MEMORANDUM

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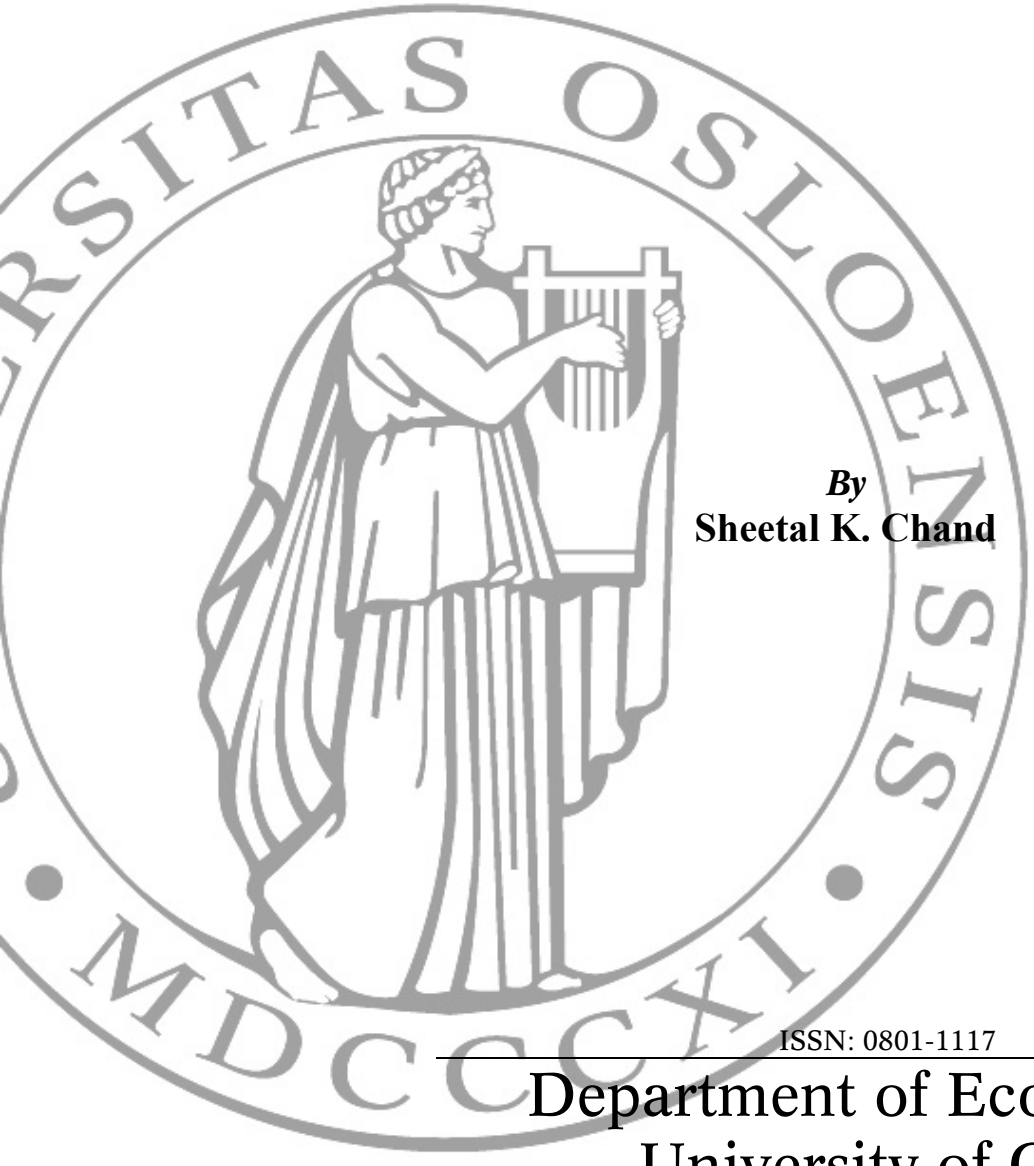
Stabilizing Poverty In The Context Of The IMF's Monetary Model



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Stabilizing Poverty In The Context Of The IMF's Monetary Model

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Abstract: The IMF monetary model focuses on the balance of payments. This paper adds a poverty stabilization objective to it. Drawing on statistical income distribution theory, key aspects of the head count poverty indicator are introduced. The resulting model reproduces traditional balance of payments policy prescriptions, while showing their implications for the incidence of poverty. A balance of payments-poverty tradeoff relationship is derived. This facilitates analysis of pre-emptive policies that can stabilize the incidence of poverty when undertaking balance of payments adjustment, thereby reducing the need for costly alleviation. The suggested approach is illustrated in the context of Mexico's 1995 stabilization episode.

Keywords: Poverty incidence; IMF monetary model; stabilization policy

JEL Classification: E61, E32, F32

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Introduction

Developing countries are prone to economic shocks that require a sustained adjustment sequence, which is often undertaken with assistance from the International Monetary Fund (IMF) and the World Bank (WB). This usually involves some initial stabilization and a variety of structural measures to improve the country's economic fundamentals. While the IMF leads on stabilization and macro-oriented structural adjustment measures, the WB complements with sectoral and micro-oriented measures with some emphasis on poverty eradication. Their combined interventions are intended to pave the way for a resumption of sustained growth once the economy has been stabilized.

Although there may not be much disagreement over the stated adjustment goals, their mode of attainment and associated side effects can be controversial. For example, the incidence of poverty can increase sharply during the initial stabilization phase. Indonesia, while undertaking macroeconomic stabilization during the recent East Asia crisis, suffered an increase in the head-count ratio, i.e. the proportion of the population falling below the national poverty line, of over 140 percent from 8 to 19 percentage points between mid-1997 and early 1999. Mexico, during its stabilization episode between 1994 and 1996 following a currency crisis, experienced an increase of over 40 percent in the head-count ratio from 15 to 21 percentage points. Stiglitz (2002), and many others, have argued that the reason for this phenomenon is over-emphasis on balance of payments adjustment during stabilization. According to this line of argument, there is excessive prioritizing of measures for improving the balance of payments such as deflation, exchange rate depreciation, tariff reform, opening up the economy to foreign investment, and cuts in government subsidies.

