A Macroeconomic Framework for

Poverty Reduction Strategy Papers

with an application to Zambia

by

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with

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I. Introduction

In October 1999, the Executive Boards of the World Bank and International Monetary Fund decided to base future assistance to low-income countries on the country's Poverty Reduction Strategy Paper (PRSP). This decision represented a shift in policy along several dimensions. First, unlike its predecessor (the Policy Framework Paper) which was a tripartite document, the PRSP had to be prepared by the country. Second, the PRSP had to be the result of a consultative process, involving not just the government, but also the private sector and civil society. Finally, the PRSP had to show the implications for poverty reduction of all aspects of the government's program. In particular, it had to gauge the impact on poverty of macroeconomic policies.

This paper describes a quantitative framework to evaluate some of the macroeconomic aspects of PRSPs, and illustrates it with an application to Zambia. There are at least two reasons why such a framework is necessary. Existing macroeconomic models used in country economic work, such as the IMF's Financial Programming Model or the Bank's RMSM-X, take economic growth and relative prices as exogenous. The two most important determinants of poverty—growth and income distribution—are outside these models. Secondly, the links between macroeconomic policies and poverty are complex—and likely to be contentious.[1] Fiscal sustainability may dictate that a country cut its public expenditures, whereas poverty concerns may require that these same expenditures be increased. A quantitative framework that

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1. See for example World Bank [2000], Dollar and Kraay [2000].

identifies the critical relationships on which the outcome depends can make a useful contribution to the preparation of PRSPs.

Given that we need such a framework, what are some of its desirable characteristics? First, as indicated above, the framework should be capable of identifying some of the critical tradeoffs in poverty-reducing macroeconomic policies. For example, how do the costs (in terms of poverty) of higher spending (and higher fiscal deficits) compare with the benefits of targeting that spending on the poor? Second, the framework should be consistent with economic theory on the one hand, and with basic data, such as national accounts and household income and expenditure surveys, on the other. Otherwise, the framework will not be able to foster a dialogue between conflicting parties on these issues.   Third, the framework should be simple enough that operational economists can use it on their desktops. This means it should not make undue demands on data, it should be based on readily available software, such as Microsoft Excel^{TM}, and—most important—should permit ready interpretation of model results.

In developing a framework with these characteristics, we make some strategic simplifications. Instead of building a full-blown, multi-sector, multi-household, dynamic general-equilibrium model, we opt for a modular approach[2]. Specifically, the framework links several existing models together. One advantage of this approach is that the individual component models already exist. Another is that, if for data or other reasons a particular component model is not available, the rest of the framework can be implemented without it. The cost of adopting this approach is that the causal chain from

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[2] Examples of the full-blown approach include Adelman and Robinson [1979], Lysy and Taylor [1979], Sahn [1996], Benjamin [1997], Devarajan and van der Mensbrugghe [2000] and Agénor et al. [2001]. The approach adopted here is closer to the tradition of microsimulation models (Bourguignon, Robillard and Robinson [2001]).

macroeconomic policies to poverty is in one direction only: we do not capture the feedback effect of changes in the composition of demand (due to shifts in the distribution of income) on macroeconomic balances. We emphasize that the modular approach means that different models (based on different views about how the economy functions) can be incorporated as alternative subcomponents of the framework.
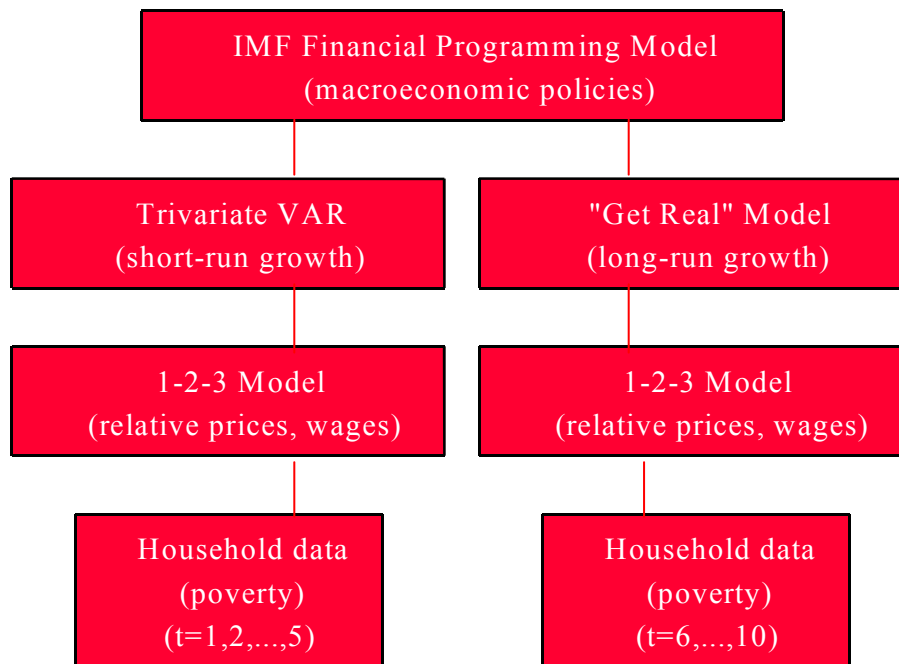
Figure 1 is a schematic representation of our macroeconomic framework for PRSPs. Specifically, we link macroeconomic policies to poverty (households) through two channels. First, we examine the distributional consequences of policies, holding growth fixed. For instance, we look at the effect of an increase in government spending on distribution (through its effect on relative prices and wages), assuming the aggregate level of output remains unchanged. Next, we look at the growth consequences of the same policies, holding distribution fixed. Thus, we would calculate the impact of the increase in government spending on output, assuming no change in relative prices and wages. The overall effect on poverty would then be the sum of these two impacts.

