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CAPITAL FLOWS AND CAPITAL-MARKET CRISES: The Simple Economics of Sudden Stops

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The paper studies mechanisms through which a sudden stop in international credit flows may bring about financial and balance of payments crises. It is shown that these crises can occur even though the current account deficit is fully financed by foreign direct investment. However, equity and long-term bond financing may shield the economy from sudden stop crises. The paper also examines possible factors that could trigger sudden stops, and argues that the greater independence that countries have, as compared to regions of a given country, could help to explain why sudden stop crises are more prevalent and destructive at international than at national levels.

I. Introduction

The recent turmoil in emerging and not-so-emerging markets countries has caused a great deal of confusion in the economics profession. The knee-jerk reaction after Mexico's Tequila Crisis was to blame it on fiscal deficits and, above all, current account deficits, CADs (which in Mexico reached 8 percent of *GDP* in 1994, and was expected to increase to 9 percent in 1995). Tequila brought back memories of the 1982 Mexico's moratorium and the ensuing international debt problems. Since the latter were preceded by *CADs*, it was tempting to conclude that high *CADs* and low saving rates lied at the heart of Mexico's difficulties then, and in 1994.

* I am thankful to Sara Calvo for useful comments on an earlier draft of the paper.

But the 1997/98 Asia Crisis raised serious doubts about the corollary's relevance. In contrast to Mexico and the rest of Latin America (except for Chile), Asian countries exhibited enviably high saving rates and, in some cases, either low *CADs* (Indonesia) or large surpluses (Taiwan). Moreover, and to add to the profession's confusion, the Asian crisis appears to be deeper and longer-lasting than the Tequila. Of course, confusion will never stop economists from advancing new conjectures or redressing old ones. For example, on the one hand, there is still a sturdy bunch claiming that *CADs* are the main culprit ("after all, it started in high *CAD* Thailand").¹ On the other hand, the "floaters" are becoming more conspicuous claiming that the fundamental error was not to allow for greater exchange rate flexibility. Their appeal is increasing because exchange rates have greatly devalued after crises.² Finally, in the din of cacophonous voices, the air is pierced with denunciations of "moral hazard," "short-term foreign-exchange denominated debt," "crony capitalism," and so on.

Consequently, time seems to be ripe for going back to basic accounting identities and economic principles. As I will argue, familiar identities still have a wealth of untapped wisdom. In particular, I will use them to discuss the mechanics of a sudden stop in capital inflows (it need not result in capital outflow), and show that this could have large deleterious effects on the economy, validating the pessimistic conjectures that likely led to the initial stop.³ I will show that the resulting shock need not put into question the country's solvency in order for the pessimistic conjectures to become self-

¹ The IMF appears to subscribe to that view and is chastising countries like the UK, US, Argentina and Chile for their widening *CADs* (despite, in the same breath, extolling the virtues of an unfettered capital market!).

² Interestingly, very few commentators realize that if these very same countries had floated their exchange rates a while before crisis hit, their currencies would likely have appreciated, not depreciated.

³ The expression "sudden stops" was inspired by a bankers "adage" it is not speed that kills, it is the sudden stop," quoted in Dornbusch et al (1995).

fulfilling. For instance, the shock could be reflected in a downward shift in marginal factor productivities due to associated bankruptcy and financial disruption.

Although debt maturity structure and currency denomination are important, I will show that capital-market crises could take place even though most capital inflows took the form of foreign direct investment.

The paper is organized as follows. Sections II and III present the core results in the context of a non-monetary economy. Section IV discusses extensions to a monetary framework. Finally, Section V concludes and discusses some policy alternatives. An appendix analyzes a model in which bankruptcies sprout as a result of an anticipated fall in the *CAD*.