The criticisms that its programs aggravate the plight of the poor place the IMF in a difficult position, since a major purpose for its establishment was that of promoting satisfactory balance of payments performance of its member countries. In order to cushion the impact on the poor, the IMF has responded with several initiatives. Program countries are encouraged to prioritize poverty alleviation and to set up safety nets; credits

are available on less onerous terms in support of better-directed measures for alleviating poverty during adjustment; and a Poverty Reduction and Growth Facility (PRGF) was established in 1999 to which 77 low-income countries are eligible, conditional on their preparation of a Poverty Reduction Strategy Paper (PRSP) that focuses on the poverty impact of macroeconomic policies.

The adopted approaches, which emphasize alleviation in the short-run, are consistent with the widespread view that growth is the principal means for influencing the incidence of poverty.1/ Since growth can only occur later in the adjustment sequence, after the economy has stabilized, early preemption would appear ruled out. According to this line of reasoning the most that can be done during the initial stabilization phase, aside from poverty alleviation, would be to redouble stabilization efforts so as to resume growth as quickly as possible. However, such a strategy contributes further to the policy dilemma, since the greater the stabilization efforts the more the resources needed for poverty alleviation. If these additional costs are met fiscal discipline is compromised, which will thwart stabilization, but if they are not met the plight of the poor will be aggravated.

This paper develops the argument that it may be possible to pursue a policy of preemptive poverty stabilization and at the same time achieve reasonable balance of payments targets during the stabilization phase. The argument is based on two components: first, a reformulation of the standard poverty-growth equation, which relates poverty reduction to real per capita income growth, and second, its integration into the IMF monetary model, which focuses on the balance of payments. Analysis of the resulting model suggests that a four-tier pre-emptive approach could help resolve the short-run policy dilemma alluded to above. A main advantage of explicitly allowing for poverty stabilization in the macro model is that it facilitates the search for measures to prevent the incidence of poverty from getting worse. This is an important objective, both for reasons of equity and for the efficiency consideration of preventing hysteresis type

1/ See Lipton and Ravallion (1995), the World Bank Development Report (2000) and Dollar and Kraay (2000).

effects that might result from repeated stabilization efforts that involve high levels of poverty. Clearly full preemption will not always be attainable and policies of alleviation, not directly dealt with here, will also need to be considered.

Section 2 derives the standard poverty-growth equation from an underlying income distribution, and shows that there is scope for influencing the poverty outcome without directly involving real per capita income growth in the short-run. This involves exploiting the difference between changes in the valuation of the poverty line and those of the GDP deflator. Additional features of the reformulation involve the explicit inclusion of distributional effects, and analytic solutions of the non-linear coefficients relating the change in the head-count ratio to growth and distributional effects. Readers not interested in the technical details of these derivations may wish to proceed directly to the next section.

Section 3 extends the IMF's monetary model (see Polak 1957, 1998) to include poverty stabilization. Incorporating the reformulated poverty-growth indicator into that model shows that there is an inverse relationship between poverty incidence and the balance of payments: the more ambitious the balance of payments target, the higher the short-run incidence of poverty. Exploiting this trade-off, if the balance of payments targets are too ambitious, or if less ambitious but there is over performance, they could be downscaled– another policy tier - with obvious benefits for the incidence of poverty. However, if the balance of payments target cannot be adjusted, presumably it is at the minimum level needed to assure continued access to international markets, some preemption could still occur through shifting the trade-off relationship, which constitutes a third policy tier. Although outside the monetary model, a fourth policy tier can be identified, which would consist of measures to reduce the degree of income inequality. Section 4 illustrates the suggested approach in the context of the recent stabilization episode in Mexico, while Section 5 concludes.

2. Evaluating growth and distributional effects on poverty incidence

The incidence of poverty can change substantially as a result of growth and distributional factors. Starting with a general form of the income distribution and then for concreteness using the Pareto income distribution, this section derives growth and distributional effects on the head-count ratio and contrasts them with the standard poverty-growth equation.

The Head-Count ratio and its decomposition

The head-count or poverty ratio is defined as

$$H = \frac{N_p}{N} \qquad (1)$$

where N_p represents the number of households whose incomes fall below the designated poverty line *z*, and N is the total number of households.

Arrange the N households in ascending order of income *x*, where income is assumed to be distributed according to some continuous, differentiable frequency (probability) density function *f (x)*. Using the cumulative density function $F(z) = \int_0^z f(x)dx$ to denote the proportion of the population whose income does not exceed *z,* enables the head-count ratio to be expressed as

$$H \equiv \frac{N_p}{N} = F(z) = \int_0^z f(x)dx \qquad (2)$$

For a given poverty line, a change in the head-count ratio is equivalent to the sum of the effects of changes in mean income and in the distribution of relative income. These are referred to here as “growth” and “distributional” effects, respectively. The growth

factor is generally viewed in terms of real per capita income growth, while the Gini coefficient is used to assess changing income distribution (see, for example, World Bank (2000)). The rest of this note is concerned with deriving analytical expressions that capture their effects, while allowing for possible changes in the poverty line as part of the growth effects.

Regarding the growth effect, first define the total income of the poor as

$$X(H) = N\int_0^z xf(x)dx \qquad (3)$$

Expressing this sub-total as a proportion of the population's total income $N\mu$ generates the Lorenz curve for the distribution

$$L(H) = \frac{\int_0^z xf(x)dx}{\mu}, \qquad L(0) = 0,\ L(1) = 1 \qquad (4)$$

The first and second derivatives of *L (H)* are 2/

$$L'(H) = \frac{dL}{dy}\frac{dy}{dp} = z/\mu \qquad (5)\ 3/$$

$$L''(H) = \frac{1}{\mu f(z)} > 0 \qquad (6)$$

Logarithmic time differentiation of (5) yields, after some arrangement, the growth effect on the head-count ratio

2/ Kakwani (1993).
3/ This derivative results on applying the chain rule, differentiating *L* w.r.t *z* and *z* w.r.t *H*, and inverting the last.

$$\frac{\dot{H}}{H} = \eta_{H,z}\left[\frac{\dot{z}}{z} - \frac{\dot{\mu}}{\mu}\right] \qquad (7)$$

Here $$\eta_{H,z} \equiv \frac{\partial H}{\partial z}\frac{z}{H} = \frac{zf(z)}{H} > 0, \quad \eta_{H,z} = \infty,\ H = 0$$
$$= zf(z),\ H = 1.$$

is the elasticity of the head-count ratio with respect to the poverty line. This is non-linear in H.