Figure 1: A Schematic Representation of the Framework
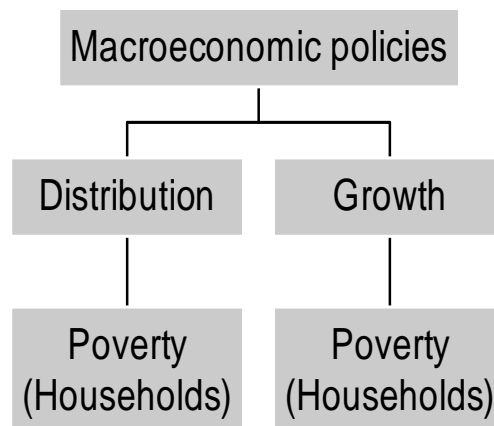
We turn now to a description of the individual modules of the macroeconomic framework for PRSPs, which we call the 123PRSP Model (Figure 2). We begin with a static, aggregate model, such as the IMF's Financial Programming Model (FPM). This model has the advantage of having a consistent set of national accounts, linked with fiscal, balance of payments and monetary accounts. Most of the macroeconomic policies, such as the level of government spending, taxation, and the composition of deficit financing, will be contained (as exogenous variables) in this module. Since the FPM is an accounting framework, with few behavioral assumptions, there are no real alternatives to this part of the framework. However, unlike the standard practice with the FPM, the economy's growth rate and its real exchange rate are not taken as given (or as targets) but rather they are explicitly derived in the models that follow.

Figure 2: The 123PRSP Model

IMF Financial Programming Model
(macroeconomic policies)

Trivariate VAR
(short-run growth)

"Get Real" Model
(long-run growth)

1-2-3 Model
(relative prices, wages)

1-2-3 Model
(relative prices, wages)

Household data
(poverty)
(t=1,2,...,5)

Household data
(poverty)
(t=6,...,10)

The information in the financial programming module is then read into each of the following models: (i) the "1-2-3 Model," a static, multi-sector, general-equilibrium model; and (ii) one of two growth models, either the "Get Real" model, which is a long-run growth model, or a Trivariate VAR model that captures short-run growth effects. The 1-2-3 Model assumes aggregate output is fixed, but captures the effect of macroeconomic policies and shocks on relative prices and wages (as well as on the composition of output). Likewise, the two growth models capture the effects of policies on growth, assuming that relative prices, wages and the composition of output is unchanged. In the following section, we describe the two sets of models in detail, as well as the process of linking them with household survey data. Section III presents the results of simulations with the model for Zambia. Section IV contains some concluding remarks.

II. The 123PRSP Model

The 1-2-3 Model

The 1-2-3 Model takes the aggregate information from the FPM but then divides the economy into two sectors: exports (E) and all other final goods produced, called domestic goods (D). Thus, GDP, which is real *GDP*(X) multiplied by the GDP deflator (P_X) can be expressed as

$$P_X X = P_E E + P_D D$$

where P_E and P_D are the prices (in local currency) of exports and domestic goods, respectively. [3]

The model makes the assumption that there is a constant elasticity of transformation function linking output in the two sectors, with the level of output determined by the point where the function is tangent to the relative price of exports to domestic goods (see the lower right quadrant in Figure 2). The price of exports is exogenous (small country assumption).

Figure 2: A Diagrammatic Exposition of the 1-2-3 Model
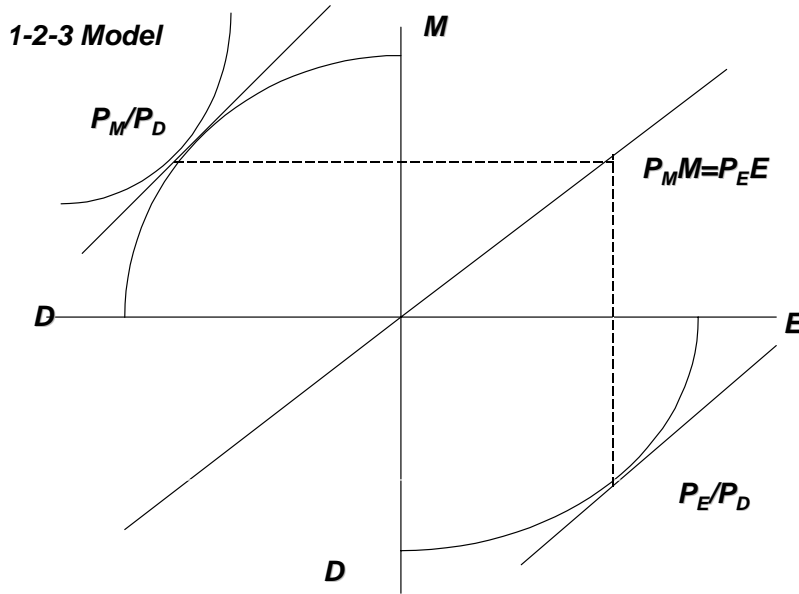
3. Since the 1-2-3 model is well-documented elsewhere (Devarajan, Lewis, and Robinson [1990,1993],

