A model of adjustment and growth: An empirical analysis

Reinhart, Carmen

University of Maryland, College Park, Department of Economics

1991

2

A Model of Adjustment and Growth
An Empirical Analysis

*Carmen M. Reinhart**

THE CONCEPT of "growth-oriented adjustment," or the notion that economic growth is essential for the achievement of the twin goals of a sustained reduction in inflation and a viable balance of payments, has recently received the attention of policymakers and academics alike. Indeed, growth-oriented adjustment is considered a key characteristic of the policy packages that make up Fund-supported programs. Examples of the blossoming literature on the subject of growth-oriented adjustment can be found in Bacha and Edwards (1988), Blejer and Chu (1989), and Corbo, Goldstein, and Khan (1987).[1]

Any analysis of the effects of policies on the targets of growth, inflation, and the balance of payments requires a consistent and unified framework. Further, because this issue is particularly relevant for developing countries, it is desirable that the framework be both sufficiently simple to allow its application where data are limited, and general enough to ensure its applicability to a diverse set of countries. The model developed by Khan and Montiel (1989), which merges a variant of a neoclassical growth model frequently employed by the World Bank with the monetary approach to the balance of payments associated with the IMF, provides such an integrated framework.[2]

However, the simplicity that makes a model more tractable from an operational standpoint may have several drawbacks as a result of the necessarily restrictive assumptions it employs. This paper assesses the usefulness of the Khan-Montiel model for policymaking by examining empirically the trade-off between its simplifying assumptions and its ability to fit reality. This trade-off can be assessed by applying the model to a variety of countries. For each country, the following questions are asked: (1) Are the key parameters of the model stable? (2) How sensitive are the policy multipliers to these parameter estimates—that is, how robust are the policy implications? and (3) Are some target variables more vulnerable to forecast errors than others?

* A shortened version of this paper was published in *Staff Papers,* International Monetary Fund, Vol. 37 (March 1990), pp. 168–82. The author is grateful to Mohsin Khan, Carlos Medeiros, Peter Montiel, and Vincent Reinhart for helpful comments and suggestions. The views expressed are the author's and do not necessarily represent those of the IMF.

1 See the references contained therein, particularly Michalopolus. Khan (1987) also provides a broad survey of this literature.

2 For a more detailed discussion of the building blocks of this model, see Khan, Montiel, and Haque (1990).

This paper examines these three questions for a diverse sample of seven capital importing developing countries and attempts to reach some conclusions about the usefulness of the model to help in designing policy. The countries considered here are Chile, Ghana, Honduras, the Republic of Korea, Myanmar, Pakistan, and Tanzania. The sample thus includes low- and middle-income countries, manufacturing and primary exporters, as well as service and remittance countries, and one heavily indebted country. This diversity makes the sample reasonably representative of a large set of developing countries.

Section I briefly outlines the theoretical framework and examines its properties. Section II presents the estimates of the key parameters of the model and tests the stability of a subset of these parameters. Special attention is given to the adequacy of the model's specification of output determination, the demand for money, and private savings behavior. Section III contains comparative static exercises dealing with a variety of exogenous and policy-induced shocks, given the estimated parameter values. The shocks are central to most adjustment programs: devaluation, changes in domestic credit, and changes in government spending.[3] The section concludes with an analysis of the "robustness" of the policy implications of the model under varying parameter values. The final section reviews the key results, discusses the limitations of the approach followed in this paper, and highlights some of the directions in which the theoretical and empirical work could be extended.

I. Summary of the Theoretical Framework

The Key Relationships

The theoretical framework outlined in this section, which follows Khan and Montiel (1989), serves as a benchmark for the subsequent empirical application. The model merges a growth block similar to that employed by the World Bank (see Khan, Montiel, and Haque (1990)) and a mone-

3 See, for instance, Khan and Knight (1985).

tary block that is central to the monetary approach to the balance of payments associated with Fund-supported adjustment programs (see International Monetary Fund (1977, 1987)).

The framework describes a small open economy, representative of a developing country, that maintains a fixed exchange rate. Equations (1) through (7) define the basic identities of the model, as well as the budget constraints for the private and public sectors.