The above derivation of the growth effect assumes an unchanged income distribution. This allows characterization of shifts in the distribution by reference to changes in mean income. Since no parameterization is provided of the curvature of the income distribution function in the general case, it does not appear feasible to undertake a similar derivation to capture distributional effects. A specific structure of the income distribution has to be assumed, for example a Pareto distribution as is done subsequently. Doing so also gives concrete expression to the elasticity term defined in (7).

Poverty lines for the poor are defined by reference to commodity baskets yielding some minimum calorie level, and are likely to behave differently from the overall GDP deflator. This is because of the different commodity compositions and weights that enter in their respective definitions, which also holds for the consumer price index (CPI) that is often used to update poverty lines. Insofar as these indices differ from the GDP deflator, the standard poverty growth equation is miss-specified as is evident on introducing the proportional change in the valuation of the GDP deflator, π, into equation (7)

$$\frac{\dot{H}}{H} = \eta_{H,z}\left(\frac{\dot{z}}{z} - \pi - \frac{\dot{\mu}}{\mu} + \pi\right) \qquad (8)$$

Only if the change in the valuation of the poverty line and the GDP deflator are identical does the expression in parenthesis reduce to the real rate of income growth.

$$\frac{\dot{H}}{H} = -\eta_{H,z}\left(\frac{\dot{\mu}}{\mu} - \pi\right) \qquad (9)$$

The relationship set out in (9) is widely estimated, typically in linear form with real per capita income growth as the main dependant variable (see, for example, World Bank (2000)). This regression performs poorly, and particularly so when tracking large short-run fluctuations in the head-count ratio during macroeconomic crisis and stabilization episodes. Among the reasons for the poor results are misspecification of the functional form as linear instead of non-linear, which is evident on substituting a constant for the elasticity term in (9), and omitted variable bias from ignoring distributional effects. 4/ The latter should be integrated into the poverty-growth equation, but as noted earlier can only be done when the income distribution takes a specific form. A potentially important further omitted variable bias results from neglecting differences between the change in the valuation of the poverty line and the GDP deflator.

Decomposition of the head-count ratio when the income distribution is Pareto

The simultaneous effects of changes in income and of a changing income distribution on the head-count ratio are readily determined from a Pareto income distribution $f(x) = ab^a x^{-a-1},\ a > 1$. Here *b* represents the lower income bound of the distribution. It can be interpreted as demarcating the subsistence level of income from the poverty line *z* lying above it. The distribution assumes a uniform rate of decline, measured by the power parameter *a*, in the proportion of the population above subsistence that earns higher levels of income. Some expressions follow:

The head-count ratio for the Pareto distribution is

4/ See Datt and Ravallion (1992), Kakwani (1993), and Bourguignon (2002).

$$H \equiv \frac{N_p}{N} \equiv F(z) = \int_b^z ab^a x^{-a-1} dx = 1 - \left(\frac{b}{z}\right)^a \qquad (10)$$

where $z > b$.

The Lorenz curve of this distribution is

$$L(H) = \frac{1}{\mu}\int_b^y ab^a x^{-a} dx = 1 - (1-H)^{\frac{(a-1)}{a}} \qquad (11)$$

The elasticity of the head-count ratio with respect to the poverty line is

$$\eta_{H,z} \equiv \frac{L'(H)}{L''(H)}\frac{1}{H} = \frac{a(1-H)}{H} \qquad (12)$$

The head-count elasticity expression can be expressed alternatively in terms of the Gini coefficient. Since

$$G \equiv 1 - 2\int_0^1 L(p)dp \quad = \frac{1}{2a-1},$$

$$\eta_{H,z} = \frac{1}{2}\left(\frac{1+G}{G}\right)\left(\frac{1-H}{H}\right). \qquad (13)$$

From the logarithmic time differentiation of equation (10), and using (12), the proportionate growth in the head-count ratio for the Pareto distribution is

$$\frac{\dot{H}}{H} = \eta_{H,z}\left(\frac{\dot{z}}{z} - \frac{\dot{b}}{b}\right) + \eta_{H,z}\left(\ln(\frac{b}{z})\frac{\dot{a}}{a}\right) \qquad (14)$$

Mean per capita income is determined as

$$\mu = \int_b^{\infty} x\, a\, b^{a} x^{-a-1} dx = \frac{a\, b}{a-1} \qquad (15)$$

Logarithmic time differentiation of (15) yields

$$\frac{\dot{\mu}}{\mu} = \frac{\dot{b}}{b} - \frac{\dot{a}}{a}\left(\frac{1}{a-1}\right) \qquad (16)$$

Using (16) to substitute for the rate of change of *b* in (14) and simplifying yields

$$\frac{\dot{H}}{H} = \eta_{H,z}\left(\frac{\dot{z}}{z} - \frac{\dot{\mu}}{\mu}\right) + \eta_{H,z}\left(\frac{\dot{a}}{a}\left\{\ln\left(\frac{b}{z}\right) - \frac{1}{a-1}\right\}\right) \qquad (17)$$

The first term on the RHS measures the growth effect and is identical to (7) for the general case. The second term on the RHS captures the distributional effect. Since $b<z$ and $a>1$, the last bracketed term on the RHS of (17) is negative. Hence increases in *a*, which are the equivalent of a reduction in the Gini, lead to a fall in the head-count ratio.

A poverty measure for macroeconomic analysis

For estimation purposes equation (17) will need to be restated in discrete terms. It is also convenient to use the relation between *a* and *G* stated in footnote 3, to express the relationship in terms of the Gini coefficient, which is more widely available.

$$\frac{\Delta H}{H_{-1}} = \eta_{H,z}\left(\frac{\Delta z}{z_{-1}} - \frac{\Delta \mu}{\mu_{-1}}\right) - \eta_{H,z}\left(\frac{1}{1+G_{-1}}\left(\frac{\Delta G}{G_{-1}}\right)\left\{\ln(\frac{b}{z}) - \frac{2G_{-1}}{1-G_{-1}}\right\}\right) \tag{18}$$

$$where \quad \eta_{H,z} = \frac{1}{2}\left(\frac{1+G_{-1}}{G_{-1}}\right)\left(\frac{1-H_{-1}}{H_{-1}}\right)$$

The preceding relationship was derived on the assumption that the underlying income distribution is Pareto. Alternative functional forms will generate different expressions for the distributional and elasticity terms.