In symbols,

$$P_E = RP_E^*$$

where R is the nominal exchange rate and P_E^* the world price of exports;

$$E/D = k(P_E/P_D)^\Omega$$

where Σ is the (constant) elasticity of transformation.

There is one other good in the economy, which is imports (M)—hence the name, "one country, two sectors, three commodities." Consumers have a constant elasticity of substitution utility function in D and M, and the level of demand is determined by the highest indifference curve that is tangent to the consumer's budget line. The price of imports is also exogenous. That is,

$$P_M = RP_M^*$$

where P_M^* is the world price of imports, and

$$M/D = k'(P_D/P_M)^\sigma$$

where σ is the (constant) elasticity of substitution. The price of D is determined by that price which equilibrates supply and demand for D. Inasmuch as D is a domestic good that is neither exported nor imported, the relative price of D to E or M is a real exchange rate. The salient aspect of the 1-2-3 model, therefore, is that it captures the effects of macroeconomic policies on a critical relative price, namely, the real exchange rate.

The transformation frontier between E and D is based on the allocation of factors between the two sectors. Thus behind this function is a market for labor and capital. For simplicity, we assume there is only one labor market in the economy and that it is a

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Devarajan, Go, et al. [1997]), we provide only a thumbnail sketch here.

competitive one. We further assume there is full employment. Finally, we assume that capital is fixed and sector-specific in this static model. All these assumptions can be relaxed if there are data on different labor categories, and information on how the factor markets operate. In this simple model, the assumptions imply that associated with the equilibrium price of *D* is also an equilibrium wage rate. Profits in each sector are then the residual of output after the wage bill. To summarize, starting with a set of national accounts, for a given set of macroeconomic policies, the 1-2-3 model generates a set of wages, sector-specific profits and relative prices (of *D*, *M* and *E*) that are mutually consistent. The 1-2-3 model is but one way of eliciting the relative-price implications of a set of macroeconomic policies. The particular sectors chosen—exports and domestic goods—highlight one critical relative price, the real exchange rate. Other approaches would be consistent with this framework. Data permitting, a full-blown, multi-sector general equilibrium model could be inserted into the framework at this stage (see Devarajan, Lewis, and Robinson [1999]). The multi-sector version would capture the effects of these macroeconomic policies and shocks on several agricultural and manufacturing sectors, say. Some of these models also have a more complex treatment of labor markets, including the informal labor market, rural-urban migration and labor unions (Agénor and Aizenman [1999], Devarajan, Ghanem and Thierfelder [1999]).[4]

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4. Despite (or perhaps because of) its simplicity, the 1-2-3 model has been applied to a variety of policy problems, including the pre-1994 overvaluation of the CFA Franc (Devarajan [1998a,b], and regional integration (Addison [2000]. The model has been extended to incorporate rational-expectations dynamics (Devarajan and Go [1998]), and export externalities (de Melo and Robinson [1991]). Finally, Devarajan, Go, and Li [1999] provide empirical estimates of the two critical parameters, σ and Σ, for 60 countries.

The "Get Real" Model

As mentioned earlier, the 1-2-3 model is a static model. For a given growth rate of the economy, it calculates the wages, profits and relative prices that are consistent with that rate. Also as mentioned earlier, this "given growth rate" is normally a forecast or a target in most macroeconomic models used by country economists. Yet, there is reason to believe that the macroeconomic policies in question may have an impact on the economy's long-run growth rate. Presumably that is why we advocate policies such as trade liberalization, infrastructure development, and monetary and fiscal stability. The "Get Real" Model (Easterly [1999]) presents a parsimonious set of cross-country growth regressions that capture the long-run growth impact of these policies. The coefficients of an extended version that includes long-term trade and debt factors are given in Table 1. Note, for example, that the long-run growth effects of increases in secondary-school enrollment and in infrastructure stocks (telephone lines) are captured by this model.

Again, we emphasize that the "Get Real" Model is one alternative of capturing the long-run growth effects of macroeconomic policies. It is a reduced-form model, and since it is based on cross-country regressions, the coefficients are the same for all countries.[5] An alternative would be to estimate a country-specific model. The problem here is that there is not enough intertemporal variation in policies to obtain significant coefficients. Nevertheless, if the analyst has an alternative model of long-run growth determination, there is nothing stopping him or her from inserting it in place of the Get Real Model at this stage in the framework.