A caveat is in order. **The paper aims at laying out some basic mechanisms whereby sudden stops can trigger a crisis, including self-fulfilling prophesy mechanism that help to rationalize sudden stops.** However, the paper stops short of providing a framework that could be used to *predict* sudden stop crises. Thus, for instance, although the discussion highlights some early warning indicators, it produces no theory that can help to attach a *probability* of crisis to each of those. This is so because the explicit and implicit models in the paper display multiple equilibria, and no theory is provided on how those equilibria are actually selected.⁴

II. Effects of a Capital Inflows Slowdown: The Non-Monetary Economy

Abstracting from errors and omissions, the following is an accounting identity in a non-monetary economy:

$$KI = CAD, \quad (1)$$

where *KI* and *CAD* stand for capital inflows and current account deficit in,

⁴ Hence the expression “Simple Economics” in the subtitle of the paper.

say, tradable goods. Moreover, for both a monetary and non-monetary economy, and distinguishing between tradable and nontradable goods, the following identity holds:

$$CAD = Z - GNP = Z^* - GDP - NFTA \quad (2)$$

where Z , Z^* , GNP , GDP^* , and $NFTA$ are, respectively, aggregate demand, demand for tradables, gross national product, gross domestic product of tradables and net factor transfers abroad.

A capital-inflows episode is a period during which KI shows a sharp and sustained increase which, by equation (1), is also a period of high CAD s. Thus, a sudden stop in KI implies a sudden contraction in CAD which, by equation (2), could be accommodated by lowering the demand for tradable goods with no output cost.

However, this is unlikely to be the case. Given the real exchange rate, lower Z^* is likely to be accompanied by a lower demand for nontradable goods, $Z - Z^*$. In a flexible-prices world, the latter implies a higher real exchange rate (i.e., a decline in the relative price of nontradables with respect to tradables). Sudden stop means that the change is largely unexpected and, therefore, loans to the nontradable sector (e.g., real estate) extended under the expectation that previous relative prices were, on the whole, permanent, could become nonperforming. This, in turn, could lead to across-the-board bankruptcies (see Appendix for an example).

The damage associated with a sudden stop of capital inflows, thus, depends on how easy it is to accommodate the associated fall in the CAD . In this respect, I would advance the following conjecture:

1. The larger is the share of consumption in total expenditure Z and, in particular, on Z^* , the more pronounced will be the damage to the real economy from a fall in the CAD .

Conjecture 1 may not sound terribly new because it brings to mind the warning that economists concerned about a country's solvency use to make,

based on the observation that investment makes it easier to repay a country's debt.⁵ My conjecture, however, has an entirely different basis. It relies on the guess that consumption of tradable goods is more labor-intensive than investment of tradable goods.⁶ Since labor is the nontradable good *par excellence*, this guess implies that the same reduction in aggregate demand for tradable goods will result in a larger cut in the demand for nontradables, the larger is the share of consumption in the demand for tradable goods. And, of course, the larger is the cut in the demand for nontradables, the larger will be the real devaluation B and, therefore, the deeper will be the ensuing financial turmoil.

Sudden Stops and Debt Maturity. The above discussion made no reference to the maturity structure of the country's debt, an issue that has received a lot of attention after the recent crises. **The theory of sudden stops is, in principle, independent of the maturity structure.** Consider, for example, the case in which the CAD is entirely financed by foreign direct investment, FDI . At one extreme, all of FDI takes the form of new investment and, therefore, by previous reasoning, sudden stops should not be of major concern. At the other end, FDI takes the form of purchases of existing firms. In principle, this need not be translated into a higher CAD . Conceivably, this transaction could give rise to an equal-value asset accumulation in the opposite direction, in which the sellers of domestic assets acquire foreign assets of equal worth, resulting in no change in KI . Thus, if a higher CAD takes place it means that the original owners (or someone else in the domestic chain) are using the proceeds to increase aggregate spending. **The fact that the CAD has its origins in FDI is not relevant. How it is spent, is (recall conjecture 1 above).**

Although previous discussion shows that the impact of a cut in KI is, in principle, independent of the debt maturity structure, the actual size of the cut is not so. Debt maturity structure (more specifically, *residual* debt maturity

⁵ For a discussion about the irrelevance of the solvency analysis, see Calvo (1998 a).

⁶ Think of the many retailers wrapping up cheap Taiwan toys, and the few stevedores needed to unload an expensive piece of machinery.

structure, i.e., the time profile of maturing debt) is relevant in assessing the *potential reversal* of capital flows (in our notation, the largest possible short-run fall in KI). In addition, one would need to determine the probability of debt *refinancing*. The latter, in turn, depends on considerations like the country's standing with the IMF and key G7 countries (recall, Korea and Mexico), and its ability to retaliate if official refinancing is not forthcoming (via trade restrictions, for example). In any case, it appears reasonable to conjecture that

2. The shorter is the residual maturity structure of a country's debt, the more fertile will be the ground for a sudden stop crisis.