3. Expanding the IMF monetary model to include poverty alleviation

The poverty indicator (18) is now in a form that can be embedded in a macroeconomic model. This is undertaken here using the IMF monetary model (Polak (1957, 1998)), which generates a solution for nominal income growth as a function of the balance of payments target. Incorporating this in the growth component of the poverty indicator in (18) enables a balance of payments/ poverty trade-off relationship to be derived. Although the focus here is on the growth effect that the model implies, IMF supported adjustment programs involve measures that can have distributional effects, and a fuller analysis would incorporate the latter as well in the poverty indicator.

The IMF's Monetary Model

The remarkable longevity of this model testifies to the power both of its basic insight and its operational character.5/ A balance of payments deficit is attributed to residents spending more than their income. Whatever the reasons for this excess

5/ Surprisingly, none of the more modern and elaborate models that have been developed in the IMF appear to have been found suitable for policy programming purposes of the sort practiced in the Fund. While the Polak model provides the conceptual underpinnings, the IMF staff generally employs a simpler version (see IMF (1987) and Chand (1989)).

expenditure, it is facilitated by financing. A sure way of bringing the balance of payments under control is to curtail access to financing. The operational issue is that of determining the critical sources of financing and setting their permissible amounts. In keeping with typical country circumstances, the model assigns a key role to domestic bank credit as the principal source of financing. Specific formulas are derived for calculating what rates of domestic credit expansion are consistent with designated balance of payments targets. The latter rates and their phasing are the subject of negotiations with the recipient country, and form a central component of the program's conditionality.

The model is in the classical monetary tradition, extended to the open economy. A stable demand for money function is assumed. Short-run equilibrium holds when money supply growth equals the desired rate of growth in the demand for money. Since there are two sources of monetary creation- domestic bank credit expansion and the monetization of foreign exchange inflows - reducing money supply growth from domestic sources forces an increase in supply from external sources to meet money demand. The transmission mechanism is from domestic monetary reduction, which reduces domestic income growth, to import compression.6/ Working out details of the appropriate degree of credit restraint and its phasing over time is referred to as "financial programming" in the IMF.7/

In formal terms, the model comprises the following equations (Polak, 1998):

6/ There is a conceptual problem with the Polak model, which breaks down if the small country assumption is maintained and nominal income is fixed. The last rules out income based import responses to monetary imbalances. The problem is avoided if imports are made a function of domestic expenditure instead of national income (Chand, 1989).

7/ Since the concern here is with the conceptual use of the model, no specifications are provided of definitions, stock and flow valuations, and other aspects needed for empirical applications. These are to be found in numerous IMF documents explaining the technique of financial programming; see especially IMF (1987). Polak (1998), and Mussa and Savastano (1999) discuss some of its later evolution, while Fine and Hailu (2000) provide a perceptive critique.

$$Mo = \frac{1}{v} Y \tag{19}$$

$$M = mY \tag{20}$$

$$\Delta Mo \equiv \Delta D + B \tag{21}$$

$$B \equiv X - M + K \tag{22}$$

where Mo is the Money stock, v the velocity of circulation of money, M is imports, m is the propensity to import, B is the local currency value of the change in international reserve holdings, D is the stock of net domestic assets of the banking system, X represents exports, K denotes net capital inflow, and Δ is the first difference operator. The model refers to an interval in time *t,* with all variables in nominal local currency values unless otherwise specified.

Equation (19) is a demand for money function; equation (20) is an import function; equation (21) is the identity indicating the two sources of monetary expansion, domestic and external; and equation (22) defines the balance of payments. Net capital inflows and exports are exogenously determined, as are the parameters v and m. To simplify the exposition Polak assumes constant parameter values, which I shall also retain in what follows.

The solutions of interest with respect to balance of payments targeting are obtained on equating the incremental flow supply of money given in (21) with its incremental demand from taking first differences of (19)

$$\frac{1}{v} \Delta Y = B + \Delta D \tag{23}$$

Using in (23) the definition of B from (22), the import demand function (20), the property $Y \equiv \Delta Y + Y_{-1}$, one–period lagged B_{-1}, and one-period lagged money demand, a reduced form solution for nominal income is obtained.

$$\frac{\Delta Y}{Y_{-1}} = \frac{1}{(1+mv)}\left\{\left(\frac{\Delta(K+X)}{Mo_{-1}}\right)+\left(\frac{B_{-1}}{Mo_{-1}}\right)\right\}+\frac{1}{(1+mv)}\left(\frac{\Delta D}{Mo_{-1}}\right) \qquad (24)$$

The rate of growth in nominal GDP is a function of two components: an exogenous component shown as the first bracketed term, and the domestic bank credit control variable. The exogenous component, subsequently referred to as the "intercept term", comprises changes in net capital inflows and export earnings, all in local currency terms. Both the intercept term and the control variable are expressed here as growth rates in terms of the domestic money stock so as to bring out explicitly their roles in the money supply process. According to equation (24), net positive increases in foreign exchange inflows stimulate GDP growth, as do increases in domestic bank credit.

The solution for the balance of payments follows from applying (24) to (23))

$$\frac{B}{Mo_{-1}} = \frac{1}{(1+mv)}\left(\frac{\Delta(K+X)}{Mo_{-1}}+\frac{B_{-1}}{Mo_{-1}}\right)-\frac{mv}{(1+mv)}\left(\frac{\Delta D}{Mo_{-1}}\right) \qquad (25)$$

The contribution of the balance of payments to money supply growth is a positive function of both capital and exports. However, an increase in domestic bank credit reduces the need for money to be supplied through the balance of payments.

The operational use of this framework consists of first specifying a balance of payments target B^t, and then determining from (25) the amount of domestic credit expansion that will ensure the target. Here a tilde ~ indicates a solution value.

$$\frac{\Delta\tilde{D}}{Mo_{-1}} = \frac{1}{mv}\left[\frac{\Delta\left(K+X\right)+B_{-1}}{Mo_{-1}}\right]-\frac{1+mv}{mv}\left(\frac{B^t}{Mo_{-1}}\right) \qquad (26)$$

The domestic bank credit solution will depend on the change in exports and net capital inflows. The larger exports and net capital inflows, say, the less restrictive should financial policy be for attaining a given balance of payments target.