The private sector's budget constraint:

$$Y_t - T_t - C_t - S_{pt} \equiv 0. \qquad (1)$$

The allocation of private savings:

$$S_{pt} \equiv P_{Dt}\, dk_t + dM^d_t - dD_{pt}. \qquad (2)$$

The government budget constraint:

$$e_t dF_t + dD_{gt} \equiv G_t + i_t e_t F_t - T_t - T_{Bt}. \qquad (3)$$

The sources of changes in the money stock:

$$dM^S_t \equiv e_{t-1} dR_t + dD_t. \qquad (4)$$

The composition of changes in domestic credit:

$$dD_t = dD_{gt} + dD_{pt}. \qquad (5)$$

Interest earnings on foreign reserves transferred to the government:

$$T_{Bt} = i_t e_t R_t. \qquad (6)$$

Gross national product:

$$Y_t = Y_t - i_t e_t (F_t - R_t). \qquad (7)$$

In order of appearance, the variables are defined as:

- Y_t: Gross domestic product
- T_t: Taxes from the private sector
- C_t: Private consumption
- S_{pt}: Private savings
- P_{Dt}: Price of domestic output
- dk_t: Change in the capital stock (investment)
- dD_{pt}: Change in domestic credit to the private sector
- dD_{gt}: Change in domestic credit to the public sector
- G_t: Government purchases of domestic output
- F_t: Foreign currency value of government foreign debt
- i_t: Interest rate on foreign debt
- e_t: Nominal exchange rate—number of domestic currency units per unit of foreign currency
- dM^S_t: Change in the money stock
- R_t: Foreign currency value of reserves held by the central bank
- dD_t: Change in total domestic credit
- T_{Bt}: Interest earnings on foreign reserves transferred to the government

The d's denote changes from time $t-1$ to time t, that is, $dx_t = x_t - x_{t-1}$.

The centerpiece of the growth block of the model is a neoclassical production function. Capacity, or potential growth, depends on increases in total factor productivity, changes in the size of the labor force, and changes in the capital stock. Combining productivity changes that are technologically driven and changes in labor supply into one exogenous variable,[4] the production function takes the following form:

$$dy_t = \alpha_0 + \alpha_1 dk_t, \qquad (8)$$

where the lowercase letters denote real magnitudes. The coefficient of investment, α_1, is the marginal product of capital, and the constant term, α_0, denotes the combined effects of total factor productivity and the change in the size of the labor force. This production function specification is a more generalized version of the "incremental capital output relationship" (ICOR).[5]

The second behavioral relationship in the growth block describes private savings. It is assumed that real private savings is proportional to real disposable income:

$$s_{pt} = s(y-t)_t;\ 0 < s < 1 \qquad (9)$$

where s is a constant representing both the marginal and average savings rate.

The third component of the growth block links savings identically to investment. Substituting the definition of the money stock, the government's budget constraint, and the savings function into equation (2), the following expression for the change in the capital stock is obtained:

$$dk_t = s(y-t)_t + [t_t - g_t - ie(F-R)/P]_t + e(dF - dR)/P_t, \qquad (10)$$

where the first term represents real private savings, the second real public saving, and the third is the real current account deficit (real foreign savings).

[4] They are combined for simplicity in the theoretical model (as in Khan and Montiel, 1989). This assumption is relaxed in the empirical work.

[5] See Chenery and Strout (1966), Sato (1971), and Wai (1985).

Since $Y_t = Y_{t-1} + dYe$, and $PO_t = Po_{t-1} + dPo_t$, capacity growth can be expressed as a function of domestic prices, reserves, and the exogenous variables and parameters:

$$dYe = (1 - sa1rl\{ ao + al[s(y_{-1} - t,) +$$

$$(t - g)_t + \frac{e(dF - dR - i[F - R])t]\}}{Pot\text{-}l+dPo,} \quad (11)$$

The monetary block is also defined by three relationships, starting with the flow supply of money (equation (4))[6].

