abandoned attempts to control liquidity through extensive bond sales. The central message of this paper, is that the central banks got it right. When the credibility of policymakers' commitment to low inflation is firm, a heavily managed float with little or no sterilization is indeed the most attractive approach to managing a large and persistent aid inflow.

[1]The Poverty Reduction Strategy Paper (PRSP) articulates a country's medium-term macroeconomic and public expenditure program. In the majority of countries the PRSP anticipates increased public expenditures financed in part by sustained increases in net aid flows, including from debt relief payments arising from the Heavily Indebted Poor Countries (HIPC) initiative.

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Since the central bank approach generates rapid nominal money growth, its appeal must rest on a view that persistent aid inflows generate a large increase in real money demand. While the evidence to date favors such a view (Section I), the literature provides little guidance as to the mechanisms involved or the structural features underlying such a response. In our model, two features of poststabilization low-income countries prove decisive. The first is that a portion of aid ends up reducing domestic budgetary financing rather than supporting an increase in government spending or a reduction in taxes. This agrees with the data. In sub-Saharan Africa (SSA) between 1990 and 2001, 21 cents of each aid dollar substituted, on average, for domestic financing.[2] A persistent aid inflow therefore reduces expected seigniorage and expected inflation, thereby generating a potentially substantial increase in real money demand.

The second decisive feature of our analysis is an active private capital account. While private capital flows have largely been ignored in discussions of aid management, this is no longer appropriate. Foreign-denominated assets constitute an important share of private financial wealth in low-income Africa, and a growing body of evidence suggests that foreign currency competes actively with domestic currency in the countries we are studying (Collier, Hoeffler, and Pattillo, 2002; Asea and Reinhart, 1996; and Bhindra and others, 1999). Our simulation results suggest that portfolio adjustments already confront central bankers with tradeoffs that, while less spectacular than those facing their emerging-market counterparts, hold similar perils for short-term macroeconomic stability. In particular, a fall in expected inflation triggers a portfolio adjustment that even under modest substitutability generates an outright reduction in desired foreign balances. The incipient capital inflow places acute short-run pressure on the foreign exchange market, dramatically undermining the case for a floating exchange rate.

In Sections II–IV, we develop the core structure of our model and calibrate it to the countries under study. Following Buffie (2003) we use a two-sector, perfect foresight model with imperfect asset substitutability. Aid accrues directly to the public sector, where the bulk of it is spent, but a portion may be devoted to reducing the government's seigniorage requirement. To quantify the macroeconomic tradeoffs we begin by solving the model under the polar exchange rate arrangements of a pure float (Section V) and a predetermined crawling peg (Section VI). The long-run response is identical, and we assume throughout the paper that the monetary authority accepts the moderate real appreciation that is required to absorb the long-run spending effect of aid.[3] A comparison of short-run responses, how-

[2]In our working paper we use data from Gupta and others (2002), covering a sample of 39 low-income countries from 1991 to 2000, to assess the contribution of aid (grants plus net loan disbursements) to the fiscal deficit and the domestic financing requirement. The *ex post* budget financing component rises to nearly 30 percent in sub-Saharan Africa in the second half of the 1990s.

[3]If the inflow is known to be temporary, it may be welfare-improving for the monetary authority to target the real exchange rate, letting inflation and/or the real interest rate increase in order to prevent "Dutch disease" or other adverse effects of a temporary real appreciation (Prati, Sahay, and Tressel, 2003; and Calvo, Reinhart, and Végh, 1995). But when the inflow is persistent, there is little to recommend a delayed real exchange rate adjustment. Monetary management should concentrate, instead, on avoiding short-run volatility around the new long-run real exchange rate. A successful monetary response is one that avoids an overshooting of the real exchange rate, a burst of inflation, a slump in real activity, or a run-up in the real exchange rate.

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ever, generates a result reminiscent of the broader literature on exchange rate regimes: when government spending rises by the full amount of aid, portfolio shifts play a minor role, and we find that floating rates deliver a superior outcome, with near-immediate adjustment to the steady state and little short-run volatility in the real exchange rate or interest rate. When a portion of aid is used to reduce the seigniorage requirement, in contrast, portfolio adjustment plays a major role and the crawling peg delivers greater short-run stability.

A clean float is even more unappealing if domestic wages and prices are downwardly rigid in the short run, because in this case the deflationary impact of nominal appreciation creates a strong bias toward economic contraction.[4] The advantages of the crawling peg, however, are not unambiguous: they are bought at the price of an initial burst of inflation, unless—implausibly in our view—domestic wages and prices are rigid in the upward direction. In Sections VIII and IX, therefore, we consider alternative strategies for neutralizing these short-run effects, including temporary bond sterilization of foreign exchange intervention and a managed float that targets the new long-run equilibrium real exchange rate. While a crawling peg with bond sterilization fails badly, generating intolerable increases in interest rates and government debt, the managed float delivers an unambiguously favorable outcome.

Section X concludes the paper with suggested extensions of the analysis.

I. Country Experiences

The experiences of Uganda, Tanzania, and Mozambique since the late 1990s illustrate well the policy problems confronting central banks in many low-income countries (see Box 1 and Tables 1 and 2). For at least the previous two decades monetary policy was subordinated to fiscal imperatives, initially to the financing of large (and ultimately unsustainable) fiscal deficits and, since the early 1990s, in support of decisive fiscal consolidations, which, in turn, ushered in an era of historically low inflation (Honohan and O'Connell, 1997). With each country resorting to fiscal rules to manage the growth in domestic credit to government, there was little or no role for active monetary policy.

Successful stabilization has been associated with large and persistent increases in aid and private capital flows, most notably into Uganda and Tanzania. Given the priorities embedded in countries' PRSPs, the public expenditure financed by these aid flows has been biased toward nontradables, creating pressure for the real exchange rate to appreciate at the same time that private capital flows caused the monetary base to expand rapidly. In this environment the central banks have wrestled with the problem of how much (if at all) domestic liquidity growth needs to be neutralized, over what time period, and by what means.

Two issues have complicated the question of the required scale of intervention. The first is a lack of clarity on the part of the authorities as to whether concerns about the exchange rate relate more to its volatility than its level (and even

[4]Calvo and Reinhart (2000b) cite debt deflation as a risk in floating exchange rate systems. Our own interpretation here emphasizes the traditional demand contraction channel.

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Box 1. Monetary and Exchange Rate Policy in Uganda, Tanzania, and Mozambique, 1999–2002[1]

Since the mid-1990s, Uganda, Tanzania, and Mozambique have enjoyed rapid economic growth based around broad overall macroeconomic stability and structural reforms that have included exchange rate unification and the de facto liberalization of the capital account; each now classifies itself as operating a floating exchange rate regime. All three have seen inflation drop sharply compared to levels experienced in the early 1990s.[2] Three key characteristics have helped shaped the countries' current policy choices: low levels of domestic debt and thin domestic debt markets; low domestic monetization; and widespread currency substitution. At the end of the 1990s, on the eve of the episodes we examine here, domestic debt averaged between 2 and 4 percent of GDP, reflecting in part the legacy of high inflation and administered interest rates on nominal debt and, more recently, a sequence of domestic budget surpluses. Moreover, markets in government debt are relatively new and dominated by short-dated instruments. Hence, changes in domestic public borrowing, which would otherwise be considered modest relative to the size of the fiscal deficit or GDP, end up being large relative to the domestic bond market and entail correspondingly large movements in domestic interest rates.

Money demand in all three countries is also low and appears to be strongly influenced by currency substitution. Reserve money averages little more than 4 percent of GDP, and narrow money is 10 percent. By contrast, foreign currency constitutes a large and rising share of private sector money. Foreign currency deposits account for between one-quarter (Uganda and Tanzania) and one-half (Mozambique) of total deposits of the banking sector, and an unknown volume of foreign currency circulates in parallel with domestic currency outside the banking sector. Consistent with the broader literature on Africa, it would appear that although some of this stock is accounted for by "passive" resident donor mission, embassy and NGO accounts, a substantial portion is actively managed as part of the private sector's wealth portfolio.[3]

Uganda

The recent surge in aid flows into Uganda, which began around 2000, occurred against the background of a slump in world coffee prices. Reflecting concerns about this sector, the initial response by the Bank of Uganda (BoU) was to accumulate foreign exchange reserves in order to forestall any exchange rate appreciation arising from increased aid-financed public expenditure on nontradables. Given the constraints of the program negotiated with the IMF—which envisaged only a modest growth in reserve money—the BoU therefore initially attempted to sterilize the domestic liquidity injection through domestic debt sales. Large relative to the initial size of the domestic debt, this intervention in the domestic debt market precipitated a rapid increase in the debt stock, interest rates, and debt service costs (since with a short average maturity the debt stock was turned over and repriced rapidly). So swift was this increase that the BoU abandoned its bond-sterilization strategy in early 2001 but without any offsetting change in its stance on the exchange rate. As a result, reserve money grew rapidly and by mid-2001 it was around 10 percent above its program target. Under pressure from the IMF and the Ministry of Finance, the BoU reverted to a sterilization strategy that relied more heavily on foreign exchange sales. With export earnings weakening and slower than anticipated implementation of public expenditure at the time, the nominal exchange rate did not in fact appreciate in response to BoU intervention (although the nominal and real exchange rates were arguably still more appreciated that the Bank would have wished at the time). Throughout this whole episode and despite the significant monetary overhang relative to the program, underlying nonfood inflation remained low and consistent with the BoU's inflation target.

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[1]These narratives are based on government documents, IMF Staff Reports, and program review documents and discussions with IMF staff. All interpretations of the evidence are our own.

[2]Inflation reached 250 percent a year in Uganda in the late 1980s and over 60 percent a year in Tanzania and Mozambique in the early 1990s.