II. The *Why* of Sudden Stops

The above discussion assumed a sudden slowdown in capital inflows, and took it as exogenous. The task of this section will be to argue that conjectures that originally lead to a sudden stop may come to be true through a self-fulfilling prophesy mechanism.

I can offer two different lines of reasoning:

1. The capital inflows slowdown could push the economy into insolvency, and/or
2. could drastically lower the "average and marginal productivity of physical capital" as a result of, say, socially-costly bankruptcy battles following sharp, and largely unexpected, changes in relative prices (as discussed in previous section).

Point 1 does not appear to be highly relevant, especially in the case of Asia.⁷ Thus, I will focus on point 2. To support the view behind point 2,

⁷ It should be noted, however, that even though the shock does not push the economy into bankruptcy, an observationally equivalent situation from the viewpoint of investors could develop if the shock lowers the country's *willingness* to pay. This issue was raised by some Mexico's observers in connection with the PRI's loss of popularity after the 1994/95 crisis.

first recall that sudden stops are likely to generate across-the-board bankruptcies. In addition, I would argue that

- crises that lead to bankruptcies destroy specific human capital (which is complementary with physical capital).

Specific human capital is destroyed for different reasons. For instance, bankruptcy is likely to interfere with the fulfilment of “implicit” contracts. Internal promotion schemes that depend on track records at the firm, for example, may be repudiated after bankruptcy. These schemes are subject to time-inconsistency sustainability problems under the best of circumstances. Hence, it is to be expected that new owners will take advantage of the situation and try to start on a clean slate, writing off implicit contracts and debts. Thus, while bankruptcy procedures take place, incentives inside the firm could be seriously jeopardized, lowering the stock of *effective* human capital. In extreme cases –as after the breakdown of the former Soviet Union– firms are actually cannibalized by employees and managers.

Bankruptcies also produce negative externalities outside individual firms. For example, even in moderately advanced economies, firms rely on interenterprise credit. Thus, the sudden emergence of bankruptcies puts into question not only the solvency of the directly affected firms, but also that of other firms which are –actually or potentially– connected with them through the credit channel. Consequently, all of a sudden more information is needed to assess firms’ creditworthiness and, as a result, human capital devoted to production is diverted to financial matters, depressing physical capital’s average and marginal productivities. Moreover, even if creditworthiness’ assessment were costless, examples can be shown in which credit vanishes until bankruptcy procedures are terminated –as when firms are laid out around a circle and depend on each other for production and credit (see Calvo (1998 b)).

Consequently, an exogenous initial slowdown in capital inflows may destroy output, and incentives to rebuild it. In addition, it may destroy credit

channels. The latter is conceivably the most devastating feature of this process because it prevents consumption-smoothing, and ensures that the new temporary equilibrium exhibits a sharp decrease of the relative price of nontradables with respect to tradables (i.e., real depreciation).

The self-fulfilling output collapse prophesy can be further deepened by pro-cyclical policy. Thus, many recently affected countries have either adopted or shadowed IMF-sponsored programs which entail tight fiscal and monetary policy. On the one hand, tight fiscal policy would further depress the relative price of nontradables, likely contributing to deeper and more widespread bankruptcies. On the other hand, tight monetary policy aggravates the credit destruction problem.⁸

IV. The Monetary Economy

A monetary economy differs from the “real” one in that, instead of identity (1),

$$\underline{KI = CAD + RA} \quad (3)$$

where RA stands for accumulation of international reserves per unit of time.

Previous discussion fully applies to this case. One key difference, however, is that a slowdown in capital inflows (i.e., a cut in KI) could now be met by a loss of reserves (i.e., a fall in RA). Therefore, the output/credit collapse associated with a contraction in the CAD could be cushioned by a loss of international reserves. However, in practice this is largely illusory.

⁸ This should not be taken as an indictment of IMF policy in East Asia which, as I understand it, was predicated on the assumption that tight fiscal/monetary policy would enhance policymakers' credibility, and help stem the slowdown of capital inflows. This issue will be revisited in Section VI.