Suppose the credit instrument solution of (26) is implemented. Inserting this solution in (24) implies nominal income growth of

$$\frac{\Delta\tilde{Y}}{Y_{-1}} = \frac{1}{mv}\left(\frac{\Delta(K+X)+B_{-1}}{Mo_{-1}}\right) - \frac{1}{mv}\left(\frac{B^t}{Mo_{-1}}\right) \qquad (27)$$

Hence the higher the balance of payments targets the smaller the implied growth in nominal GNP.

Incorporating a poverty extension

The solution obtained in (27) for nominal income growth can now be introduced into the formula for the change in the head-count ratio in (18). Since income growth in (18) is per capita, the population growth rate has to be subtracted from the GDP growth rate solution of (27).

$$\frac{\Delta H}{H_{-1}} = \eta_{H,z}\left(\frac{\Delta z}{z_{-1}} + n - \frac{\Delta\tilde{Y}}{Y_{-1}}\right) \qquad (28)$$

Substituting for nominal income growth from (27) indicates the direct nature of the dependence between the head-count ratio and the balance of payments target.

$$\frac{\Delta\tilde{H}}{H_{-1}} = \eta_{H,z}\left[\frac{\Delta z}{z_{-1}} + n - \frac{1}{mv}\left\{\frac{\Delta(K+X)+B_{-1}}{Mo_{-1}}\right\} + \frac{1}{mv}\left(\frac{B^t}{Mo_{-1}}\right)\right] \qquad (29)$$

The following proposition can now be stated: *The more ambitious the balance of payments target, the greater the deterioration in the head-count ratio*. Equation (29)

provides a balance of payments/poverty tradeoff relationship, focusing on the growth effects.

The trade-off equation (29) is illustrated in Figure 1. Purely to facilitate a linear representation rely, a constant elasticity of the head-count ratio with respect to the poverty line is assumed. In the diagram, the intercept term A is shown as positive. If the balance of payments target is at the point b^t on the X-axis, the implied rate of change in the head-count ratio is h on the Y-axis. The maximum attainable balance of payments target that is compatible with poverty stabilization can be determined from equation (29).

$$\frac{B^t}{Mo_{-1}} = -mv\left(\frac{\Delta z}{z_{-1}} + n\right) + \left\{\frac{\Delta(K+X) + B_{-1}}{Mo_{-1}}\right\} \qquad (30)$$

If the amount generated by equation (30) falls below the minimum acceptable balance of payments target, poverty stabilization will then have to rely on shifting the trade-off curve (29). One option or policy tier involves increasing exports or net capital inflows, which shifts up the intercept term in the figure. Another policy tier would concentrate on restraining increases in the valuation of the poverty line. For example, could more be done to ensure that food prices do not rise unduly? 8/

The growth effects of exchange rate adjustments, which hitherto have been implicitly taken into account in the valuation of foreign exchange related items, can also be considered more explicitly in the context of equation (29). Differentiating the head-count change term with respect to the exchange rate

$$\frac{\partial}{\partial e}\left(\frac{\Delta \tilde{H}}{H_{-1}}\right) = \eta_{H,z}\frac{\partial}{\partial e}\left(\frac{\Delta z}{z_{-1}}\right) + \frac{\frac{\partial}{\partial e}(m)}{m^2}\left[\frac{\Delta(K+X)}{Y_{-1}} - \frac{\Delta B^t}{Y_{-1}}\right] - \frac{1}{m}\left[\frac{\partial}{\partial e}\left(\frac{\Delta(K+X)}{Y_{-1}}\right)\right] \lessgtr 0 \qquad (31)$$

8/ Several policy measures may be available to restrain valuation increases in the poverty line, ranging from anti-speculation actions to measures that do not impose a direct cost to food subsidies.

The direct effect on the valuation of the poverty line, shown as the first term on the right hand side, is positive given some pass-through effect, which raises the head-count ratio. The effect of the likely positive increase in the import ratio on the second term will depend on whether the change in foreign exchange inflows exceeds the targeted improvement in the balance of payments. However, the third term shows that the pure income effect of the depreciation, which raises foreign exchange inflows, will reduce the head-count ratio. The net effects of the exchange rate action on the head-count ratio are thus ambiguous.

4. An Application to Mexico

This section applies the IMF monetary model together with the proposed poverty extension to Mexico's stabilization episode of 1995. Their usefulness in explaining the observed changes is first determined. This is followed with a review of possible pre-emptive policies that could have stabilized the incidence of poverty.

A Mexican case study

In late 1994, Mexico experienced a currency crisis accompanied by large capital outflows (Appendix Table 1A). The IMF, the U. S. treasury, and the Canadian authorities mobilized substantial amounts of short-term financing in support of a stabilization program. To induce the needed turnaround in the balance of payments, a stabilization package was put together, which included, inter alia, a deflationary financial policy and a depreciating exchange rate. The stabilization measures succeeded in sharply improving the balance of payments, especially its current account. However, the episode was very costly for Mexico. The exchange rate greatly overshot conventional estimates of its overvaluation and import volumes were severely compressed. One indication of the welfare cost was the sharp increase in the head-count ratio from 15 percent of the population in 1994 to 21 percent by 1996.

It is interesting to see what light the modified model set out in the preceding section can shed on the macroeconomic determinants of the poverty outcome. The data needed to estimate the model is presented in Appendix Table 1.

The first step is to apply the IMF monetary model to the data. The key equations of the model are (24) and (25), which are applied successively to each year over the period 1993-97. The exercise conducted here is an ex post one, and the issue investigated is that of the conformity of this monetary model with the data. The results are presented in Table 1 and in Figure 2. There is some broad conformity between the estimated and actual movements for the nominal GDP growth rate, and for the balance of payments, respectively. Nonetheless, the discrepancies, especially for 1995, are troubling in light of how close the model is to the underlying accounting identities, and the highly favorable mode of application here, where the observed values of exogenous variables and parameters are used. This indicates that there are likely errors of misspecification reflected in the IMF monetary model's projections of the nominal GDP growth rate. The errors could concern matters such as the assumed lag structure (minimal) and the simplified behavioral specifications, but also omitted variables.