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5. Although the coefficients are the same for all countries, the long-run growth rates will be different since the levels of the explanatory variables will be different.

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Table 1: Growth Coefficients of the Get Real Model

Policy determinants		
Black market premium	–0.0153	(-4.02)
M2/GDP	0.0004	(3.31)
Inflation	-0.0014	(-0.21)
Real exchange rate	–0.0087	(-2.36)
Secondary enrollment	0.0003	(2.40)
Telephone lines/1000	0.0054	(2.13)
Shocks		
Terms of trade as % of GDP	0.2125	(2.45)
Interest on external debt as % of GDP	-0.0029	(-3.28)
OECD trading partner growth	0.0210	(3.56)
Initial conditions		
Initial income	-0.0105	(-2.33)
Intercept	0.0236	(0.71)
Shifts 80s	-0.0021	(-0.41)
Shifts 90s	0.0046	(0.60)
Zambia's economic growth		
Actual, 90s	-1.5 %	
Estimated	-2.1%	

Source: Easterly (2000). Figures in parenthesis are t-statistics

Trivariate VAR Model

The Get Real model captures the long-run effects of macroeconomic policies—approximately five years after the policies have been enacted. What about the first five years? One option is to use the consensus forecast for growth in those five years. However, this forecast would not tell us what the short-run growth impact of, say, a terms of trade shock or an increase in government expenditure would be. To capture these impacts, we estimate a trivariate vector autoregression (VAR), where the three variables are: the exogenous shock or policy (terms of trade or government expenditure), the real

exchange rate and growth. The short-run growth elasticities of the trivariate VAR model for Zambia are given in Table 2.

Table 2: Growth Elasticities in the First Two Years[*]

	Year 1	Year 2
Terms of trade shock (price of copper)	0.053	0.024
Government spending	0.038	-0.033

*Note: Impulse response from the VAR for the first two periods.

Since the 1-2-3 and Get Real (or Trivariate VAR) models render endogenous relative prices and growth (respectively), the resulting projections may not match those generated by the IMF's financial programming model that takes these variables as exogenous. For instance, the projections on tax collections may be different from those obtained by projecting an exogenous growth rate. The discrepancy can only be reconciled by examining the assumptions underlying the models that endogenize these variables and comparing them with the (implicit) assumptions behind the IMF's exogenous forecasts.

Household Data

So far, we have not mentioned poverty, and yet this framework is supposed to capture the effects of macroeconomic policies on poverty. We turn therefore to the final—and most important—module, which is labeled "household data" in Figure 1. Consider each of the households in the household survey. If each household maximizes its utility (over labor supply and consumption), the indirect utility function, v, is a function of wages (w), profits (π) and prices (p):

$v = v(w, \pi, p)$

To look at the impact of small changes in prices on this utility, we differentiate v and apply Shephard's Lemma:

$dv / \lambda = wL(dw/w) + d\pi - pC(dp/p).$

where $\lambda = \partial v/\partial \pi$, the marginal utility of income, L is net labor supply and C is net commodity demand.

Each of the variables on the right-hand side is portrayed by the results of the combined 1-2-3 and Get Real/Trivariate VAR models. Thus, with the information on changes in wages, profits and the prices of the three goods given by the models, and with the initial levels of labor income and commodity consumption given by the household surveys, we can calculate the impact of macroeconomic policies on household welfare.

Table 3: Distribution of Income and Expenditure, Zambia

Share of Income				Share of Expenditure	
Deciles	W	Π_D	Π_E	Exp M	Exp D
1	0.00	0.98	0.02	0.23	0.77
2	0.01	0.92	0.07	0.24	0.76
3	0.06	0.82	0.13	0.26	0.74
4	0.33	0.52	0.15	0.28	0.72
5	0.55	0.34	0.11	0.28	0.72
6	0.83	0.14	0.04	0.29	0.71
7	0.88	0.09	0.02	0.30	0.70
8	0.89	0.09	0.02	0.30	0.70
9	0.90	0.09	0.02	0.31	0.69
10	0.64	0.13	0.23	0.30	0.70
Average	0.71	0.14	0.16	0.30	0.70

Source: Zambia Household Survey

Table 3 shows the information on wages, profits and commodity demands for the ten deciles in Zambia. An examination of Table 3 reveals several interesting features of the distribution of income and expenditures in Zambia. First, note that the poor spend more of their income on domestic goods, whereas the rich spend more on imported goods. A policy that leads to an appreciation of the real exchange rate (increased government spending on nontradables, for instance) would favor the rich vis-à-vis the poor. On the income side, the poor get more of their nonwage income from the domestic sector, so a real depreciation would hurt the poor.

In principle, we can calculate the impact on each household in the sample so as to capture the effect on the entire distribution of income. Of course, for a given poverty line, the effect on different poverty measures can also be reported. In short, the

framework described so far allows for a forecast of welfare measures and poverty outcomes consistent with a set of macroeconomic policies. Since the model is quite flexible, it will eventually permit the analysis of poverty across different regions in a country, when the data allow for such a level of disaggregation.