[3]See, for example, the literature on private capital flows by Asea and Reinhart (1996), Bhindra and others (1999), Collier and others (2002), and Fedderke and Liu (2002) on private capital flows and

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Tanzania

Tanzania's experience is similar to that of Uganda although perhaps more dramatic. Following a sequence of successful ESAF/PRGF arrangements through the late 1990s, tensions began to emerge in mid-1999 as aid and private capital flows increased. As in Uganda, the Bank of Tanzania (BoT) sought to resist the pressure on the exchange rate by targeting the nominal exchange rate which, despite the surge in inflows, remained virtually constant against the U.S. dollar for almost two years (mid-1999 to April 2001).[4] Sterilization of the shilling counterpart of these aid flows was initially achieved through domestic debt sales. As it happened, the start of this period coincided with a temporary shortfall in tax revenues which the authorities chose to fund through domestic debt sales, so that part of the surge in domestic borrowing and the rise in interest rates at this time reflected conventional deficit-financing requirements.[5] However, during the final quarter of 1999 and well into 2000, by which time the funding crisis had receded, BoT continued to rely on debt sales to sterilize the shilling counterpart to the aid inflow. By mid-2000 concerns about rising interest costs saw the Bank scale back its intervention in the domestic debt market. With both of the conventional instruments for neutralizing domestic liquidity pinned down, reserve money grew rapidly and quickly broached the ceiling implied by the targets for net international reserves (NIR) and net domestic assets (NDA) defined under the PRGF. Since 2001 the IMF has argued for a significantly tighter monetary stance, and secured the agreement of the Bank of Tanzania to supplement the existing performance criteria with an explicit program benchmark for reserve money growth in the 2002/03 PRGF arrangement. As in Uganda, however, inflation has remained low and stable, despite the volatility in interest rates and excess growth in reserve money.

Mozambique

In many respects, the experience of Mozambique is rather different from that of Uganda or Tanzania. One important difference is that the surge in private capital flows preceded the resurgence of official aid flows. The Bank of Mozambique's (BoM) initial response to the growth in private flows, from 1998 to roughly the end of 1999, was conventional. Although BoM did not appear to explicitly target the nominal and real exchange rate, it did allow its net international reserves to rise rapidly, so that over this period reserve coverage increased from 3.5 to 6.5 months of (a rising volume of) imports. This increase was offset by a fiscal sterilization—government deposits with BoM rose sharply and NDA fell one-for-one with the rise in NIR. Reserve money growth was thus almost entirely capped, with higher real money balances accommodated through an increase in the broad money multiplier and a steady rise in the share of foreign currency deposits—on which the domestic reserve requirement was zero at the time—in total private sector money balances.

By late 1999 and into 2000 reserve money growth began to exceed its program targets, even though these had been revised upward to accommodate the effects of the floods of 2000. By this stage aid flows had increased to finance nontradable PRSP-related public expenditure, and the previously tight fiscal stance had been loosened somewhat. Although the BoM was not attempting to offset an appreciation in the exchange rate, it was reluctant to use its instrument aggressively to control the growth in reserve money, arguing instead that the observed growth was noninflationary and reflected an underlying recovery in money demand. Initial sterilization efforts through the debt market were therefore relatively mild, and only in response to significant encouragement from the IMF and a sharp increase in inflation in the second half of 2001 did the BoM adopt more aggressive open market operations.

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the empirical work by, among others, Fielding (1994), Adam (1999), Henstridge (1999), and Nachega (2001), which finds significant currency-substitution effects on the demand for domestic monetary aggregates.

[4]However, given the sharp depreciation of the South African rand over this period, Tanzania's trade-weighted exchange rate appreciated over this period.

[5]This shortfall, which had been anticipated from early in 1999, reflected over-optimistic forecasts of revenue following tax reform measures implemented in 1989/99.

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whether the argument that monetary policy cannot depreciate the real exchange rate on a permanent basis is fully accepted, Calvo, Reinhart, and Végh, 1995). The second is the absence of a consensus on the likely evolution of the demand for money and hence the sustainable noninflationary growth in domestic liquidity. As Table 1 indicates, velocity has declined in all three countries, and in both Uganda and Tanzania inflation has remained low and stable despite bursts of rapid growth in reserve money. In Mozambique, by contrast, a closer—or at least more rapid—link between reserve money and inflation has been evident. The central banks of Uganda and Tanzania, and to a lesser extent the Bank of Mozambique, have argued that the decline in velocity, which was consistently greater than the IMF had projected, reflected two factors: first, that the inflation-induced demonetization of the late 1980s and early 1990s was still in the process of being reversed; and second, that structural reforms had substantially increased permanent income and therefore the demand for money. The contrary view, articulated in IMF staff appraisals but apparently supported by the Ministry of Finance in Uganda, is more pessimistic. According to this view, structural reforms have generated, at best,

Table 1. Output, Aid, Inflation, and Reserve Money in Uganda, Tanzania, and Mozambique

Calendar Year	Real GDP Growth (in percent)	Net Aid Inflow (percent of GDP)	CPI Inflation (in percent)	Reserve Money Velocity (1997 = 1.00)
		Tanzania		
1997	3.5	3.1	15.4	1.00
1998	3.7	4.0	11.2	1.01
1999	3.5	4.5	7.0	0.92
2000	4.9	6.0	5.5	0.93
2001	5.7	5.0	4.9	0.98
2002	6.2	5.9	4.4	0.91
2003(proj)		6.4		
		Uganda		
1997	5.0	8.3	8.4	1.00
1998	4.5	7.9	−1.9	0.85
1999	8.0	7.9	9.3	0.88
2000	5.0	9.2	3.3	0.78
2001	5.5	11.7	−3.3	0.70
2002	6.6	12.5	−0.5	0.64
2003(proj)		10.5		
		Mozambique		
1997	11.2	14.8	6.9	1.00
1998	12.0	12.7	−1.1	1.15
1999	7.5	13.5	6.1	1.12
2000	1.5	14.4	11.6	1.01
2001	13.0	15.2	22.0	0.91
2002	7.7	15.4	9.1	0.90

Sources: IFS and IMF Staff Reports.

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only a modest increase in money demand, while the history of inflation in these countries has permanently increased the elasticity of substitution between domestic and foreign money, reducing the demand for money at any inflation rate. Hence, while there may have been a structural shift in money demand between the 1980s and 1990s, the case for a further sustained increase in real money demand in the poststabilization period remains unproven. This pessimism, combined with a view that money supply growth is still taken as a signal of the credibility of government's commitment to fiscal discipline, underpins the "neutralize at all costs" position that appears to have dominated the IMF's perspective on the limit of monetary policy in these countries in recent years.

Turning next to the question of how sterilization is to be achieved—via traditional bond sterilization, foreign exchange sales, or delayed fiscal absorption of aid—it would appear the central banks have first and foremost been concerned with avoiding excessive nominal and real appreciation. The initial response to inflows in all three countries thus included a sharp accumulation of international reserves, and in Uganda and (especially) Tanzania the central bank intervened in the foreign exchange market to limit the pressure on the nominal exchange rate. To the extent that the underlying anxieties about the exchange rate are articulated, it is the adverse effect on traditional cash-crop exports that appears to have been of prime concern to the central banks. It is much less clear whether their concerns extend to nontraditional exports or the import-substituting sector, as stressed by the Dutch disease literature.

In the context of a reserve money program, this fear of floating suggests the use of sterilized intervention, and bond sterilization played a major role in all three countries, at least initially. The thinness of domestic debt markets, however, meant large increases in domestic interest rates which in turn, given the short maturity of debt instruments, led to a rapid pass through to debt-servicing costs (Table 2). It

Table 2. Bond Sterilization Episodes in Uganda, Tanzania, and Mozambique
(In percent)

	Before	Active OMO	After
Tanzania			
91-day yield	7.3	13.9	4.6
Ex post real yield	–1.1	6.9	–0.5
Uganda			
91-day yield	7.1	13.8	6.7
Ex post real yield	–2.2	9.6	4.1
Mozambique			
91-day yield	12.6	22.9	—
Ex post real yield	1.8	10.4	—

Sources: IFS and IMF Staff Reports.

Notes: "Active OMO" denotes periods of aggressive open market operations by the central bank. These periods are: Tanzania, July 1999–April 2000; Uganda, December 1999–July 2001; and Mozambique, July 2000 onward. "Before" refers to the six months prior to the Active OMO period and "After" to the full period since.

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appears to have been these mounting fiscal costs of debt service, rather than the impact of high interest rates on credit to the private sector, that constituted the dominant constraint on central banks' willingness to continue bond sterilization, and it was this unwillingness that induced the authorities to switch toward more aggressive foreign exchange sales (in Uganda) and/or allow reserve money growth to exceed its program target (in Tanzania and Mozambique).

II. The Model

We work with a simple currency substitution model of a small open economy that produces a nontraded good and a composite traded good. Real output is fixed in both sectors and the world price of the traded good equals unity. The private sector divides its wealth between domestic currency, foreign currency, and government bonds. Notational conventions are as follows: P_n and γ denote the relative price of the nontraded good and its share in aggregate consumption; Q_i is output in sector i; b is the nominal stock of bonds deflated by the price level; and m, F, and E are real money balances, the stock of foreign currency, and aggregate real expenditure measured in U.S. dollars (i.e., units of the traded good).

Before turning to the equations, two remarks are in order about the general specification of the model. First, the assumption that the foreign asset does not earn interest is innocuous. What *is* critical, especially in the section on sterilization, is that the foreign asset and domestic bonds are not perfect substitutes; hence the domestic interest rate is not tied down by the interest-parity condition. Second, when aid spending shifts out the demand curve in the nontradable sector, the real exchange rate would appreciate less if the supply curve were not vertical. This does not substantively alter the results. The only change in the solutions is that the compensated elasticity of demand for the nontraded good, whenever it appears, is replaced by the sum of the demand elasticity and the general equilibrium elasticity of nontradables supply.

Prices

P_n adjusts to clear the goods market in the nontradables sector. This requires

$$D_n(P_n, E) = Q_n, \tag{1}$$

where $D_n(\cdot)$ is the Marshallian demand function for the nontraded good. The overall price level P is a geometric weighted average of the prices of the traded and nontraded goods. Since the nominal exchange rate e sets the domestic price of the traded good,[5]

$$P = eP_n^{\gamma}. \tag{2}$$

[5]For small changes, γ can be treated as a constant. In the numerical simulations, γ varies endogenously with P_n. (We do not assume Cobb-Douglas preferences.)

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The Private Agent's Optimization Problem

All economic decisions in the private sector are controlled by a representative agent who possesses an instantaneous utility function of the form $V(P_n, E) + \phi(mP_n^{-\gamma}, FP_n^{-\gamma})$. $V(\cdot)$ is a standard indirect utility function that measures utility from goods consumption, while $\phi(\cdot)$ reflects liquidity services generated by holdings of domestic and foreign currency. To obtain concrete results and prepare the model for calibration, we assume $V(\cdot)$ and $\phi(\cdot)$ are nested CES-CRRA functions in which τ, β, and σ denote, respectively, the intertemporal elasticity of substitution, the elasticity of substitution between traded and nontraded consumer goods, and the elasticity of substitution between domestic and foreign currency.