Another significant issue for the applicability of the IMF model concerns control over the credit instrument. In late 1994, and related to the currency crisis, there was a massive outflow of capital and the overall balance of payments moved from a surplus of 1.8 percent of GDP into a deficit of 4.1 percent. In response, financial policies were tightened and the rate of domestic credit expansion (NDC in Table 1) sharply reduced both in 1995 and 1996. However, the effective reduction in NDA was considerably less, which raises the question of how closely the net domestic assets component of money supply was controlled.9/ While some of the discrepancy between movements in NDA

9/ The IMF's Monetary Survey (reported in the IFS) is used here. This distinguishes on the assets side net foreign assets (NFA) and net domestic assets (NDA), with the last further broken down between net domestic credit (NDC) and other items net (OIN). The liabilities side consists of broad money, which is the sum of narrow money comprising currency and deposits, and quasi-money involving savings deposits.

and NDC are the result of valuation effects on balance-sheet items owing to the massive depreciation of the exchange rate, it is also likely that the rate of credit expansion variable NDC was not reduced as sharply as reported in the statistics (Table 1). That the latter was the case in 1995 and even more so in 1996 is borne out by the experience of 1997, when the NDC rate of expansion jumped by 72 percent, in the face of a continued decline in NDA. It would seem that items of a credit nature were being booked initially in suspense accounts that form part of OIN and then subsequently reclassified.

Nonetheless, even focusing only on the NDA numbers, which because of valuation and other adjustments would tend to underestimate the degree of credit restraint, it is apparent that there was a sharp credit contraction. This indicates some measure of control over the credit instrument. Comparing both the NDC and the NDA numbers with the observed balance of payments outcomes confirms that the credit restraint was associated with improvements in the balance of payments. By 1995, the overall balance of payments deficit was almost eliminated, and from 1996 on it began to exhibit surpluses. While there can be little doubt from the data that the IMF monetary model does capture some strategic interactions that affect the balance of payments, its failure to reproduce observed nominal GDP growth rates sufficiently accurately suggest that the latter should instead be used to test the poverty extension.10/

The 40 percent change in the poverty ratio between 1994 and 1996 is the outcome of the growth and distributional factors outlined in Section 2, which we shall examine using an assumed Pareto income distribution. First compute the growth effect using equation (28). Given a Gini coefficient of 0.54 and head-count ratio of 15 percent for 1994, the elasticity η is estimated to be 8.08, applying the formula in (13). The

10/ Proponents of the financial programming approach argue that its value lies not so much in the accuracy of its forecasts, but in the usefulness of the framework in facilitating thinking about mutually consistent policies to achieve the stated objectives. Given the limited structure of the model, and a host of problems with data, behavioral and institutional representations, there is reliance on a considerable amount of guesswork and iterative manipulations to arrive at a program that "seems reasonable". See Polak (1998) and Mussa and Savastano (1999) for expositions of this view.

application of the first part of the formula in (18) to the data presented in Table 2, and taking note of the two-year lag between the head-count observations, yields an increase of 78.4 percent in the head-count ratio.

The distributional effect is found next using the second part of the formula set out in (18). Since the Gini is estimated to have declined from 0.54 in 1994 to 0.53 in 1996, the favorable distributional effect will lower the poverty ratio. The effect is estimated at 40.7 percent of the base year's head-count ratio.11/ Subtracting it from the growth effect gives an increase of 37.7 percent in the head-count ratio, from 15 percent to 20.7 percent in 1996, close to the reported poverty ratio of 21 percent for 1996.

Could the poverty ratio have been stabilized in Mexico, while pursuing external adjustment?

While there appears to have been a clear need for Mexico to turn the balance of payments around, one issue is that of how much improvement to seek in the balance of payments. If this were the sole objective then the more the better, and applying sufficient restraint on domestic credit expansion would be a means to that objective. However, such a policy would have worsened the head-count ratio. On the other hand, relying solely on a policy of full stabilization of the poverty objective would not have been feasible. Applying equation (30) shows that keeping the head-count ratio at the 1994 level of 15 percent would have required a substantial negative balance of payments target. This would not have been feasible, given that international reserve holdings were badly depleted in 1994.

Nonetheless, lowering the balance of payments target and performance could have made a partial contribution to the poverty stabilization goal. Table 1 and Appendix Table 1 show a marked improvement in foreign exchange inflows for Mexico after the

stabilization was initiated, despite the massive deterioration in net capital inflows. This development is the result of the sharp increase in exports of goods and services and the reduction in imports, resulting in a turnaround in the goods and services balance between 1994 and 1995 of 7.5 percent of GDP. Insofar as the programmed balance of payments target may have been exceeded there would have been scope for some relaxation. If the balance of payments target itself is unduly ambitious there might have been scope for further relaxation of the credit policy, which would have helped with the poverty stabilization objective.

Additional measures to stabilize the poverty ratio such as further improving net capital inflows and export earnings, could have helped. A critical component of net capital inflows concerns private capital flows, which were highly volatile. The large amount of international financing Mexico obtained in 1995 was used to settle short-term payment arrears that had arisen on non-resident claims. While no doubt important as a means for restoring access to international capital markets, they are not likely to have the effect of, say, foreign direct investment in supporting additional domestic credit expansion. Perhaps more could have been done to reverse the private capital outflow through more aggressive confidence restoring measures.12/ A temporary stay on external debt repayment as recently proposed by Krueger (2002) could have made a significant contribution in preventing the resource drain, thereby providing more domestic stimulus.

One option that might have made a difference is restraining the rise in the poverty line. The data in Appendix Table 1B indicate that food prices rose faster than the CPI in Mexico both in 1995 and 1996. This is puzzling in light of food's virtually full domestic content. Had the food price increases been lower, given its weight of 50 to 55 percent in the consumption baskets of the poor, depending on urban or rural, there would have been

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11/ $\ln \frac{b}{z}$ is calculated as –0.3, on identifying *b* with the World Bank's $1 criterion for the very poor and *z* with the Bank's criterion of $2 per day, which was the basis for the head-count figures here.