III. Illustrations Using Zambia Data

Zambia represents an extraordinary case of an undiversified and landlocked economy, exhibiting a very high dependence on mineral resources and exports, subject to external price shocks as well as transport problems throughout its history. With a per capita income of US$ 300,[6] Zambia is among the poorest countries in Africa. It is also one of the most heavily indebted and recently qualified for debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative. Not surprisingly, Zambia's poverty has remained high; poverty incidence is over 70 percent by the national poverty line and near 64 percent based on $1 (PPP) a day. Its population, about 10 million in 2000, is highly urbanized, and large parts of the country are thinly populated. Population is concentrated along the "Line of Rail" that links the Copperbelt with Lusaka, the capital, and with the border town of Livingstone. Apart from South Africa, Zambia is the most urbanized country in Southern Africa. At 20 percent, it also has one of the highest prevalence rates of HIV/AIDS.

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[6] 2000 GDP per capita converted to U.S. dollars using the World Bank Atlas method.

Zambia's lack of per-capita growth is not a recent problem and is widely documented.[7] The long-term economic decline is closely associated with the deterioration of copper fortunes (see Figure 3). It has brought about painful contractions to a predominantly urban-based wage economy, which was once relatively rich in the region. It also made unaffordable the previously high levels of public expenditure, public employment and social assistance. Outside of copper dependence and the long-term decline in the price of copper, key constraints to Zambia's growth include transportation problems and disruptions arising from regional circumstances, ineffective public expenditure by a dominant but inefficient public sector, and the debt overhang. This anemic growth has continued despite significant liberalization in the 1990s. The large quasi-fiscal deficit stemming from losses of large parastatals and the delays in the privatization of the largest state-owned enterprise, Zambia Consolidated Copper Mines Limited (ZCCM), until the late 1990s were key factors.

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[7]See, for example, World Bank (2001) and Go (2002).

Figure 3: Copper Price and Zambia's Per Capita Income
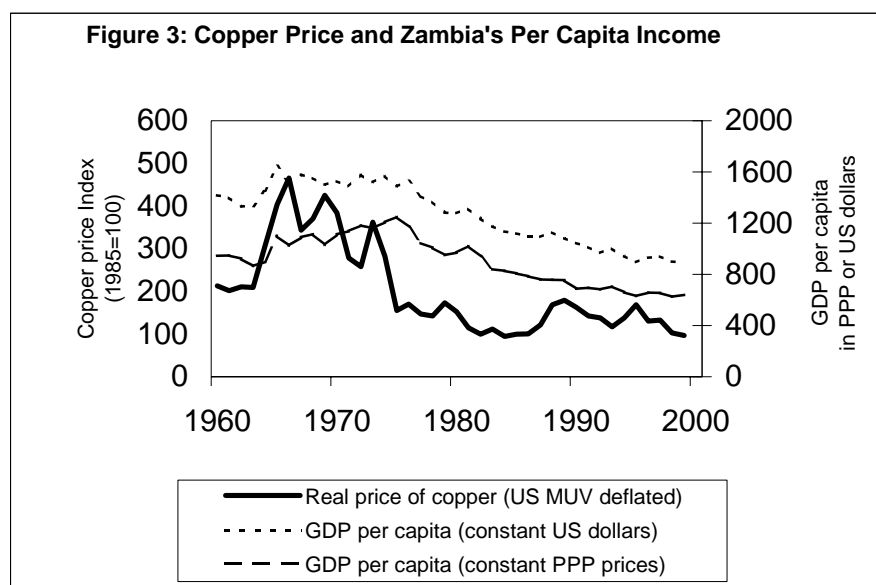
Sources: World Development Indicators (World Bank); GDP per capita in constant PPP, 1960-91, is from Penn World Table (Mark 5.6); 1991-99 is approximated from World Bank''s GDP per capita in current PPP deflated by US GDP deflator.

Zambia's Medium-Term Macroeconomic Framework

Zambia's economic outlook continues to depend on the supply response of the copper mines to the recent privatization of ZCCM, better copper prices, and the debt relief brought about by HIPC. Moreover, much remains to be done to ensure that the government continues with economic reforms, including governance reforms. Key aspects of the consensus forecast include the following points (Table 4):

Table 4: Consensus Forecast: Medium-term Macroeconomic Framework, Zambia[8]
(IMF Financial Programming/Bank RSMS-X; in percent change, unless otherwise specified)