The private agent chooses m, b, F, and E to maximize

$$U = \int_0^\infty \left[V(P_n, E) + \phi\left(mP_n^{-\gamma}, FP_n^{-\gamma}\right)\right] e^{-\rho t} dt, \tag{3}$$

subject to the wealth constraint

$$A = m + P_n^\gamma b + F \tag{4}$$

and the budget constraint

$$\dot{A} = P_n Q_n + Q_T + P_n^\gamma g + rP_n^\gamma b + (\pi - \chi)P_n^\gamma b - \chi m - E, \tag{5}$$

where ρ is the time preference rate; g is real lump-sum transfers; $\chi = \dot{e}/e$ is the rate of currency depreciation; r is the real interest rate; and $\pi = \dot{P}/P$ is the inflation rate. $P_n^\gamma = P/e$ multiplies g and b because wealth is measured in dollars but transfers and bonds are indexed to the price level. For the same reason, the artificial capital gains term $(\pi - \chi)P_n^\gamma b$ appears in the budget constraint (5).

On an optimal path, the marginal rate of substitution between consumption and m or F equals the income forgone from holding that type of money:

$$\phi_1/V_E\, P_n^\gamma = r + \pi, \tag{6}$$

$$\phi_2/V_E\, P_n^\gamma = r + \pi - \chi. \tag{7}$$

In addition, the path of real expenditure satisfies a standard Euler equation. Under the assumption of homothetic preferences, the Euler equation reads

$$\frac{\dot{E}}{E} = \frac{\tau(\eta + \gamma)}{\eta}(r - \rho), \tag{8}$$

where $\eta = \beta(1 - \gamma)$ is the compensated own-price elasticity of demand for the nontraded good.[6]

[6] η appears in equation (8) because the solution takes into account how the price of the nontraded good varies on the transition path.

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The Public Sector Budget Constraint

Money is injected into the economy whenever the central bank accumulates foreign exchange reserves Z or runs the printing press to finance the fiscal deficit of the central government. For now, we ignore bond sales and open market operations. The *consolidated* public sector budget constraint is thus

$$\dot{m} = P_n^{\gamma}(g + rb) + \dot{Z} - X - \chi m, \tag{9}$$

where X is sale of aid dollars net of government imports and interest payments on the public sector foreign debt net.[7]

Net Foreign Asset Accumulation and the Balance of Payments

One last equation completes the core structure of the model. Summing the private and public sector budget constraints produces the accounting identity that foreign asset accumulation equals national saving or the current account surplus:

$$\dot{F} + \dot{Z} = P_n Q_n + Q_T + X - E. \tag{10}$$

Fixed versus Flexible Exchange Rates

In a pure float the central bank never intervenes in the foreign exchange market; with $\dot{Z} = 0$, equations (8)–(10) comprise a 3×3 dynamic system in which m and E are jump variables and F is predetermined. Under a crawling peg, on the other hand, the money supply adjusts endogenously through the capital account to satisfy money demand. But while domestic currency can be swapped for foreign currency at the central bank, the total dollar value of currency holdings J is predetermined. To bring J into view, add equations (9) and (10). After cancelling terms, we have

$$\dot{J} = P_n^{\gamma}(g + rb) + P_n Q_n + Q_T - E - \chi m. \tag{11}$$

Equations (8) and (11) then comprise a 2×2 system in which E is a jump variable and J is predetermined. This ends the formal, notation-intensive part of the paper.

Most of the space in the next seven sections is devoted to nontechnical, intuitive explanations of how aid affects the economy's equilibrium path. Additional equations appear only insofar as they are needed to state important results or describe extensions of the core model. All of the algebra involved in solving for the steady state outcome, deriving key conditions, and characterizing the dynamic systems associated with different policy regimes may be found in the IMF Working Paper version of the paper available via the Internet at *http://www.imf.org*.

[7]For simplicity, we ignore interest payments on reserves. This ensures that the long-run impact of aid on real income and the fiscal deficit is independent of the exchange rate regime.

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III. The Steady State Outcome

The long-run equilibrium is independent of the exchange rate regime. It is not yet necessary therefore to specify whether the central bank operates a crawling peg, a clean float, or some type of managed float.

Across steady states, $\dot{m} = \dot{F} = \dot{Z} = \dot{E} = 0$ and $r = \rho$. Imposing these conditions produces the equilibrium depicted in Figure 1a. The R and F schedules in the first and fourth quadrants show how seigniorage ($R \equiv \pi m$) and holdings of foreign currency vary with inflation. The slopes of these two schedules are

$$dR/d\pi = m(1 - \varepsilon)$$
$$dF/d\pi = (\sigma - \tau)\,\theta_m F/i\,,$$

where $i = \rho + \pi$ is the nominal interest rate; θ_j is the share of liquidity services provided by currency j; and $\varepsilon = (\tau\theta_m + \sigma\theta_f)\pi/i$ is the elasticity of money demand with respect to inflation. In the ensuing analysis we assume $\varepsilon < 1$ and $\sigma > \tau$. Neither assumption is particularly restrictive. The first keeps the economy away from the slippery, downward-sloping portion of the seigniorage Laffer curve. (When $\varepsilon > 1$, long-run comparative statics results are perverse and the equilibrium path is indeterminate.) The second implies that lower inflation reduces the demand for foreign currency. Although theory does not guarantee this result, there is not much doubt that it is easier to substitute between the two currencies than to substitute intertemporally in consumption; hence some flight capital comes home when inflation declines.

The D schedule in the second quadrant summarizes the general equilibrium relationship between aid and the fiscal deficit after grants. (Hereafter we use the shorter term fiscal deficit and omit "after grants.") When more aid flows in, X rises and the government increases real transfers to the private sector by $d(P_n^\gamma g) = \psi dX$. Since aid also drives up the relative price of the nontraded good by the amount $dP_n/P_n = dX/\eta E$, the overall impact on the fiscal deficit D is

$$dD = (\psi - 1 + \gamma s\rho/\eta)dX \lesseqgtr 0,$$

where $s \equiv P_n^\gamma b/E$.

In the long run, π is pinned down by the requirement that revenue from the inflation tax cover the fiscal deficit. Much depends therefore on the slope of the D schedule. We distinguish here between aid that is fully spent and aid used partially for deficit reduction (PDR aid). Figure 1a applies when every dollar of aid is spent ($\psi = 1$). In this case, the fiscal deficit worsens because appreciation of the real exchange rate ($P_n \uparrow$) increases the size of the internal debt measured in dollars. But higher spending also shifts the R and F schedules upward by strengthening the demand for domestic and foreign currency. Consequently, despite the rise in the fiscal deficit, inflation falls when

$$\pi\mu > \frac{\rho s\gamma}{\eta + \gamma}\,, \tag{12}$$

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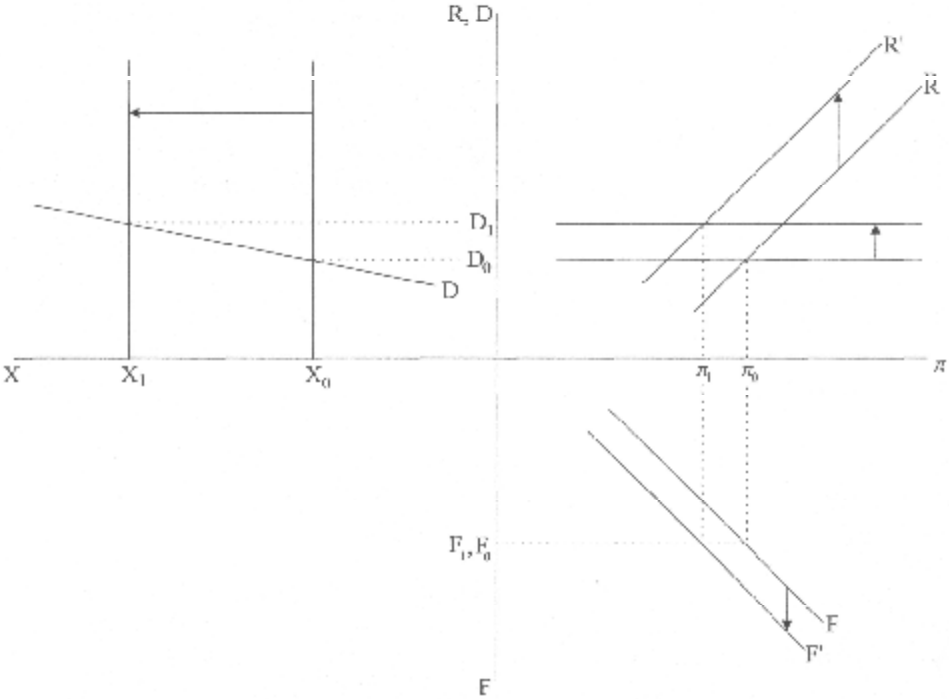
Figure 1a. The Long-Run Outcome When All Aid Is Spent



where $\mu \equiv m/E$. The term on the left side is seigniorage expressed as a percentage of national income, a number on the order of 0.005–0.02 in countries experiencing low/moderate inflation. On the right side, real interest payments on the internal debt (ρs) are equally small (in SSA), while $\gamma/(\eta + \gamma)$ is typically 0.5–0.8. (See the discussion in Section IV.) The sign of $d\pi$ is thus highly uncertain. This is irritating but unimportant; as will become apparent shortly, even large aid inflows do not change the inflation rate by more than half of a percentage point.[8]

PDR aid (Figure 1b) is different in that $(1 - \psi)$ percent of the external inflow is earmarked for reduction of the fiscal deficit. When analyzing this scenario, we assume $\psi < 1 - \rho s\gamma/\eta$ so that the seigniorage requirement does, in fact, decline. This ensures that inflation falls and that the real money supply increases. Private capital flows could go either way since lower inflation and higher consumption spending exert conflicting effects on the demand for foreign currency. Normally, however, the currency substitution effect dominates the outcome; point H lies to the north of point G provided σ is not unusually small.

[8]This statement assumes that ε is not too close to unity. Near the top of the seigniorage Laffer curve, small variations in the fiscal deficit have large effects on the inflation rate.