12/ In this regard Stiglitz (2002) argues that the adopted response of raising interest rates is a double-edged weapon.

smaller increases in the head-count ratio. It is possible that liberalization of the external sector together with the exchange rate depreciation may have made it attractive to export food, which would have contributed to the local food price increases. A more deliberate policy of controlling domestic food prices might have contributed to a lower poverty ratio.13/ Insofar as such a policy requires additional financing, taxing exchange rate related windfalls could have contributed.14/

5. Conclusion

This paper has attempted to develop a macroeconomic - poverty incidence relationship that can assist in formulating pro-poor policies, for example in the context of balance of payments stabilization. The proposed indicator contains both growth and distribution components. To identify growth effects on the poverty ratio, a simple comparison is needed of the nominal GDP growth rate and the rate of adjustment in the poverty line. To quantify these effects, the shape of an underlying income distribution has also to be provided, so as to enable the impact coefficient on the head-count ratio to be calculated. If information on the distributional effects of the various structural measures that form part of the adjustment strategy is available in terms of their impact on the Gini coefficient, the distributional effects on the head-count ratio can also be estimated.

The analysis of the paper shows some scope for preemptively stabilizing the poverty ratio through operating on the poverty line's valuation. The additional scope available will depend on the specifications of the macroeconomic model. In the context of the IMF monetary model, the available short-run policy options consist of adjusting the balance of payments target and influencing some of the components of the balance of payments, since these are the major determinants of nominal income in that model. It

13/ Some governments have found it necessary to introduce restraints on the free export of domestic staples so as to better control domestic prices.

14/ A windfall tax on foreign exchange earnings or holdings of foreign assets can be justified on equity grounds, which become stronger if the exchange rate overshooting adversely affects the poverty line. A credible windfall tax, in place before a crisis hits,

should be emphasized that the short-run analysis is compatible with different structural adjustment strategies that may be initiated at various times, provided any implied effects on national income and if possible their distributional implications are taken into account.

Although the approach adopted here is macroeconomic, it can be further elaborated to take account of sectoral or geographical influences on incomes and consumption.15/ This is especially desirable when evaluating distributional effects. While shifts in the parameters describing the income distribution might be useful for assessing distributional effects on the head-count ratio, the reasons for their change will need to be understood in preparing possible countervailing measures.

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might even go some way towards restraining the initial speculative excesses and exchange rate overshooting.

15/ See Kanbur (1987) for a discussion in the context of IMF programs.

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Table 1. Mexico: The IMF Monetary Model: Balance of Payment solutions and Outcomes (1993-1997) (in percent change)

Years	$\frac{B}{MO_{-1}}$	$\frac{\tilde{B}}{MO_{-1}}$	$\frac{\Delta Y}{Y_{-1}}$	$\frac{\Delta \tilde{Y}}{Y_{-1}}$	$\frac{\Delta NDC}{MO_{-1}}$	$\frac{\Delta NDA}{MO_{-1}}$
1993	7.6	4.7	11.6	12.0	14.2	7.6
1994	-17.1	-12.0	13.1	21.3	28.0	34.5
1995	-3.6	11.5	29.3	41.4	6.5	33.8
1996	5.5	13.8	37.5	32.6	-16.8	19.4
1997	16.5	15.1	25.7	28.7	72.3	12.9

B=balance of payments, MO= broad money, Y=GDP, NDC= net domestic credit of the banking system, NDA= net domestic assts of the banking system, $\sim$ indicates estimated.
Source: Appendix 2 Table 1

Table 2. Mexico: The Head-Count Ratio *H*, 1995-96

Years	*H* (Percent)	Gini	CPI (% Change)	$\frac{\Delta \mu}{\mu_{-1}}$ (% change)
1994	15.0	0.54	7.0	11.1
1995			35.0	28.0
1996	21.0	0.53	34.4	34.1

Source: IFS, and Szekley and Hilgert (1999) for the head-count ratio and Gini estimates. H=head count ratio, $\frac{\Delta \mu}{\mu_{-1}}$ = nominal per capita GDP growth.