	1999	2000	2001	2002	2003
Real GDP	2.4	3.6	5.0	5.0	5.5
Inflation – end year CPI	20.6	30.1	17.5	12.0	10.0
Inflation – average annual CPI	26.8	26.1	22.5	13.7	10.8
GDP deflator	21.7	27.9	24.9	17.2	13.2
Investment (percent of GDP)					
Term of trade	- 5.7	1.9	3.1	3.5	2.4
Copper price (US$/lb)	0.70	0.83	0.87	0.91	0.92
End-period Exchange rate (kwacha/US$)	2630	4160			
Average Exchange rate (kwacha/US11$)	2380	3110			
Current account balance (percent of GDP)	-15.2	-18.5	-19.9	-21.1	-19.3
Broad money	29.2	67.5	17.1		
Net foreign assets	-14.7	63.9	16.3		
Net domestic assets	43.9	1.6	0.8		
Net claims on government	10.2	12.4	-4.2		
Claims on public enterprises	12.0	3.6	-4.4		
Revenue and grants (percent of GDP)	25.5	25.4	26.7	23.5	23.4
Revenue (percent of GDP)	17.6	19.6	17.3	17.7	18.1
Expenditure (percent of GDP)	29.2	31.2	31.3	29.7	28.2
Overall balance (cash basis – percent of GDP)	-4.0	-7.1	-5.0	-6.6	-5.2
O. balance w/o grants(cash basis–percent of GDP)	-11.9	-12.9	-14.5	-12.4	-10.5
Domestic balance (cash basis- percent of GDP)	0.4	-3.4	-3.3	-2.2	-1.2

- GDP is projected to rise to a modest 5.5 percent in 2003. Inflation is expected to go down to about 10 percent in 2003. The overall fiscal deficit (cash basis), about 7.3 percent of GDP in 2000, will fall to about 4.5 percent by 2003.

- Public revenue and expenditure as percent of GDP will remain relatively stable at about 18 and 30 percent, respectively.

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[8] The figures and ratios to GDP may differ from PRGF/FSC numbers for a number of reasons – the assumptions of the consensus forecast are run through to the 123PRSP model to derive the reference run numbers; the tax rates are smoothed out if the implied taxes from the revenue to GDP ratios suggest wide variations in the tax rates.

- Extra-budgetary headroom is however created with HIPC debt relief, amounting to about 2.7 percent of GDP in 2001 and rising to 3.2 percent in 2003. The government has identified about US$86 million (about 2.7 percent of GDP) in poverty-related activities that will be funded by HIPC resources.

The consensus forecast is contingent on the realization of key reform measures identified in the credits and should therefore be interpreted as policy target.

The two main risks factors to the consensus forecast in the short and medium-term are:

- weakening of copper price because of a possible slowdown in world demand; and

- expenditure pressures from the presidential election in late 2001.

Over the long run, failure to implement the structural and policy reform measures are key risks. Additionally, the benefits of reforms may not be realized quickly or within the time horizon of the medium-term framework. We will explore what may elevate the long-term growth of Zambia, by considering the lessons and determinants of growth compiled from many countries and their implications to the composition of public expenditure and policy reform.

Deviations to the Medium-term Projections

The short-run growth elasticities of the two key risk factors, expenditure pressures and copper price shock, are given Table 2. [9]

Shocks in public expenditure: The growth elasticities indicate that increases in government consumption do not have much short-term beneficial impact on growth—the slight positive effect in the first year is offset by the second year. In fact, the cyclical behavior between GDP and shocks to government consumption was broken in 1987, when macro balances deteriorated rapidly. Prior to 1987, the connection was more positive and significant; after 1987, it began to move in opposite directions when large swings in government expenditure occurred particularly between 1987 and 1992.

Shocks in copper prices: Changes in Zambia's GDP can be tracked almost completely by changes in world price of copper (except for a brief period between 1970-74). The response of GDP to changes in copper prices persists for 2 to 3 years, but the response has been tighter since the balance-of-payments situation deteriorated in the late eighties.

The results of two simulations are shown in Table 5. The first simulation is *the expenditure shock*.

- Using the consensus forecast as a reference run, election pressures raise expenditure (government consumption) by 15 percent in the first year and 10 percent in the next year. The mode of adjustment to the shocks assumed is to

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[9] A third possible risk is shock in the agriculture sector. Random weather changes such as a drought continue to be important factors in agricultural production and its impact to GDP. However, we generally did not find that agricultural value added to be a good predictor of the underlying shocks to agricultural production and GDP. Nevertheless, there has been a stronger responsiveness of GDP growth to changes to the value added in agriculture since the late eighties.

keep foreign borrowing as percent of GDP constant relative to the reference run (i.e. a constraint); investment adjusts to available savings.

- Relative to the consensus forecast, the small Keynesian effect of additional expenditure on GDP, a percentage point deviation of 0.6 in the first year is largely dissipated by the second year.

- Even without the availability of additional foreign financing, the overall fiscal deficit of the central government deteriorates to 6.0 percent of GDP in 2001, 7.8 percent in 2002, and 6.3 percent in 2002, raising issues of sustainability.

- With no room to expand the current account deficit (by assumption), macro adjustment falls heavily on investment, crowding out private investment in particular. Investment falls from the reference run by about 4 to 5 percent in general.

- There are very little effects in the external sector in terms of the real exchange rate or relative price of exports and imports and the volume of exports and imports.