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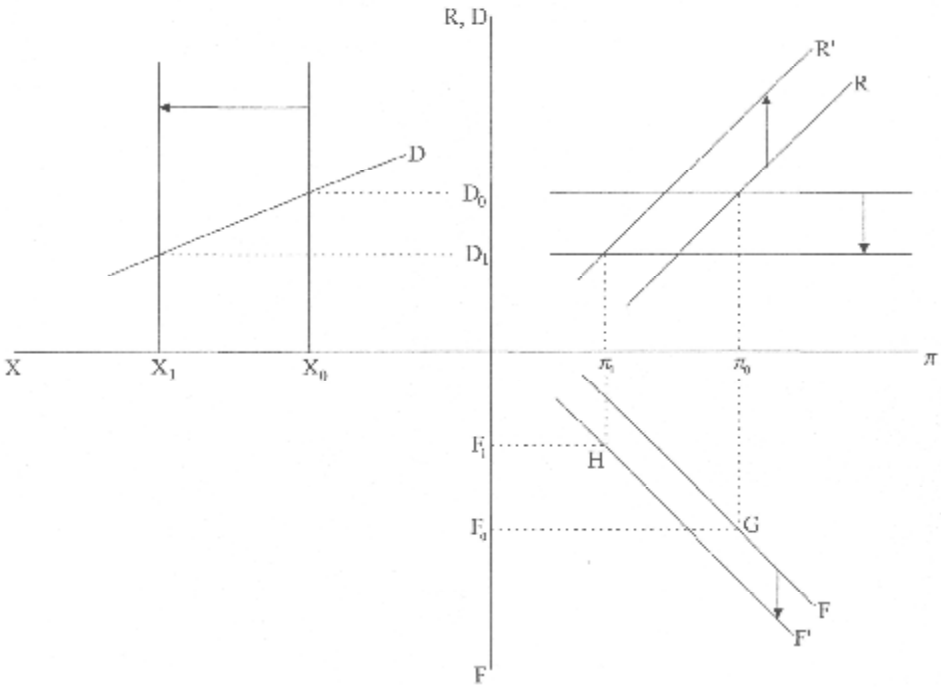
Figure 1b. The Long-Run Outcome in the Case of PDR Aid



IV. Model Calibration

To calibrate the model we chose units so that $P_{no} = E_o = 1$ and set

$$m_o = 0.08,\ b_o = 0.09,\ \pi_o = 0.10,\ \gamma_o = 0.50,\ X_o = 0.10$$
$$\beta = 0.50,\ \sigma = 0.75 - 3,\ \rho = 0.10,\ \tau = 0.25 - 50,\ F_o = 0.12.$$

The numbers assigned to m_o, π_o, b_o, γ_o, and X_o are rough averages of the values observed in Uganda, Mozambique, and Tanzania in the period 1999–2001 (see Table 3). We chose average values mainly to save space; the results do not change much when the model is calibrated separately to the data for each country. With respect to the other choices:

- *Elasticity of substitution in consumption between traded and nontraded consumer goods* (β). Fixing β at 0.50 implies that the compensated elasticity of demand for the nontraded good is 0.25 initially. This agrees with the finding in empirical studies that compensated elasticities of demand tend to be small at high levels of aggregation.[9]

[9]See Lluch and others (1977, chapter 3), Deaton and Muellbauer (1980, p. 71), Blundell (1988, p. 35), and Blundell, Pashardes, and Weber (1993, Table 3b, p. 581).

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Table 3. Recent Economic Statistics for Uganda, Tanzania, and Mozambique

	Uganda	Tanzania	Mozambique
Reserve money[1] (average, 1999–2001)	0.055	0.096	0.077
Inflation[2] (range, 1998–2002)	0.05–0.10	0.05–0.10	0.10–0.15
Nontradables share in consumption (2001)[3]	0.51		
Net aid transfers[4]			
2000	0.09	0.06	0.144
2001	0.12	0.05	0.152
Foreign currency deposits[1]			
2000	0.049	0.045	0.13
2001	0.041	—	0.16

[1]Expressed as a percentage of private consumption.
[2]Nonfood inflation rate.
[3]Adam and Bevan (2003). Half of food consumption is assumed to be nontradable.
[4]Expressed as a percentage of GDP.

- *Elasticity of substitution between domestic and foreign currency* (σ). There are no reliable estimates of σ for the countries in our sample or any other country in Africa. For Latin America the numbers range from 1.5 to 7 (Ramirez-Rojas, 1985; Marquez, 1987; Giovannini and Turtleboom, 1994; and Kamin and Ericsson, 1993). Not trusting the high-end estimates, we decided to let σ vary from 0.75 to 3.
- *Time preference rate* (ρ). The time preference rate is 10 percent because the real interest rate on government debt—fixed by ρ across steady states—seems to be high in the countries we study.
- *Elasticity of intertemporal substitution* (τ). Most estimates for less-developed countries (LDCs) place τ between 0.20 and 0.50 (Agénor and Montiel, 1999, Table 12.1). We settled therefore on 0.25 and 0.50 as the low and high values for the intertemporal elasticity of substitution.[10] Occasionally, we also report results for the intermediate case of $\tau = 0.35$.
- *Ratio of foreign currency to national income* (F_o). Foreign currency deposits in the domestic banking sector range from 45 to 200 percent of reserve money in Mozambique, Uganda, and Tanzania.[11] This suggests $F_o = 0.086$, but the true value is higher because a good deal of foreign currency is held outside of the domestic banking system. We arbitrarily set F_o at 0.12. This is in line with dollarization ratios in other LDCs (Kamin and Ericsson, 1993; Savastano, 1996; and Baliño, Bennett, and Borensztein, 1999).

[10]The point estimate for τ is 0.25 for Tanzania in Ogaki, Ostry, and Reinhart (1996); 0.50 is slightly below their average point estimate (0.57–0.60) for middle-income countries.

[11]Evidence from Uganda, Tanzania, Mozambique, and elsewhere (e.g., IMF Staff appraisals for Zambia and Ghana) indicates that the overwhelming proportion of foreign currency deposits in the domestic banking system is held by domestic residents.

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All simulations postulate an increase in aid (net of government imports) equal to 2 percent of initial national income. This causes the real exchange rate ($1/P_n$) to appreciate 7.5 percent in the long run. In every case, the steady state is a saddle point and the path that converges to the long-run equilibrium is unique.[12]

V. Flexible Exchange Rates

On paper, flexible exchange rates and strict targeting of the money supply are the norm in SSA. But the commitment to money-based stabilization and market-determined exchange rates is far from absolute, especially in periods of adjustment to large external shocks. Many countries have responded to large aid inflows by shifting to managed floats and partly accommodating monetary policy.

The decision about how much to manage the exchange rate is a decision about how much to move in the direction of a fixed exchange rate. Most of the information relevant to this decision is contained in the outcomes at the endpoints of the policy spectrum. Accordingly, we start by investigating the transition path associated with a pure float. Section VI analyzes the polar opposite case of a crawling peg.

All Aid Is Spent[13]

When all aid is spent the new steady state is very close to the old steady state. The fiscal deficit rises a trivial one-tenth of a percentage point, the equilibrium inflation rate drops from 10 percent to 9.4–9.8 percent, and holdings of foreign currency increase 2–6 percent (0.2–0.7 percent of GDP). While close proximity of the old and the new steady state does not preclude interesting dynamics, we have yet to discover a case (based on sensible parameter values) where any macro variable changes much on the transition path. The current account surplus peaks in the first year at a modest 0.2–0.4 percent of GDP, and most of the long-run appreciation of the real exchange rate is accomplished in a single downward jump of the nominal exchange rate at $t = 0$. In the run for $\tau = 0.25$ and $\sigma = 0.75$, the real interest rate jumps initially to 11 percent. This is mildly exciting, but in the rest of the parameter space r increases only one- to five-tenths of a percentage point. The most notable conclusion is that aid spending does *not* temporarily exacerbate inflationary pressures. Quite the contrary, thanks to sharp appreciation of the nominal exchange rate, the price level decreases 1.6–6.4 percent on impact.

PDR Aid

In the PDR-aid scenario, inflation and holdings of foreign currency decrease significantly across steady states when currency substitution is easy. Several results

[12]The paths for inflation, the real interest rate, the current account balance, etc., were generated by substituting the linearized solutions for the variables in the core dynamic system into the static nonlinear model. This retains more of the nonlinear structure of the model and thereby reduces linearization error (Novales and others, 1999).

[13]The IMF Working Paper version of the paper contains the numerical results for the case where all aid is spent. We summarize the results here in order to save space.

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follow directly from the private sector's desire to run down its stock of foreign currency: at $t = 0$ expenditure increases *more* than aid, the current account worsens, and the real exchange rate *overshoots* its steady state level. Furthermore, since expenditure declines monotonically after its initial jump, the real interest rate is lower (see the Euler equation) and current account deficits persist throughout the adjustment process.

The spending boom that accompanies aid might seem to be a source of trouble for the price level in the short run. But this is not the case. When the private sector attempts to sell foreign currency at $t = 0$ the nominal exchange rate appreciates enough to fully neutralize the inflationary pressures of higher consumption spending. In the long version of the paper we demonstrate that the price level decreases on impact and that inflation is continuously lower on the transition path to the new steady state.

Numerical results

Table 4 shows how inflation, the real interest rate, the real exchange rate (RER), and the current account (CA) evolve during the first five years of the adjustment process. The number in parentheses in the cell for $t = 0$ states the initial percentage jump in the price level. In the column at the far right, Long Run refers to the steady state outcome.

The simulations assume, consistent with the African data for the 1990s, that the government spends 75 percent of the aid inflow.[14] This lowers the fiscal deficit by roughly half a percentage point (recall that aid increases by 2 percent of national income) and reduces the steady state inflation rate to 2.1–3.3 percent. Cumulative private capital inflows range from 0 to 6.6 percent of national income.

What happens on the way to the long-run equilibrium depends mainly on the currency substitution parameter σ. For $\sigma = 0.75$ private capital inflows are small and the economy moves quickly to the vicinity of the new steady state. But when $\sigma = 2 - 3$ the ride is a bit wild. Consumption spending strongly overshoots its steady state level; as a result, the real exchange rate appreciates 14–20 percent in the short run and the current account deficit, *inclusive of aid,* jumps to 1.8–3.5 percent of national income. There are also pronounced fluctuations in π and r in the runs where $\tau = 0.25$. The real interest rate decreases 1.8–2.2 percentage points at $t = 0$; it rises steadily thereafter but is still 1.3–1.7 percentage points lower at $t = 2$. Because of the temporary decrease in the real interest rate, the fiscal deficit and inflation also overshoot their steady state levels.