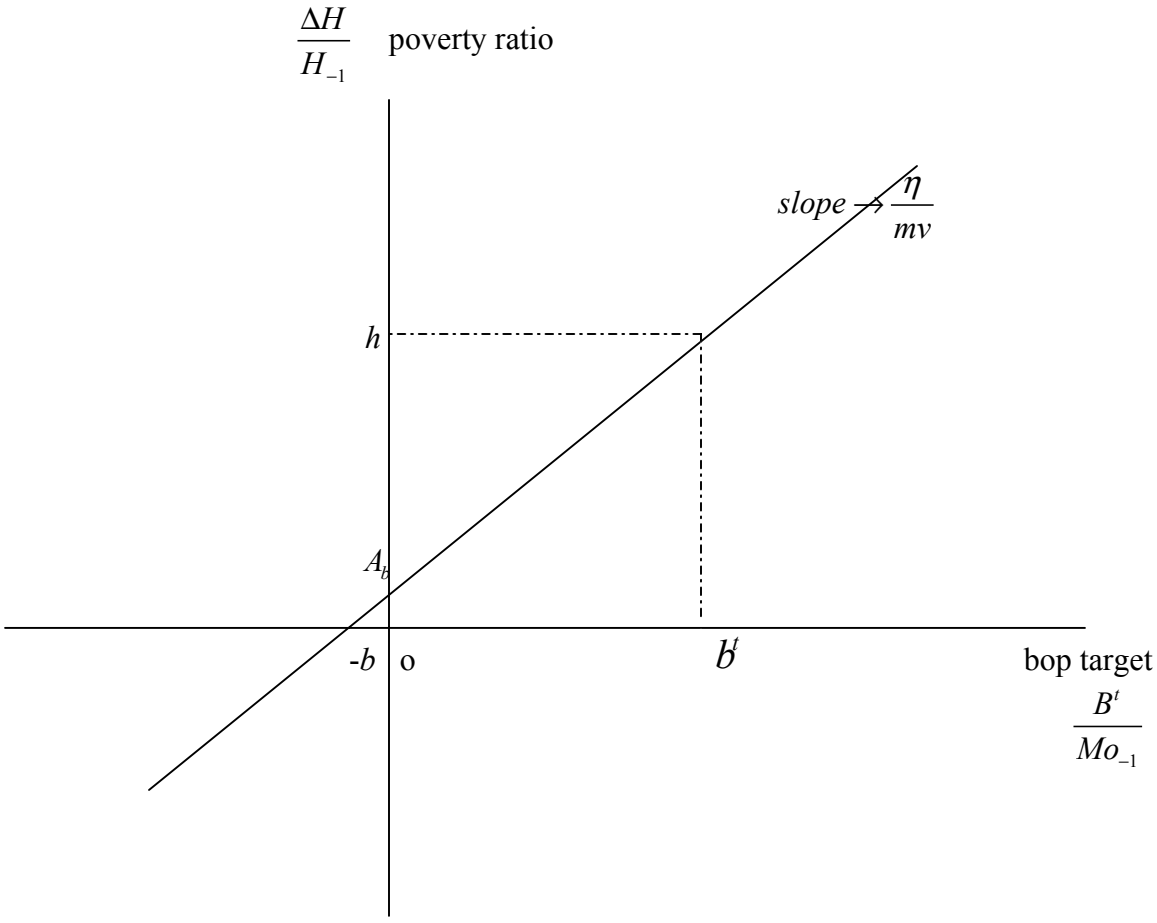
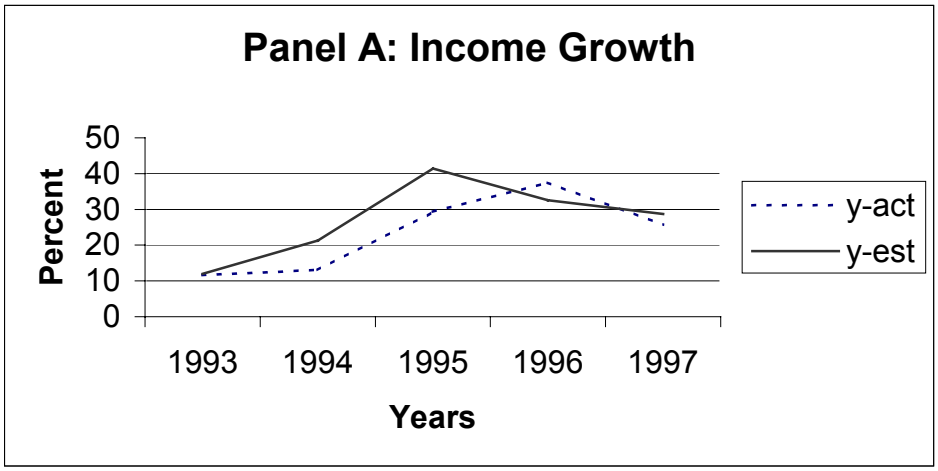
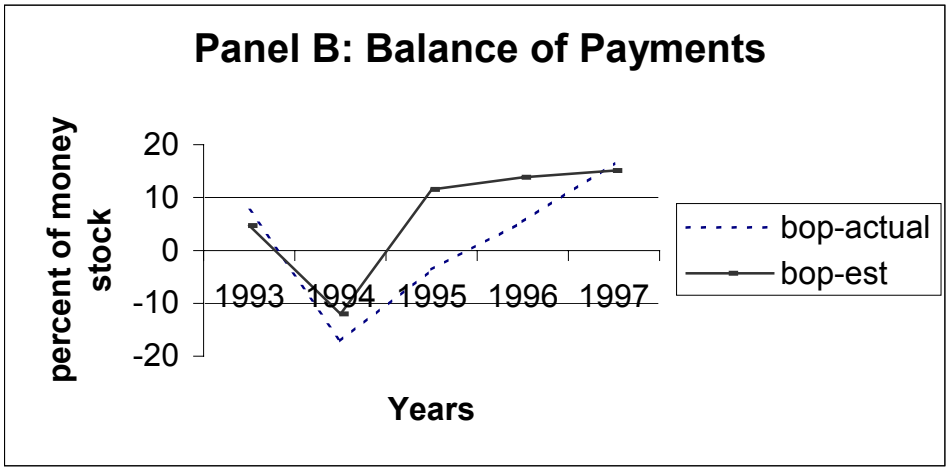


FIGURE 1. The Balance of Payments-Poverty Tradeoff

Figure 2. Mexico: IMF Monetary Model Estimates and Outcomes.





Appendix Table 1. MEXICO (1992-1997) Basic Data and computations

A. External Sector Data (in billions of US $)

	Av. Exchange rate, P/$	End period exchange rate, P/$	Net Capital Inflows 16/	Exports of goods and services	Imports of goods and services	Balance of payments BOP 16/	Current account BOP
1992	3,095	3,120	26,190	55,480	74,090	1,750	-24,440
1993	3,120	3,110	30,630	61,410	77,420	7,230	-23,400
1994	3,380	5,330	12,460	71,200	92,390	-17,200	-29,660
1995	6,420	7,640	-0,720	89,320	82,170	-2,300	-1,580
1996		7,850	6,190	106,900	100,290	3,860	-2,330
		8,080	21,450	121,830	122,430	14,000	-7,450

B. Basic Data

	Consumer Price Index, % change	Food prices, % change	Gini	Head-count ratio	Population growth
1992	15.5	11.2			
1993	9.8	6.7			1.8
1994	7.0	5.3	0.54	0.15	1.8
1995	35.0	39.2			1.0
1996	34.4	41.6	0.53	0.21	2.5
1997	20.6				

C. In billions of new pesos

	GDP	M2	NDC	NDA	NFA	OIN
1992	1125,300	295,440	352,790	251,530	43,910	37,190
1993	1256,200	340,350	394,880	274,110	66,240	37,430
1994	1420,200	406,010	490,220	391,640	14,370	-36,360
1995	1837,000	534,870	516,750	528,960	5,910	-144,170
1996	2525,600	670,300	426,640	632,820	37,480	-312,120
1997	3174,300	897,250	911,330	719,440	177,810	-145,260

Source: IFS (2001), WDI (2002), Szekley and Hilgert (1999)

16/ The net capital inflow for 1995 and the overall balance of payments for that year differ by US$ 14 billion from the amount shown in the IFS. This is because the latter sum, representing exceptional financing, was netted against net capital inflows.