Loss of Reserves. Consider the following central bank balance-sheet identity (in terms of tradable goods):

$$R + NDA = H \quad (4)$$

where R and H denote international reserves and high-powered money, respectively, and NDA denotes net domestic assets (i.e., the difference between H and RA and, hence, includes with a negative sign, the central bank's certificates of deposit and net worth, and government's deposits at the central bank, among other things). In practice, R is likely to increase as a result of the expansion in high-powered money, H , and certificates of deposit, but also as a result of an increase in government deposits. The latter could be very significant in countries that embark in massive privatization efforts (e.g., Peru after 1991).

Consider now an exogenous fall in KI . If the central bank sticks to its reserves, the economy would essentially go through the same type of adjustment as in the nonmonetary case. To improve over that solution, the central bank would have to find mechanisms that release R and, as a consequence, allow CAD to fall by a smaller amount than KI . A direct way to accomplish this would be to extend loans to those firms and individuals that suddenly found their international credit cut. But this is not easy in practice. Once it is known that the country faces credit rationing, it will be to everyone's advantage to claim that he/she has lost international credit lines.

A capital inflows slowdown is typically associated with an increase in domestic interest rates. Thus, a common procedure is for the central bank to increase NDA (through a discount window, for example) to cushion the interest rate rise. A higher NDA (keeping international reserves constant), in turn, results in an increase in the stock of high-powered money, H , and a devaluation, i.e., a rise in the nominal exchange rate (i.e., the price of foreign in term of domestic currency). However, this does not resolve the adjustment problem because, up to that point, international reserves would not have

been lost. Thus, in order for the mechanism to work, the central bank will have to intervene in the foreign exchange market and release international reserves.

If the country is committed to a fixed (or semi-fixed) exchange rate, this mechanism makes the central bank vulnerable to a speculative attack. The moment this is perceived by the public, they will:

1. Lower their demand for assets denominated in domestic currency (most prominently, bonds and bank deposits), and
2. Try to convert dollar-denominated liabilities into domestic-currency denominated liabilities.

Recent experience in Mexico and Indonesia shows that reaction 2 could be very powerful because it is usually conducted by firms and banks with access to the international capital market, which have an above-average in-house financial expertise and information (including *inside* information). Of course, the force of this reaction is likely to increase, the larger is the stock of their dollar-denominated liabilities.

Since reactions 1 and 2 are taking place against a background of tighter international credit, they are likely to further increase all interest rates inside the country: both dollar and domestic currency interest rates. Besides, the rush out of domestic currency assets could exacerbate the fall in capital inflows KI .

As noted above, even if the country is not committed to defend the currency, policies that entail reserves losses to cushion the real economy from a slowdown in capital inflows, call for a departure from pure floating, at least momentarily. But, the question arises, could the country release a certain amount of reserves and then go back to floating. Conceivably “yes,” but if lower reserves induce a flight from domestic assets, reserves-loss policies could trigger further KI 's contraction and, thus, additional downward pressure on the real economy.

In sum, even though the ability to release international reserves could soften the blow of a sudden cut in capital inflows, recent experience, backed

by basic economic reasoning, suggests that doing it properly could be a major feat.

Sticky Prices. A monetary economy introduces the realistic possibility of sticky prices and wages. This adds a keynesian channel through which a cut in the current account deficit can have a depressive effect on output, independently of the channels emphasized in previous section. However, keynesian considerations typically conjure up the possibility of avoiding major output loss by means of counter cyclical monetary policy or, more specifically, currency devaluation. However, although this policy could certainly speed up reaching the neoclassical set of relative prices associated with lower KI , it does not necessarily help to bypass financial crisis. This is clearly the case if debt is denominated in foreign exchange. The devaluation helps rising the relative price of tradable goods with respect to nontradables, but if nontradables sector took dollar-denominated debt, the problem would be identical to that discussed in previous section.

Would the situation be much better if debt in the nontradables sector was denominated in domestic currency? The answer is likely “no.” Devaluations prompted by crises are usually accompanied by higher nominal and real interest rates (witness Mexico in 1995, and Korea in 1998). This is so because those devaluations are, by and large, involuntary, raising doubts about the government’s ability to control over key macro variables.⁹ Hence, the real interest rates in terms of both nontradables and tradables rises, implying a mounting debt burden. Thus, the main difference between dollar and domestic-currency denominated debt is timing: with dollar debts financial distress brought about by devaluation is instantaneous, while with domestic-currency denominated debt it may surface only after several months or even years.¹⁰

⁹ However, some observers would claim that higher interest rates are induced by IMF type policy.