Sticky prices

We have saved the bad news for the end. Unfortunately, the results presume far too much flexibility of nominal prices. Consider how the economy adjusts in the short

[14] On average, governments in sub-Saharan Africa spend 79 cents of every aid dollar. Recall, however, that our analysis applies to aid net of government imports. When import purchases are netted out, far less than 79 percent of aid is spent. Our assumption that 25 percent of aid supports deficit reduction is therefore highly conservative.

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Table 4. Transition Path in a Pure Float

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$							
π	0.031 (–0.20)	0.032	0.032	0.032	0.033	0.033	0.033
r	0.093	0.096	0.098	0.099	0.099	0.10	0.10
RER	0.91	0.92	0.92	0.92	0.92	0.92	0.92
CA	–0.003	–0.002	–0.001	–0.001	0	0	0
$\tau = 0.50$ and $\sigma = 0.75$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.031 (–0.24)	0.031	0.031	0.031	0.031	0.031	0.031
r	0.10	0.10	0.10	0.10	0.10	0.10	0.10
RER	0.92	0.92	0.92	0.92	0.92	0.92	0.92
CA	0	0	0	0	0	0	0
$\tau = 0.25$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0 (–0.37)	0.013	0.019	0.022	0.024	0.025	0.026
r	0.078	0.082	0.087	0.092	0.095	0.097	0.10
RER	0.84	0.88	0.90	0.91	0.92	0.92	0.92
CA	–0.022	–0.013	–0.007	–0.004	–0.002	–0.001	0
$\tau = 0.50$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.014 (–0.42)	0.019	0.021	0.023	0.023	0.024	0.024
r	0.092	0.093	0.095	0.097	0.098	0.099	0.10
RER	0.86	0.88	0.90	0.91	0.92	0.92	0.92
CA	–0.018	–0.011	–0.006	–0.004	–0.002	–0.001	0
$\tau = 0.25$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.023 (–0.45)	–0.001	0.011	0.017	0.020	0.021	0.023
r	0.082	0.079	0.083	0.088	0.093	0.096	0.10
RER	0.80	0.85	0.88	0.90	0.91	0.92	0.92
CA	–0.035	–0.020	–0.011	–0.006	–0.003	–0.002	0
$\tau = 0.50$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.004 (–0.50)	0.008	0.015	0.018	0.019	0.020	0.021
r	0.095	0.092	0.093	0.095	0.097	0.098	0.10
RER	0.81	0.86	0.88	0.90	0.91	0.92	0.92
CA	–0.031	–0.018	–0.011	–0.006	–0.004	–0.002	0

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run. According to our model, the nominal exchange rate appreciates 24–55 percent at $t = 0$ to forestall incipient capital inflows (F is predetermined). Since the real exchange rate appreciates "only" 8–20 percent, the nominal price in the nontradables sector has to immediately fall 16–44 percent to keep demand equal to supply. This strains belief to say the least. But if nominal price adjustment is incomplete, the economy slides into a recession—probably a deep recession given the magnitude of nominal appreciation at $t = 0$. To confirm this, we carried out simulations for a variant of the model in which nontradables output is demand-determined and prices are sticky à la Calvo and Végh (1983). The price of the traded good is still set by the exchange rate but firms in the nontradables sector adjust prices only when they receive a random "price-change signal." Firms that receive a signal choose a new price by forecasting the future paths of the price level and excess demand.[15] Price adjustment is thus forward-looking. Calvo (1983) shows that when the price-change signal obeys a Poisson process

$$\dot{P}_n = (\pi_n - \chi)P_n \tag{13}$$

$$\dot{\pi}_n = -\delta[D_n(P_n, E) - \overline{Q}_n], \qquad \delta > 0, \tag{14}$$

where $\overline{Q}_n$ denotes notional output (i.e., the level of output associated with a normal capacity utilization rate). Equation (13) follows from the fact that, at any given point in time, the nominal price of the nontraded good is fixed by past price quotations. (More precisely, at any time t the set of firms that adjust their prices is of measure zero.) Equation (14) is a higher-order Phillips Curve. It says that the *change* in π_n, the inflation rate in the nontradable sector, is a decreasing function of excess demand. The parameter δ is larger the shorter the length of the average price quote.

Table 5 shows the outcome when price adjustment is fast but not instantaneous.[16] Examine first the entries in the row for Q_n, which tracks the percentage difference between nontradables output at time t and its pre-aid level. Although the compensated elasticity of demand is only 0.25, substitution toward traded goods—induced by appreciation of the nominal exchange rate—easily dominates the expansionary income effect of higher aid flows. Consequently, Q_n declines in every case. When $\sigma = 2 - 3$, the recession in the nontradables sector is protracted and severe as large private capital inflows force the nominal exchange rate to appreciate 29–37 percent at $t = 0$. For $\sigma = 0.75$, capital inflows and nominal appreciation are comparatively modest; nevertheless, Q_n falls 4 percent on impact and is 1.4 percent lower at $t = 1$.

Recession is not the only problem policymakers face. The real exchange rate overshoots its steady state level much more than in the flex-price model, especially in the runs for $\sigma = 2 - 3$. Moreover, the impact on the real interest rate changes dramatically. When prices are flexible, the real interest rate decreases temporarily from 10 percent to 7.8–9.3 percent. With sticky prices, the rate jumps to 18–34 percent

[15]Forecasts are mathematically correct and weighted by the probability the price quote will be in force at time t.

[16]We assume fast price adjustment: $\delta = 5$ in Table 5 (and later Table 7). To solve the floating rate model, real money balances measured in units of the nontraded good had to be introduced as a state variable.

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Table 5. Transition Path in a Pure Float When Nontradables Prices Are Sticky

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$							
π	–0.006 (–0.08)	0.019	0.028	0.031	0.032	0.033	0.033
r	0.183	0.125	0.108	0.103	0.101	0.10	0.10
RER	0.83	0.89	0.91	0.92	0.92	0.92	0.92
CA	–0.006	–0.002	–0.001	0	0	0	0
Q_n	–0.040	–0.014	–0.005	–0.002	–0.001	0	0
$\tau = 0.25$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.081 (–0.14)	–0.016	0.009	0.019	0.023	0.025	0.026
r	0.259	0.140	0.110	0.101	0.099	0.099	0.10
RER	0.71	0.82	0.88	0.90	0.91	0.92	0.92
CA	–0.025	–0.013	–0.007	–0.004	–0.002	–0.001	0
Q_n	–0.071	–0.030	–0.012	–0.005	–0.002	–0.001	0
$\tau = 0.50$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.127 (–0.16)	–0.025	0.008	0.018	0.022	0.023	0.024
r	0.30	0.149	0.112	0.102	0.099	0.099	0.10
RER	0.69	0.82	0.87	0.90	0.91	0.92	0.92
CA	–0.016	–0.011	–0.007	–0.004	–0.003	–0.002	0
Q_n	–0.106	–0.040	–0.014	–0.005	–0.002	–0.001	0
$\tau = 0.25$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.124 (–0.17)	–0.038	–0.002	0.012	0.018	0.021	0.023
r	0.305	0.150	0.111	0.10	0.098	0.098	0.10
RER	0.66	0.79	0.86	0.89	0.91	0.92	0.92
CA	–0.038	–0.020	–0.011	–0.006	–0.003	–0.002	0
Q_n	–0.082	–0.038	–0.016	–0.007	–0.003	–0.002	0
$\tau = 0.50$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	–0.172 (–0.18)	–0.044	–0.002	0.012	0.017	0.019	0.021
r	0.344	0.159	0.113	0.101	0.099	0.099	0.10
RER	0.63	0.78	0.85	0.89	0.90	0.91	0.92
CA	–0.028	–0.018	–0.011	–0.007	–0.004	–0.002	0
Q_n	–0.117	–0.046	–0.017	–0.007	–0.003	–0.001	0

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in the first year. This is a natural byproduct of the transitory recession: r is higher on the transition path because aggregate consumption spending rises over time as demand and output recover in the nontradables sector.

The adverse impact on the real interest rate is important, for it implies that the simulation results underestimate the real output losses from floating. Our model assumes constant output in the tradables sector. But if a higher return on treasury bills increases the cost of working capital or depresses investment spending, then tradables production will contract and the demand curve in the nontradables sector will shift further to the left. In a more elaborate model that captured these linkages, the recession would be deeper and more persistent than in Table 5. A pure float is impractical when the foreign exchange market has to absorb large private capital inflows.

VI. A Crawling Peg

In a crawling peg some policy rule controls the path of the nominal exchange rate. A variety of rules are plausible and compatible with stable dynamics. For simplicity, we assume the government lowers the rate of currency depreciation to its new steady state level at time $t = 0$.

All Aid Is Spent

The macroeconomic effects are still small and generally uninteresting when all aid is spent. The choice of exchange rate regime is not, however, unimportant. In a crawling peg the nominal exchange rate is predetermined. Consequently, appreciation of the real exchange rate at $t = 0$ occurs through a large increase in the nominal price of the nontraded good. Purists may argue that this is not inflation but rather a change in a relative price. Be that as it may, the nasty spike in the CPI (P rises 2.9–3.3 percent at $t = 0$) is something most policymakers would prefer to avoid.[17] We return to this point later in Sections VII and VIII.

PDR Aid

PDR aid has potentially strong effects on private capital flows and total currency demand. The qualitative results hinge on the degree of substitutability between domestic and foreign currency. If

$$\sigma > \tau(1 + \rho/\pi\theta_f) + \frac{i\rho(1-\varepsilon)(\eta+\gamma)}{\pi\theta_f \underbrace{[\pi\mu(\eta+\gamma) - \rho s\gamma + \eta(1-\psi)]}_{\text{Positive for PDR aid}}} \frac{J}{E}, \tag{15}$$

currency substitution allows the private agents to enjoy more liquidity services while spending down part of their financial wealth. ($J = m + F$ decreases across

[17] Aid is funneled to the private sector through lump-sum transfers. Since $\gamma_o = 0.50$, approximately half of the extra aid money is spent on nontraded goods. If aid financed some project that involved a larger component of nontradables spending, the initial increase in the price level would be greater. When all aid is spent on nontraded goods, for example, the upward jump in P at $t = 0$ is about twice as large.