Consumption and household incomes increased slightly relative to the reference run, but nowhere near the magnitude of the expenditure increase. In fact, if fiscal or tax adjustment is needed to reduce the fiscal deficit, the small gains would be reversed.[10] The findings confirm the arguments about expenditure policy in Zambia—the benefits are few but the risks of fiscal deficit and the crowding of investment are high. In the next and last section, we return to the issues about the links between public expenditure, growth and poverty.

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[10] A fiscal adjustment simulation (not shown) confirms the results.

In the second simulation, *a terms-of-trade shock* is added to the above:

- Over the first simulation, copper price also deviates from the medium term framework by –20 percent in the first year; -15 percent in the second year and –10 percent in the third year. For comparison, the average volatility of the spot price of copper is about 23 percent; during the period 1997-99, copper price fell by more than 45 percent from peak to trough.

- The adverse effects of such a copper price shock will be devastating in Zambia. GDP growth will fall by –0.5 percentage point immediately, -1.4 percentage point in the second year, and a further –1.3 percentage point in the third year.

- The loss of tax base means that the fiscal deficit will rise to 7.3 percent of GDP immediately and to about 10 percent eventually.

- Triggered by the need for the economy to adjust to this sharp drop in terms of trade, the depreciation of the real exchange rate or relative price of foreign goods will be high, particularly for imports. Imports will be much more expensive relative to domestic goods by 22 percent and over 35 percent in the second and third year. The relative price of exports over nontraded goods also rises by about 8 percent to 13 percent.

- As a consequence, expenditure and production switching will take place. Imports fall strongly relative to the reference run, by about 13 percent in the first year and over 20 percent the next two years. As the economy contracts but the real exchange rates of exports rising, exports will rise slightly in real terms, by about 2 to 3 percent in spite of the general fall in their dollar prices.

- The contraction in aggregate demand is strongest in investment, which deviates from the reference run from 15 to 25 percent. Aggregate consumption falls by 8 to 13 percent.

- As a consequence, household welfare generally declines. Relative to the reference run, household incomes in general will fall by 2 percent immediately, accumulating to about 6 percent in the third year. The impact on each income decile is shown in Table 5. The results generally confirm that such a terms-of trade shock will be hard on all household groups, particularly the poorest. They also show how a "macro shock", even if though it is accommodated by a real exchange rate depreciation, can have severe distributional consequences.

Table 5: Impact of Shocks in Government Expenditures and Copper price
(Percent Deviation from the Reference Run; unless otherwise stated)

	2001	2002	2003
Real GDP (percentage point +/-)			
Expenditure shock	0.6	-0.1	0.1
Expenditure + TOT shock	-0.5	-1.4	-1.3
Overall fiscal balance (cash basis–% of GDP)			
Reference run	-5.0	-6.6	-5.2
Expenditure shock	-6.0	-7.8	-6.3
Expenditure + TOT shock	-7.3	-9.8	-8.6
Real exchange rate of imports (depreciation >0)			
Expenditure shock	0.0	0.0	0.0
Expenditure + TOT shock	21.8	35.9	35.8
Real exchange rate of exports (depreciation>0)			
Expenditure shock	0.0	0.0	0.0
Expenditure + TOT shock	7.9	12.7	13.6
Imports (real)			
Expenditure shock	0.5	0.4	0.6
Expenditure + TOT shock	-12.8	-20.1	-21.2
Exports (real)			
Expenditure shock	0.6	0.4	0.6
Expenditure + TOT shock	2.7	3.2	2.2
Investment (real)			
Expenditure shock	-4.3	-4.9	-4.5
Expenditure + TOT shock	-14.6	-25.3	-25.1
Consumption (real)			
Expenditure shock	0.6	0.4	0.6
Expenditure + TOT shock	-7.6	-11.6	-13.0
Household income in real terms			
Expenditure shock			
Decile 1 (poorest)	0.5	0.4	0.6
Decile 2	0.6	0.6	0.7
Decile 3	0.6	0.6	0.7
Decile 4	0.6	0.5	0.7
Decile 5	0.6	0.5	0.7
Decile 6	0.6	0.5	0.7
Decile 7	0.6	0.5	0.7
Decile 8	0.6	0.5	0.7
Decile 9	0.6	0.5	0.7
Decile 10	0.6	0.5	0.7
Total	0.6	0.5	0.7

Expenditure + TOT shock			
Decile 1 (poorest)	-4.6	-8.0	-9.8
Decile 2	-4.2	-7.4	-9.2
Decile 3	-4.0	-7.0	-8.8
Decile 4	-3.6	-6.4	-8.2
Decile 5	-3.4	-6.1	-7.8
Decile 6	-2.6	-5.0	-6.6
Decile 7	-2.4	-4.7	-6.3
Decile 8	-2.7	-5.1	-6.7
Decile 9	-2.5	-4.8	-6.4
Decile 10	-1.7	-3.7	-5.3
Total	-2.1	-4.4	-5.8

Deviations to the Long-term Growth Path

Is it possible for the Government of Zambia to undertake further reforms and reallocate public expenditure in order to raise long-term aggregate growth? We turn to that important question next and examine possible deviations to the long-term growth or historical trends.