¹⁰ Thus, for example, according to some reports, Mexico’s banking difficulties associated with the Tequila crisis are still simmering in the background.

V. What's *International* About All That?

The above discussion could have been carried out in terms of regions within a given country (e.g., Provinces, States). Once identified, each region would have a well-defined *KI* and *CAD*, so the same story could be told with just minor presentation changes. However, although self-fulfilling prophecies can occur in a national context, there are important *international* characteristics that would be absent. As a general rule:

1. Countries, as opposed to regions, are shielded by sovereignty clauses. In particular, countries are less constrained than regions in choosing fiscal and monetary policy, e.g., countries can devalue. Thus, in a way, countries are more able to “repudiate” earlier commitments (e.g., policy commitments).
2. For legal and cultural reasons, labor mobility across countries is markedly less responsive to cyclical fluctuations than across regions and, thus, expected lifetime labor income reflect more local conditions in countries than in regions.

Point 1 implies that, controlling for natural risks,¹¹ “country risks” are bound to include more non-natural factors (e.g., political factors) than “region risks.” Assessing non-natural risks could be more costly in crisis-stricken economies because the political situation in many of them is in a state of flux (recall Mexico, Korea, Indonesia) and, in some cases, because they have a relatively young – and, thus, not much “tried by fire” – economic system (Argentina). As shown in Calvo and Mendoza (1997), high risk-assessment costs makes herding more likely. Moreover, in this context, the probability of herding is even higher if credit runs produce (and/or are expected to produce) negative effects of their own, as discussed in previous sections.

¹¹ Natural factors include, for instance, floods and earthquakes that are not subject to *short-run* direct human control.

Point 2 implies that national politicians are more likely to be asked by their constituents to implement new policies if hit by crisis, contributing to country risk. Moreover, the higher correlation between a country's cycle and its citizen's expected lifetime income as compared to regions (i.e., the correlation between a region's cycle and its present inhabitant's lifetime income), implies that a country's aggregate demand will have a larger effect on its real exchange rate than in a region. Moreover, lower international labor mobility implies that after-crisis depreciations of the real exchange are likely to be more persistent in countries than in regions. All of which leads to the conjecture that a cut in KI contributes to deeper and longer-lasting financial crises in sovereign countries than in regions.

VI. Conclusions and Policy Discussion

Conclusions

1. High negative swings in capital inflows -i.e., sudden stops- are dangerous. They may result in bankruptcies, and destruction of human capital and local credit channels.
2. Large current account deficits are dangerous *independently on how they are financed*. This is so because in order to keep the same current account deficit "new money" is necessary, and the latter is hard to get during sudden stops.
3. The negative effects of a cut in capital inflows are likely to increase, the higher is the marginal propensity to spend on nontradables. Thus, assuming that consumption is more nontradable-intensive than investment, the higher the share of consumption financed by capital inflows, the stronger is likely to be the negative impact of a future sudden stop.
4. Short-term financing may add to those risks to the extent that they contribute to generate larger slowdowns in capital inflows (or downright outflows).

Policy Discussion

1. The financial sector is at the center of the action and directly, or indirectly, must be the key to the solution.
2. Given the different forms that financial transactions can quickly take, partial solutions may be ineffective and highly distorting. Thus, controls on (international) capital flows could be ineffective unless they are accompanied by suitable regulations of the *domestic* capital market.
3. Financial sector policies should cover the whole financial system, including domestic transactions, especially those done through institutions that are under the tutelage of the central bank. This is so because the central bank usually offers free deposit insurance and, thus, a financial crisis could represent a large fiscal burden (recall Chile, Mexico and Venezuela).
4. Financially closed and underdeveloped systems (e.g., India's) should *not* be encouraged to liberalize the financial sector in one fell swoop. Financial reform should be gradual and should not outpace equity financing. Policymakers should keep an eye on firms' leverage ratios (i.e., bond/equity ratios).
5. However, financially open systems (e.g., Argentina's and New Zealand's) should be kept that way and should be complemented with iron-clad rules that make the country resemble a region of a stable country (Argentina's Currency Board is a good example).
6. There is no contradiction between advices 4 and 5. Financial liberalization generates large "capital flows" from, for example, consumers to firms which, since information is limited, are likely to take the form of short-term credit. Thus, these flows are easily reverted, and could cause serious financial trouble. Moreover, financial liberalization may generate large (international) capital inflows through capital repatriation, with similar potentially dangerous results. In contrast, if the financial system is already liberalized, much of the above-mentioned risks may have already been incurred, and the expectation that flows

will be taxed or trampled with may generate a run causing, not averting, a crisis.