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steady states.) The paths for expenditure, the real exchange rate, the current account, and the real interest rate are then qualitatively the same as the paths in a pure float. The item missing from the list is the impact effect on the price level. Once again, the big increase in spending at $t = 0$ triggers large jumps in the nominal price of the nontraded good and the CPI. Nor is the effect small: under the weaker condition $\sigma > \tau(1 + \rho/\pi\theta_f)$, the spike in the price level is *larger* than in the case where 100 percent of the aid is spent.

The dynamics are quite different when the condition in equation (15) does not hold: expenditure and the real exchange rate undershoot their steady state levels, the real interest rate rises, and the current account registers surpluses instead of deficits. Moreover, expenditure may *decrease* initially, causing the real exchange rate to depreciate and the price level to jump downward at $t = 0$. The result is odd but it cannot be ruled out by plausible parameter values.

Numerical results and comparisons with the outcome under a pure float

How does switching from a pure float to a crawling peg affect the paths of key macroeconomic variables? We should be able to say a lot about this *without* taking a stand on the condition in equation (15). In a pure float, spot appreciation of the nominal exchange rate at $t = 0$ confers a large wealth gain on the private sector ($m + F \uparrow$ on impact) while also exerting strong downward pressure on the price level. No similar effects operate in a crawling peg. Thus intuition suggests that in comparisons of the two systems a crawling peg buys greater stability of the real exchange rate and smaller current account deficits (or possibly current account surpluses) at the price of higher inflation and higher real interest rates.

For the parameter values that underlie our simulations, the condition in equation (15) does not hold (implying $J \uparrow$) in five of six cases. The choice of exchange rate regime exerts a strong influence therefore on the adjustment process. Compare the numbers in Tables 4 and 6. In Table 4, inflation and the real exchange rate overshoot their steady state levels, the real interest rate decreases, and the current account worsens. All of this turns around in Table 6. The real interest rate rises, the current account improves, and inflation and the real exchange rate undershoot, approaching their steady state levels from above.[18] At higher values of σ and π_o the qualitative properties of the transition paths are frequently the same (apart from the initial jump in the price level) as in a float. We carried out 30 simulations for this part of the parameter space ($\sigma = 3 - 5$, $\pi_o = 0.10 - 0.50$, $s = 0.10 - 0.25$, $m_o = 0.05 - 0.08$, $F_o = 0.08 - 0.16$). The results proved perfectly robust. Under a crawling peg, inflation and the real interest rate always decreased less, the real exchange rate always appreciated less, and the current account deficit was always smaller.

Two other results merit comment. First, the increase in the real interest rate is small in most cases. For $\tau = 0.25$ and $\sigma = 0.75$, the rate jumps initially to 12 percent;

[18]The results are not quite uniform. In the panel for $\tau = 0.25$ and $\sigma = 3$, the real interest rate decreases two-tenths of a percentage point at $t = 0$, and inflation barely overshoots its steady state level.

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Table 6. Transition Path in a Crawling Peg

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$							
π	0.041 (0.025)	0.037 (0.064)	0.035	0.034	0.034	0.033	0.033
r	0.120	0.110	0.106	0.103	0.102	0.101	0.10
RER	0.95	0.94	0.93	0.93	0.93	0.93	0.92
CA	0.007	0.004	0.002	0.001	0.001	0	0
$\tau = 0.50$ and $\sigma = 0.75$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.042 (0.015)	0.038 (0.055)	0.035	0.033	0.032	0.032	0.031
r	0.115	0.108	0.105	0.103	0.102	0.101	0.10
RER	0.97	0.95	0.94	0.94	0.93	0.93	0.92
CA	0.012	0.008	0.005	0.003	0.002	0.001	0
$\tau = 0.25$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.029 (0.035)	0.028 (0.063)	0.027	0.027	0.026	0.026	0.026
r	0.106	0.103	0.102	0.101	0.101	0.10	0.10
RER	0.93	0.93	0.93	0.93	0.93	0.93	0.92
CA	0.002	0.001	0.001	0	0	0	0
$\tau = 0.50$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.032 (0.022)	0.029 (0.052)	0.027	0.026	0.025	0.025	0.024
r	0.110	0.106	0.103	0.102	0.101	0.101	0.10
RER	0.96	0.95	0.94	0.93	0.93	0.93	0.92
CA	0.009	0.006	0.003	0.002	0.001	0.001	0
$\tau = 0.25$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.022 (0.043)	0.022 (0.064)	0.023	0.023	0.023	0.023	0.023
r	0.098	0.099	0.099	0.10	0.10	0.10	0.10
RER	0.92	0.92	0.92	0.92	0.92	0.92	0.92
CA	–0.001	–0.001	0	0	0	0	0
$\tau = 0.50$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.027 (0.027)	0.025 (0.052)	0.023	0.022	0.022	0.021	0.021
r	0.107	0.104	0.103	0.102	0.101	0.101	0.10
RER	0.95	0.94	0.93	0.93	0.93	0.93	0.92
CA	0.007	0.004	0.003	0.002	0.001	0.001	0

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in every other case, the increase is less than a percentage point. Second, inflationary pressures are confined to the spike in the price level at $t = 0$. Although the spike is large (P jumps 2.5–4.3 percent), the path of the CPI drops below the pre-aid path within 3–7 months and the inflation rate for the first year decreases from 10 percent to 5.2–6.4 percent. (The number in parentheses in the cell for $t = 1$ is the cumulative percentage increase in the price level over the first year—the real world definition of annual inflation.[19])

Sticky Prices

The results for a crawling peg in Table 7 are what policymakers dream about. Inflation decreases smoothly without an initial spike in the price level. The current account records a small surplus and the real exchange rate moves toward its long-run equilibrium value in a gradual, orderly manner. For a couple of years, the economy also enjoys higher output and lower real interest rates. What makes everything work is that the deficit-reduction component of aid effectively finances a perfectly credible exchange-rate-based stabilization (ERBS). The small ERBS component (¼ of the total aid package) ensures that inflation decreases monotonically even though real spending rises 2.2–3.4 percent in the short run.

Does this mean that a crawling peg with fully accommodating monetary policy solves all macroeconomic problems in the case of PDR aid? Probably not. Few macroeconomists have trouble with the notion that prices are sticky downward. But are prices sticky upward as well? For reasons that are hard to justify, we suspect that price adjustment is asymmetric in sub-Saharan Africa and that the flex-price specification is correct for many branches of the nontradables sector (e.g., the informal sector) when nominal price increases are required to clear the market. The pure flex-price model may exaggerate the initial upward jump in the CPI, but the sticky-price model is overly optimistic in assuming the problem away. Doubtless the truth lies somewhere in between.

VII. Policy Implications

The preceding analysis yields some useful guidelines for policy. Our strongest conclusion is that a pure float is the best way to absorb aid that will be entirely spent. Adjustment is quick in both a float and a crawling peg, with 80–90 percent of total appreciation of the real exchange rate being concentrated in the short run. What differs is the type of nominal price adjustment paired with real appreciation. Under a crawling peg, real appreciation takes the form of a sharp increase in the nominal price of the nontraded good and a spike in the CPI. In a float, by contrast, spot appreciation of the nominal exchange rate reconciles higher spending and appreciation of the real exchange rate with a large decrease in the price level. Crucially, nominal appreciation is not so large as to require significant deflation in the nontradables

[19]Due to continuous-time compounding, the increase in the price level over the calendar year is greater than 10 percent when $\dot{P}/P = \pi = 0.10$ (i.e., $e^{0.10} - 1 = 0.105$). The figure reported for inflation in the first year is the constant level of inflation that produces the same increase in the price level at $t = 1$ as in the model.

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Table 7. Transition Path in a Crawling Peg When Nontradables Prices Are Sticky

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$							
π	0.062	0.046	0.039	0.036	0.034	0.034	0.033
r	0.091	0.101	0.103	0.102	0.102	0.101	0.10
RER	1	0.96	0.94	0.94	0.93	0.93	0.92
CA	0.009	0.005	0.003	0.002	0.001	0.001	0
Q_n	0.022	0.008	0.004	0.002	0.001	0	0
$\tau = 0.25$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.061	0.040	0.032	0.028	0.027	0.027	0.026
r	0.064	0.088	0.096	0.099	0.10	0.10	0.10
RER	1	0.95	0.94	0.93	0.93	0.93	0.92
CA	0.006	0.003	0.001	0.001	0	0	0
Q_n	0.028	0.010	0.004	0.002	0.001	0	0
$\tau = 0.50$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.052	0.036	0.030	0.027	0.026	0.025	0.024
r	0.088	0.10	0.102	0.102	0.102	0.101	0.10
RER	1	0.96	0.94	0.94	0.93	0.93	0.92
CA	0.008	0.006	0.004	0.003	0.002	0.001	0
Q_n	0.023	0.008	0.003	0.001	0.001	0	0
$\tau = 0.25$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.062	0.037	0.028	0.025	0.024	0.023	0.023
r	0.047	0.081	0.093	0.098	0.099	0.10	0.10
RER	1	0.95	0.93	0.93	0.93	0.92	0.92
CA	0.003	0.001	0	0	0	0	0
Q_n	0.034	0.012	0.004	0.001	0.001	0	0
$\tau = 0.50$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.052	0.033	0.026	0.024	0.022	0.022	0.021
r	0.079	0.096	0.10	0.101	0.101	0.101	0.10
RER	1	0.96	0.94	0.93	0.93	0.93	0.92
CA	0.006	0.005	0.003	0.002	0.001	0.001	0
Q_n	0.027	0.009	0.003	0.001	0.001	0	0

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sector: the overall price level decreases 1.6–6.4 percent, but the nominal price of the nontraded good rises or is unchanged in four cases and decreases 1.7–2.9 percent in the other two cases ($\tau = 0.25 - 0.50$ and $\sigma = 3$).[20]

Absorption of PDR aid presents more difficulties. PDR aid uses part of the external windfall to reduce the fiscal deficit and the equilibrium inflation rate. So far so good. But expectations of lower inflation elicit large private capital inflows. This complicates macroeconomic management because staying out of the foreign exchange market is no longer a genuine option: central banks that rely on a pure float passively acquiesce to (i) stupendous appreciation of the nominal exchange rate, (ii) lower employment in both the tradables and nontradables sectors (assuming wages and prices are not exceptionally flexible downward), (iii) overshooting of the real exchange rate, and (iv) large current account deficits. A crawling peg eliminates the threat of a harsh recession and secures greater stability of the real exchange rate but leaves the government with the problem of negotiating an initial big spike in the CPI. Surprisingly, the initial jump in the price level may be higher than when all aid is spent even though inflation decreases more in the long run.