Get Real Model: To derive alternative long-term growth in Zambia, we employ an extended version of the *Get Real* model (Table 1), which presents a parsimonious set of cross-country growth regressions and captures the long-run growth impact of key economic policies and factors. Determinants generally fit in four broad groups – physical capital, human capital, policy, and shocks.

Alternative Long-Term Growth Rate: Strictly speaking, there is no long-term growth rate in the consensus forecast, a medium-term framework covering the next three years from 2001 to 2003. The GDP growth rate of 5.5 percent in 2003 is therefore assumed to continue and is taken as the implied long-term growth rate in the consensus forecast. It should be noted further that initial conditions and inertia are significant factors

in the get real model and substantial reforms are necessary to attain such a growth rate. Starting from the realities of the 1990s, a 5.5 percent GDP growth would require, for example, the following: (i) no economic distortions (zero black market premium and zero overvaluation of the real exchange rate); (ii) a HIPC debt relief that reduce the interest payment as ratio to GDP by more than half ; (iii) an inflation rate of less than 10 percent;[11] (iv) a very favorable export environment; and (v) substantial increases (over 30 percent) in school enrollment rate and infrastructure like telephone.

Table 7: Alternative Long-Term Growth
(Percent Deviation from the Reference Run)

	Sim 3	Sim 4	Sim 5
Real GDP (percentage point +/-)	0.9	-4.6	-1.0
Household income in real terms			
Decile 1 (poorest)	1.1	-4.7	-0.9
Decile 2	1.0	-4.7	-0.9
Decile 3	1.0	-4.6	-0.9
Decile 4	1.0	-4.6	-0.9
Decile 5	1.0	-4.6	-0.9
Decile 6	1.0	-4.6	-0.9
Decile 7	1.0	-4.5	-0.9
Decile 8	1.0	-4.5	-0.9
Decile 9	1.0	-4.5	-0.9
Decile 10	0.9	-4.5	-0.9
Total	0.9	-4.5	-0.9

Three alternative long-term growth paths are examined (counting the two VAR simulations, Simulation 3 is the starting point):

- Simulation 3: A 10 percent improvement across the board on all the underlying variables in the Get-Real Model (except initial income). The net effect is to add 0.9 percentage point to the economic growth of Zambia.

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[11] Note the coefficient for inflation is not significant. The variable may be multicolinear with other determinants. The growth effects of inflation may also cancel out over the cycle of inflation crises.

Household income in all deciles increase by about 1 percent relative to the reference run.

Simulation 4: As a policy target, the consensus forecast is generally higher and more optimistic than the historical trends or what the get real model would suggest.[12] In Zambia's case, the latter would imply a lower GDP growth of less than 2 percent per year and a negative growth for GDP per capita. If progress is not made and all growth determinants remain the same as in the nineties, a –4.6 percentage point reduction in GDP growth from the reference long-term growth is projected (i.e., 0.9 percent GDP growth). The net effect of about the same magnitude on all households (Table 7) measures the income foregone from a reform program that is seriously off track.

IV. Concluding Remarks

As we said in the introduction, the PRSP process emphasizes country ownership, consultation and a poverty-focus of all policies. In particular, the poverty-focus of macroeconomic policies calls for a new framework that can capture some of the tradeoffs and distributional implications of traditional macroeconomic policies and shocks. The framework presented here, the 123PRSP model, attempts to portray some of these effects. For instance, in an application to Zambia, the model showed that a terms of trade shock (a fall in the price of copper) could have adverse distributional consequences, harming the poor more than the rich, even if the shock were fully accommodated by macroeconomic policies. This outcome was due to differences in the sectoral composition of income sources in Zambia between the poor and the rich. Similarly, the

model showed that, in the case of Zambia at least, greater fiscal flexibility may not be so desirable. The first-round Keynesian multiplier effects of an increase in government spending (financed domestically) are offset by the crowding-out effects of higher fiscal deficits in the near term. That this model could be put together in a relatively short time, in a country with limited data, and that policy-relevant results could be generated and used by policymakers in their PRSP, is evidence that the first objective of the PRSP, country ownership, could also be reinforced with the present exercise.

To be sure, the framework presented here, while tractable, is a patchwork of models with different philosophies. For instance, the neoclassical structure of the 1-2-3 model is based on a different philosophy from the reduced-form, Get Real model. Future work will aim to better integrate the various pieces. For example, a more satisfactory description of the labor market—keeping in mind the requirement that the model be applicable in countries with poor data—is a high priority. A second task is to develop some two-way interactions between at least some of the model's building blocks, so that eventually a fully simultaneous system can be developed.

Nevertheless, the model fulfills many of the criteria for a macroeconomic framework for PRSPs: it is capable of identifying some of the salient tradeoffs; it is based on solid economic foundations; it can be estimated with data from low-income countries; and—perhaps more important—it is simple enough that model results are easy to

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[12]In many countries, there is a tendency for overestimation with regard to the execution of reforms and the impact of future investments on growth. See, for example, Easterly (1997).

interpret. Alternative frameworks will have to ensure they do not sacrifice these desirable

characteristics.

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