7. Efficient bankruptcy regulations are essential to prevent liquidity crises to result in major destruction of specific human capital.
8. Policy in the aftermath of crisis. A sudden stop in capital inflows signifies, as a general rule, a serious blow to the economy. Standard offsetting monetary and fiscal policies are likely to be of little use. Large devaluations and easy money are unlikely to be of much use for reasons discussed above. Lax fiscal policy makes no sense when external financing becomes a serious constraint. Thus, it seems that a reasonable course of action would be a monetary policy aimed at price stability and a fiscal policy that does not further constrain aggregate demand in the short run, and moves towards a balanced budget.¹²

Appendix. Mechanics of a Financial Crisis

A key assumption in the above analysis is that an unanticipated cut in the *CAD* may result in financial disarray due to the associated decline in the relative price of nontradables. I will now show the assumption's plausibility by means of a simple model.

Consider first a two-period non-monetary endowment economy with one homogeneous tradable good. The economy faces a perfect capital market and a constant real interest rate which, without loss of generality, we assume to be zero. The country is small, both in the output and capital markets, and there are no trade or capital mobility barriers. Denoting y_t endowment at time t , $t = 1, 2$, we assume

¹² These fiscal policy objectives may not be easy to attain. To do so it may be necessary, for instance, to increase taxes and government expenditures in such a way that the former exceeds the latter, but does not revert the expansionary effects of government expenditures -quite a "balancing act" in the aftermath of crisis! It is worth noting that, in contrast, in all crisis-stricken countries government expenditures were cut, and taxes raised.

$$y_1 = 0, \text{ and } y_2 > 0. \quad (5)$$

The utility function of the representative individual takes the following form:

$$u(c_1) + u(c_2), \quad (6)$$

where c_t , $t = 1, 2$, stands for consumption in period t , and u is an increasing, strictly concave and differentiable function on the non-negative real line.

Assuming no initial wealth, the relevant Lagrangean for a Social Planner attempting to maximize the representative's individual welfare takes the following form:

$$u(c_1) + u(c_2) + \lambda(y_2 - c_1 - c_2). \quad (7)$$

Hence, at an interior maximum:

$$u' < c_1 = c_2 = \frac{1}{2} y_2 \quad (8)$$

Clearly, the planner's optimum is decentralizable into a competitive equilibrium. Therefore, in equilibrium the economy exhibits a $CAD = y_2/2$ in period 1. Under the present circumstances, it is hard to argue that a cut in the CAD in period 1 will cause any damage to the supply side (even if we relax the assumption of exogenous endowments and assume that output is produced). Hence, a momentary loss of international credit in period 1 will quickly be offset by new funds from other credit sources.

I will now introduce nontradable goods, and modify the utility function as follows:

$$u(c_1) + u(h) + u(c_2), \quad (9)$$

where h denotes consumption of nontradables (home goods, houses) in period 1. I assume that one unit of nontradable is produced with one unit of tradable

in period 0 (so now the economy exhibits three periods, although nothing momentous happens in period 0, except for the capital market transaction referred to above). Again, the Social Planner's Lagrangean can be written as follows:

$$u(c_1) + u(h) + u(c_2) + \lambda(y_2 - c_1 - c_2 - h) \quad (10)$$

Hence, at interior maximum:

$$0 < c_1 = c_2 = h = \frac{2}{3} y_2 \quad (11)$$

The situation looks very similar to the previous model and, in a sense, it is. For example, the solution described in expression (11) is a competitive equilibrium. There is a *CAD* at the beginning (here, periods 0 and 1), followed by a current account surplus at the end. However, there is now a capital account transaction in period 0 that may sour if relative prices in period 1 are different from those expected at time 0.