Summing up, in the case of PDR aid, neither a crawling peg nor a pure float produces fully acceptable results. We move on therefore to the analysis of alternative policy strategies. In Section VIII the central bank temporarily sterilizes capital inflows; in Section IX it operates a managed float, intervening in the foreign exchange market to prevent extreme fluctuations in the nominal exchange rate.

VIII. Temporary Sterilization

The price level jumps when aid flows increase and the central bank maintains a crawling peg. Since inflation decreases rapidly after the initial spike in the CPI, temporary sterilization comes to mind as a strategy for smoothing the paths of money growth and the price level. To fix ideas, suppose the government sells bonds as needed to stabilize the price level at $t = 0$ and then redeems the debt in future periods. That is

$$\dot{b} = -\alpha[b(t) - b_o], \tag{16}$$

and hence

$$b(t) = b_o + [b(0) - b_o]e^{-\alpha t}. \tag{17}$$

Initial bond sales are $b(0) - b_o$ and the parameter α determines how fast the debt is paid off. The steady state is unchanged—b eventually returns to b_o.

Tables 8 and 9 assume 80 percent of the newly issued debt is redeemed over 10 years ($\alpha = 0.161$).[21] A quick scan of the results reveals pluses and minuses. On

[20]In the two cases where nontradables demand decreases, output would fall if prices were sticky downward. The reduction in output, however, is very small. In the worst case, where $\tau = 0.50$ and $\sigma = 3$, Q_n falls only 0.5 percent in the first year.

[21]Paying off the debt more quickly results in higher real interest rates.

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Table 8. Transition Path in a Crawling Peg with Temporary Sterilization

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$							
π	0.065	0.050	0.041	0.037	0.034	0.033	0.033
r	0.255	0.152	0.121	0.109	0.104	0.101	0.10
RER	1	0.95	0.93	0.92	0.91	0.91	0.92
CA	0.020	0.008	0.002	–0.001	–0.003	–0.003	0
$\tau = 0.50$ and $\sigma = 0.75$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.054	0.045	0.039	0.035	0.033	0.032	0.031
r	0.145	0.120	0.110	0.106	0.103	0.101	0.10
RER	1	0.96	0.94	0.93	0.92	0.92	0.92
CA	0.020	0.010	0.005	0.002	0	–0.001	0
$\tau = 0.25$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.063	0.045	0.035	0.030	0.028	0.026	0.026
r	0.312	0.162	0.123	0.109	0.103	0.10	0.10
RER	1	0.95	0.92	0.91	0.91	0.91	0.92
CA	0.020	0.006	0	–0.003	–0.005	–0.005	0
$\tau = 0.35$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.057	0.043	0.034	0.030	0.027	0.026	0.025
r	0.207	0.138	0.117	0.107	0.103	0.101	0.10
RER	1	0.95	0.93	0.92	0.91	0.91	0.92
CA	0.020	0.008	0.001	–0.002	–0.003	–0.004	0
$\tau = 0.50$ and $\sigma = 2$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.050	0.039	0.033	0.029	0.026	0.025	0.024
r	0.154	0.123	0.111	0.105	0.103	0.101	0.10
RER	1	0.96	0.94	0.93	0.92	0.92	0.92
CA	0.020	0.009	0.003	0	–0.002	–0.002	0
$\tau = 0.25$ and $\sigma = 3$							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.063	0.043	0.033	0.027	0.024	0.023	0.023
r	0.360	0.169	0.124	0.109	0.102	0.10	0.10
RER	1	0.94	0.92	0.91	0.90	0.90	0.92
CA	0.020	0.005	–0.002	–0.005	–0.006	–0.006	0

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Table 8. *(concluded)*

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
			$\tau = 0.35$ and $\sigma = 3$				
π	0.057	0.041	0.032	0.027	0.024	0.022	0.022
r	0.226	0.142	0.117	0.107	0.103	0.10	0.10
RER	1	0.95	0.92	0.91	0.91	0.91	0.92
CA	0.020	0.007	0	–0.003	–0.005	–0.005	0
			$\tau = 0.50$ and $\sigma = 3$				
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.049	0.037	0.030	0.026	0.023	0.022	0.021
r	0.162	0.125	0.111	0.105	0.103	0.101	0.10
RER	1	0.96	0.93	0.92	0.91	0.91	0.92
CA	0.020	0.009	0.002	–0.001	–0.003	–0.003	0

Table 9. Initial Bond Sales and Path of Capital Flows When Central Bank Engages in Temporary Sterilization

Path of F ($F_0 = 0.12$)[1]

τ	$t = 0$	$t = 1$	$t = 2$	Long Run	σ
0.25	0.078 (0.103)	0.094 (0.108)	0.104 (0.110)	0.114	0.75
0.50	0.086 (0.102)	0.099 (0.109)	0.108 (0.113)	0.120	
0.25	0.044 (0.073)	0.058 (0.075)	0.067 (0.076)	0.077	2
0.35	0.047 (0.072)	0.060 (0.074)	0.069 (0.076)	0.078	
0.50	0.052 (0.070)	0.063 (0.074)	0.071 (0.077)	0.081	
0.25	0.024 (0.052)	0.035 (0.052)	0.043 (0.052)	0.051	3
0.35	0.027 (0.050)	0.037 (0.051)	0.044 (0.051)	0.052	
0.50	0.031 (0.047)	0.040 (0.050)	0.046 (0.051)	0.054	

Value of b after bond sales at $t = 0$ ($b_0 = 0.09$)

τ	$\sigma = 0.75$	$\sigma = 2$	$\sigma = 3$
0.25	0.130	0.146	0.155
0.35	—	0.140	0.148
0.50	0.119	0.131	0.138

Offset Coefficient[2]

τ	$\sigma = 0.75$	$\sigma = 2$	$\sigma = 3$
0.25	0.60	0.52	0.43
0.35	—	0.50	0.40
0.50	0.55	0.44	0.33

[1]The number in parentheses is the value of F when there is no temporary sterilization.

[2]The offset coefficient is calculated as $[F(0)_{ns} - F(0)]/[b(0) - b_0]$, where $F(0)$ and $F(0)_{ns}$ are the postjump values of foreign currency holdings at $t = 0$ with and without sterilization.

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the plus side, temporary sterilization does a nice job of smoothing the path of the price level. The inflation rate drops to 4.9–6.5 percent at $t = 0$ and then declines monotonically toward its steady state level. This is accomplished, to repeat, without a prefatory spike in the CPI. Compared to the no-sterilization case, inflation is 1–2 percentage points lower in the first year and slightly higher in subsequent years. Preferences decide which path is superior. That said, we suspect most policymakers would opt for the smooth, spike-free path proffered by temporary sterilization.

The drawbacks of the policy concern the impact on the real interest rate and the size of the bond sales needed to prevent the price level from jumping. In the runs for $\tau = 0.50$ the real interest rate fluctuates between 12 and 16 percent in the first year. This is not too worrisome, but when $\tau = 0.25 - 0.35$ the rate vaults to 21–36 percent and takes two full years to fall back to 12 percent. It is also disturbing that so much debt has to be sold so quickly. The policy rule in equation (17) is partly to blame as it forces all bond sales to occur at $t = 0$. A fair interpretation of the results, however, is that smoothing the path of the price level requires the central bank to increase the internal debt by 4–6 percent of GDP in the span of six months or less. This is probably the outer limit of what is feasible in Africa's thin bond markets. It is easy to understand therefore why most governments have employed a mix of sterilization and foreign exchange sales to counteract the short-run inflationary pressures created by high aid flows.

In passing we should remark on something that is not a problem, or at least not as much of a problem as the literature on sterilization contends. Schadler and others (1993), Calvo, Leiderman, and Reinhart (1994), and others have asserted that sterilization is self-defeating because bond sales push up the real interest rate and thereby attract the capital inflows they are trying to neutralize. In our model, this argument is substantially but not completely correct. Observe in Tables 8 and 9 that high real interest rates are associated with *massive* overshooting of private capital inflows and fairly large offset coefficients (for $\sigma = 0.75 - 2$).[22] Certainly this is not to the liking of the central bank. Sterilization works by reducing liquidity and raising the real interest rate to a level that induces the private agent to hold expenditure constant at $t = 0$. At the margin, the withdrawal of one dollar of domestic currency from circulation reduces liquidity services by i dollars (20 cents worth in Table 6). When the private agent exchanges foreign for domestic currency at the central bank, π dollars of the cut in liquidity services is restored, leaving a net loss of r dollars. This is only 50 percent of the decrease in liquidity services achieved from selling bonds for domestic currency [$r/i = \rho/(\rho + \pi) = 0.50$ for differential changes]. Thus capital inflows make it harder but not impossible for the central bank to control liquidity. Monetary policy *can* be used to smooth the path of the CPI, huge capital inflows notwithstanding. The critical question is: when does it become too costly to do so? Our own view is that the cost is acceptable when $\tau = 0.50$ and the real interest rate temporarily increases 3–5 percentage points more than in the no-sterilization case. But for $\tau = 0.25 - 0.35$ it is a hard call; since high T-bill rates are not of concern *per se,* a lot depends on the structure of financial

[22]Interestingly, numerous empirical estimates find offset coefficients close to those in Table 9. See Agénor and Montiel (1999, p. 204).

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markets and the extent to which sterilization affects the cost of credit for private firms.[23]

IX. A Managed Float

. . . the question of the appropriate exchange rate regime for African countries remains open. None of these countries has a 'pure' floating exchange rate, opting instead for the common intermediate case of a 'managed' float . . . (Leape, 1999, pp. 126–27).

The preceding results for PBS aid shed light on why most countries prefer managed floats to either a pure float or a crawling peg. Policy is too passive in a pure float: while inflation decreases strongly, the nominal exchange rate is allowed to appreciate to the point where output contracts in the nontradables sector. A crawling peg errs in the opposite direction, imperiling a different target: when the government commits to a fixed path for the exchange rate it throws away the policy instrument that is most effective in combatting the short-run inflationary pressures created by higher aid spending and accompanying private capital inflows. Nor does more active monetary policy resolve the targets-instruments problem. A crawling peg combined with temporary sterilization *does* deliver continuously lower inflation; but, as we have just seen, this often produces very high real interest rates and may require bond sales on a scale that is not feasible.