The second relationship is the flow demand for money, here simplified by the assumption that velocity is constant:[7]

$$dM\sim = vPtdYt + vy_{-1} dP_t, \quad (12)$$

where P is the aggregate price level, defined below, and v is the inverse of the income velocity of money.

The last relationship in the monetary block describes money market equilibrium:

$$dM\sim = dM;'. \quad (13)$$

Defining the change in the aggregate price level, dP'' as a weighted average of the change in the price of importables, dP'', and the change in the price of domestic output, dPo'' with weights e and $(1 - e)$, respectively, it can be written

$$dP_t = edPz_t + (1 - e)dpo_t. \quad (14)$$

Assuming that e and the foreign currency price of importables are constant, initial conditions are set so that $eo = Pz0 = Poo = 1$ and that the law of one price holds, the following is obtained

$$dPz_t = PO^*tdet = de_t. \quad (15)$$

Using equations (14) and (15), and the definitions of flow money ?~m~nd and supply, and substituting them into the money market .eqUllIbnu~ condition (equation (13)), an expression for the change In domestic prices as a function of output, reserves, the exogenous variables, and the parameters of the system is obtained

$$dPo_t = \{v(1 - e)[Yt\text{-}1 + dYt]tl\{dRt - vdYt - veYt\text{-}ldet$$

$$- vedetdYt + dD_t\}. \quad (16)$$

6 See Robichek (1985).

7 The underlying specification $M\sim = vP_ty''$, assumes a constant mterest rat~. This type of restrictive assumption is not ~sse~tial to the model, as the analySIS carries through with a more general speCIficatIon.

The Merged Model

Combining the growth block (equation (10)) with the monetary block (equation (16)) does not close the system, as there are two equations in three unknowns, dYt, dPo'', and dR_t. The additional relationship that enables this system to be fully determined is the balance of payments identity:

$$dRt = Xt - Z_t - i(F - R)t + dFt, \quad (17)$$

where X_t and Z_t are the foreign currency value of exports and imports. Defining the trade balance in foreign currency terms, $B_t = Z_t - X_t$, it is assumed that

$$B_t = B_0 - a(e_t/P_{Dt} - 1) + bdy_t, \quad (18)$$

where a and b are positive constants and B_0 is a constant whose sign is undetermined. Equation (18) implies that the trade balance improves in foreign currency terms when the real exchange rate depreciates ($e/P_O > 1$) or when real output falls.[8] Recalling that $F_t = \sim\_I + d\sim$ and, similarly for R_t, equations (17) and (18) yield an expression for the change in reserves:

$$dR_t = (dF_t - Bo') + a'(et/POt - 1) - b'dYt - i'(F_{t-1} - R_{t-1}), \quad (19)$$

where $a' = a/(1 - i)$, $b' = b/(1 - i)$, $i' = i/(1 - i)$, and $B_0' = B_0/(1 - i)$.

Having obtained an expression for reserves (equation (19)), the system can be solved in terms of equation (10), which summarizes the growth block, and equation (16), which summarizes the monetary block.

The substitution of equation (19) into equation (10) yields

$$dYt = [1 - sal - albet/Pottl \quad \{<l() + al$$

$$\{S(Yt\text{-}1 - t_t) + (t - g)t + \sim tfBo - a(et/Po_t - I)]\}\}. \quad (20)$$

Graphically, the growth block traces out the locus in Chart 1 that has been labeled GG. Its slope, evaluated at $dYt = dP_{O'} = 0$, is

$$\left.\frac{(dPo)}{(dy)}\right|_{GG} = -f3/al1'),$$

where,

$$1'' = B_0 - a$$

and

$$f3'' = 1 - al(s + b) > 0.$$

8 Because imports (Z) decline in the latter case.

If η is negative, the GG schedule is upwardly sloped as depicted in Chart 1.