Let us consider the case in which h is borrowed by the representative individual in period 0 to produce h units of nontradables in period 1. At equilibrium, the relative price of nontradables with respect to tradables in period 1, p , satisfies:

$$p = \frac{u'(h)}{u'(c_2)} = 1, \quad (12)$$

where equality to unity holds in the equilibrium described by expression (11). Such an equilibrium requires a *CAD* = $c_1 = y_2/3$. Thus, if, for example, individuals are unable to borrow as planned in period 1 and, thus, $c_1 < y_2/3$, then $p = u'(y_2/3)/u'(c_1) < 1$. Consider the case in which the individual borrowed under the assumption that equilibrium (11) would hold. Expected profit in period 0, π , satisfies:

$$\pi = (p - 1)h \quad (13)$$

Hence, given (12), $\pi = 0$. However, as noted, if the individual is unable to borrow as planned, $p < 1$, and, hence, $\pi < 0$. Consequently, if individuals set up limited-liability firms to carry out this project in period 0, those firms would become technically bankrupt in period 1 if the CAD in period 1 were smaller than planned. Moreover, in the present setup, even if individuals were fully liable, they could not repay their debt in full in period 1 because, by assumption, period 1 endowment income is zero.

If bankruptcy carried no social or individual cost, the world capital market should be able quickly to restore credit and allow the representative individual to carry out his/her original plan, preventing bankruptcy. However, aside from the observation that bankruptcies *are* in actuality very costly, bankruptcies involve legal procedures that, at the very least, involve *verification* costs. In the present setup, ensuring that the debt will be repaid in period 2 (instead of period 1 as in the original contract) requires legal paperwork.

To illustrate the effect of bankruptcy cost, consider the simple case in which bankruptcy costs are fixed, independently of size of default.¹³ Let the fixed cost (in terms of tradables) be denoted by κ (in addition to the cost of repaying the principal h). This implies that the cost of serving the debt is higher with than without bankruptcy (a sensible assumption). Therefore, after bankruptcy in period 1, the representative individual's budget constraint satisfies (recalling equation (11)):

$$c_1 + c_2 = y_2 - h - \kappa = \frac{2}{3} y_2 - \kappa \quad (14)$$

Hence, by utility function (9), it follows that

$$c_1 + c_2 = \frac{y_2}{3} - \frac{\kappa}{2} < \frac{y_2}{3} \quad (15)$$

¹³ Same implications are obtained if (1) bankruptcy costs are proportional to $(1 - p)h$, i.e., default's size, and the factor of proportionality is greater than unity, and (2) the marginal utility function is iso-elastic, and elasticity is larger than one.

and

$$p = \frac{u'(h)}{u'(c_1)} = \frac{u'\left(\frac{y_s}{3}\right)}{u'\left(\frac{y_2}{3} - \frac{\kappa}{2}\right)} < 1 \quad (16)$$

implying bankruptcy. Moreover, since c_1 falls relative to the nobankruptcy solution, bankruptcy is associated with a lower CAD in period 1.

In the present model bankruptcy costs are a black box but the analysis shows the crucial role that financial difficulties may play when a country is forced to lower its CAD. Shedding light on the black box appears to be an important area for further research.¹⁴

It is worth pointing out that bankruptcy costs are, in principle, independent of whether the original investment in the nontradables sector was done by domestic or foreign residents (i.e., foreign direct investment), to the extent that bankruptcy costs cannot be shifted to foreign residents. However, the situation would be different if the original investment was:

- equity financed since, in that case, period 1 losses could be partially shifted to equity holders, lowering bankruptcy probabilities,¹⁵ or
- financed through two-period bonds since, under those circumstances, bankruptcy will only materialize in period 2 when endowment income is positive, possibly cutting on bankruptcy's paperwork.¹⁶

In any case, these observations suggest that equity financing and long-term loans may help shield the economy from sudden stop crises, as conjectured in Section II.



¹⁴ For a related discussion, see Calvo (1998 b).

¹⁵ In the present example equity financing would, by necessity, have to be undertaken by foreign residents because, by assumption, domestic residents have no endowment income in period 0.

¹⁶ Notice, however, that bankruptcy may not be prevented if firms are covered by limited-liability clauses.

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