A managed float gives policymakers the freedom to find the middle ground between too much and too little intervention. The right amount of intervention depends, of course, on the weights attached to the targets for output, inflation, the real exchange rate, and the real interest rate. Rather than derive a complicated intervention rule by optimizing over a quadratic objective function that incorporates all of these targets, we assume the central bank sells/buys foreign currency whenever the real exchange rate ($1/P_n$) is above/below its long-run equilibrium level:

$$\dot{Z} = \Omega \frac{P_n - P_n^*}{P_n}, \ \Omega > 0. \tag{18}$$

Equation (18) relates the *flow* accumulation of reserves to deviations of the real exchange rate from its target value. In addition, Z may jump at $t = 0$. The initial purchase of reserves and Ω are chosen jointly to ensure that the existing nominal price of the nontraded good clears the market at $t = 0$. The intervention strategy, in other words, is to let the exchange rate appreciate enough to reduce inflation but not so much as to drive the nontradables sector into a recession. Other targets do not influence the intervention rule; it turns out, however, that the rule postulated here also greatly reduces volatility of the real exchange rate and the real interest rate.

[23]High T-bill rates are usually a concern because they threaten fiscal stability. In the case at hand, however, the increase in the fiscal deficit (relative to the no-sterilization path) is temporary and does not prevent inflation from decreasing monotonically. The remark about the structure of financial markets is motivated by the fact that sometimes changes in the T-bill rate do not have a perceptible impact on bank loan rates.

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Table 10 shows the outcome when the initial stock of reserves is 5 percent of GNP. At long last, we have something that can be pronounced an unqualified success. In contrast to the polar exchange rate regimes, the managed float reduces inflation immediately without any adverse side effects on output, the current account balance, or the real exchange rate. The one minor blemish in the results is that the real interest rate initially jumps to 12–13 percent in three cases.

The upshot of all this is that the optimal exchange rate regime lies close to the crawling peg end of the policy spectrum. To quantify the meaning of "close," consider the paths of the exchange rate and reserves associated with the policy rule in Table 10. Appreciation of the nominal exchange rate at $t = 0$ is 3–9 percent vs. 24–55 percent in a pure float. Cumulative reserve purchases are 42–96 percent as large as in a crawling peg, with the figure exceeding 70 percent when $\sigma = 2 - 3$. (The figure in parentheses in the row for Z is the stock of reserves in a crawling peg.) Note, however, that the managed float entails greater reserve purchases at $t = 0$ in the runs for $\tau = 0.50$. This makes an odd impression. Shouldn't a managed float involve less, not more, intervention than a crawling peg? Ceteris paribus, the answer is yes. But other things are not equal in Tables 6 and 10. For $\tau = 0.50$, inflation and the rate of currency depreciation χ decrease more in the short run when the government operates a managed float instead of a crawling peg.[24] This leads to larger capital inflows and greater reserve accumulation in the short run even though appreciation of the nominal exchange rate bears some of the burden of adjustment. When the central bank intervenes only at $t = 0$ (i.e., $\Omega = 0$), initial reserve purchases decrease 8–29 percent but are still a bit larger than in a crawling peg.

X. Concluding Remarks

The dynamic response to persistent official capital flows is linked to the degree of budget support they provide and the strength of private portfolio substitution. When these take even ordinary values by the standards of poststabilization African economies, portfolio adjustments dominate the short-run dynamics and produce some distinctly unpleasant trade-offs. A pure float, in particular, performs very poorly. Portfolio pressures produce a nominal appreciation that is an order of magnitude larger than the required real appreciation, and unless the prices of nontraded goods are perfectly flexible, the real exchange rate overshoots and substitution effects produce a potentially deep recession. A crawling peg does better, but allows a short-run spike in inflation; bond sterilization can prevent the inflation spike, but only at the cost of a rapidly rising interest burden. In our preferred "managed float" scenario, the central bank uses unsterilized foreign exchange intervention to target the modest real appreciation needed to absorb the aid inflow. Real interest rates then stay low and macroeconomic adjustment is rapid. Our analysis suggests that African central banks have been correct to intervene substantially in the face of recent increases in aid, and to discount the argument that rapid domestic liquidity expansion necessarily calls for a combination of bond sterilization and cleaner floating.

[24]In a crawling peg, χ is constant and equal to the steady state inflation rate. In Table 10, $\chi = -0.013$ and 0 at $t = 0$ in the runs where $\tau = 0.50$ and $\sigma = 0.75, 2$.

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Table 10. Transition Path in a Managed Float[1]

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
$\tau = 0.25$ and $\sigma = 0.75$ ($\Omega = 0.15$)							
π	0.023	0.029	0.031	0.032	0.032	0.032	0.033
r	0.118	0.108	0.104	0.102	0.101	0.10	0.10
RER	0.94	0.93	0.93	0.93	0.93	0.93	0.92
CA	0.005	0.003	0.001	0.001	0	0	0
Z	0.069 (0.067)	0.067	0.065	0.065	0.065	0.064	0.064 (0.081)
$\tau = 0.50$ and $\sigma = 0.75$ ($\Omega = 0.10$)							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.003	0.019	0.025	0.028	0.029	0.030	0.031
r	0.128	0.111	0.105	0.102	0.101	0.101	0.10
RER	0.97	0.95	0.94	0.93	0.93	0.93	0.92
CA	0.012	0.006	0.003	0.002	0.001	0.001	0
Z	0.078 (0.068)	0.074	0.072	0.071	0.071	0.070	0.070 (0.095)
$\tau = 0.25$ and $\sigma = 2$ ($\Omega = 1$)							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.028	0.027	0.026	0.026	0.026	0.026	0.026
r	0.099	0.099	0.10	0.10	0.10	0.10	0.10
RER	0.92	0.92	0.92	0.92	0.92	0.92	0.92
CA	0	0	0	0	0	0	0
Z	0.090 (0.097)	0.092	0.092	0.092	0.093	0.093	0.093 (0.102)
$\tau = 0.50$ and $\sigma = 2$ ($\Omega = 0.25$)							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.010	0.018	0.021	0.023	0.023	0.024	0.024
r	0.118	0.107	0.103	0.102	0.101	0.10	0.10
RER	0.96	0.94	0.93	0.93	0.93	0.93	0.92
CA	0.008	0.004	0.002	0.001	0.001	0	0
Z	0.115 (0.10)	0.109	0.105	0.104	0.103	0.102	0.102 (0.120)
$\tau = 0.25$ and $\sigma = 3$ ($\Omega = 1$)							
	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$	$t = 5$	Long Run
π	0.033	0.028	0.025	0.024	0.023	0.023	0.023
r	0.093	0.096	0.098	0.099	0.10	0.10	0.10
RER	0.91	0.92	0.92	0.92	0.92	0.92	0.92
CA	–0.004	–0.002	–0.001	0	0	0	0
Z	0.093 (0.118)	0.104	0.109	0.112	0.113	0.113	0.113 (0.116)

[1]The row for *Z* shows the path of reserves. *Z* equals 0.05 initially. The number in parentheses is the level of reserves in a crawling peg.

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We close with some thoughts about two extensions of the analysis that would test the robustness of our conclusions in a broader policy context.[25] The first concerns aid flows that support public investment. We have equated aid with transfer payments to the "poor" (i.e., the representative private agent). It is also desirable to investigate the repercussions of aid that finances rehabilitation of social and physical infrastructure. This type of aid brings many new effects into play. If productive capacity increases proportionately in the tradables and nontradables sectors, then appreciation of the real exchange rate will be strictly temporary. Furthermore, if private capital and infrastructure are complements, aid may produce large multiplier effects and a nontrivial increase in tax revenue in the long run.[26] The complications that were confined here to PDR aid would then materialize in the case where all aid is spent. Related to this, we conjecture that productive aid—aid that has a strong positive impact on permanent income and the equilibrium private capital stock—will elicit immediate, large increases in private consumption and investment. In the short run, therefore, it might prove very difficult to contain inflationary pressures. This pushes the "optimal" managed float more in the direction of the middle ground between a fixed exchange rate and a pure float. How much more is not clear absent careful analysis. For what it is worth, our prior is that the macroeconomic tradeoffs associated with aid and the right policy intervention *are* sensitive to the type of aid.

The second extension acknowledges that African central banks have to worry about more than just aid shocks when deciding on the appropriate exchange rate regime. We are currently working on a stationary, discrete-time version of our model in which aid shocks compete with other important shocks for policymakers' attention and some portion of aid may in fact represent a response to other shocks (e.g., to the terms of trade). We look for desirable intervention and sterilization rules, given a plausible loss function and given the observed joint distribution of shocks and aid. This approach links the analysis in the current paper with the growing literature on monetary policy rules in the open economy (e.g., Svensson, 2000). The conclusions we have emphasized here—including the merits of managed floating and the limited role for bond sterilization—seem likely to survive if the environment is dominated by autonomous and reasonably persistent changes in aid. What remains to be seen is whether these conclusions constitute a serious challenge, under more general circumstances, to rules that incorporate greater exchange rate flexibility and/or more aggressive bond operations.

[25]For a couple of reasons, we do not consider the assumption that aid is permanent to be especially limiting. First, empirical measures of aid generally show strong persistence in African countries. Even after removing a linear trend, for example, the variance of variables like real aid per capita or the aid-to-GNP ratio tends to be dominated by low-frequency components. (Thus while Bulíř and Hamann (2001) emphasize the volatility of aid, their analysis applies to the short-run "cycle"—that is, the component that remains after using the Hodrick-Prescott filter to remove a slow-moving nonlinear "trend." The trend itself shows very substantial persistence, even when applied to linearly detrended aid series.) Second, intuition suggests that temporary aid inflows will produce results qualitatively similar to but quantitatively weaker than in the case of permanent aid flows. (The present model applies, of course, if the government converts temporary aid into permanent aid by spending only its annuity value.)

[26]Theory suggests that the crowding-in effect on private investment could be quite strong. See Buffie (1995).

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a comma (,) separates thousands and millions;

"billion" means a thousand million; and "trillion" means a thousand billion;

a short dash (–) is used between years or months (for example, 1998–99 or January–June) to indicate a total of the years or months inclusive of the beginning and ending years or months;

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