Similarly, substituting reserves in the equation representing the monetary block (equation (16)) yields

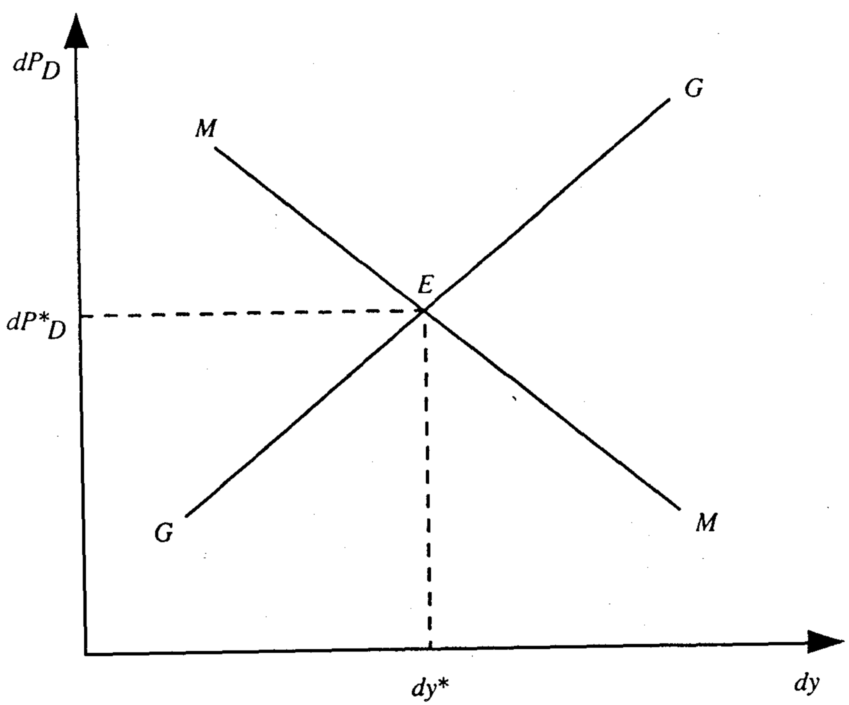
$$dP_{Dt} = [v(1 - e)(Yt\text{-}l + dYt)r1\{[dFt - B_0' - i'(F_{t-1} - R_{t-1}) + dDtJ - (b' + v)dYt - veYt\text{-}Ide_t - vedetdy_t + a'(et/P_{D,} - 1)\}. \quad (21)$$

Equation (21) traces a negatively sloped locus, labeled MM in Chart 1. The slope at $dYt = dP_{Dt} = 0$ is given by

$$\left.\frac{(dP_D)}{(dy)}\right|_{MM} = -(b' + v)/\gamma < 0,$$

where $\gamma = a' + v(1 - e)y_0 > 0$.

Chart 1. Macroeconomic Equilibrium



The intersection of the GG and MM schedules in Chart 1 depicts the equilibrium values of output changes and domestic inflation.

Parameters to Be Estimated

The model outlined above is applied to a sample of seven countries. Table 1 lists the parameters that must be estimated to make it operational.

II. Estimating the Parameters of the System and Testing the Underlying Assumptions

General Comments

To test the empirical validity of the model outlined above, the model is applied to a set of seven diverse developing countries: Chile (1976–87), Ghana (1969–87), Honduras (1969–87), Korea (1969–87), Myanmar (1969–87), Pakistan (1976–87), and Tanzania (1969–87).

The common approach to evaluating a model's empirical performance involves a two-step process: the first is the estimation of the model as a system; the second uses the estimated system to generate either in-sample forecasts, out-of-sample forecasts, or possibly both; and the final judgment is based on a comparison between the "fitted" values and the actual values-the forecast errors.

One problem with this approach is that it generally provides little or no direct information about what particular assumptions of the model are inappropriate, or what equations were misspecified. The approach followed here, although similar to the one outlined above, varies in some important ways. The first step still is to obtain estimates for the seven parameters that characterize the system. However, this was accomplished by estimating each behavioral equation separately, using either ordinary

Table 1. Parameters of the System

Symbol	Definition
a_0	Captures total factor productivity and changes in the size of the labor force
a_1	The marginal product of capital
s	The private savings rate
v	The inverse of income velocity
θ	The share of importables in the aggregate price level
a	The sensitivity of the trade balance with respect to the real exchange rate
b	The sensitivity of the trade balance with respect to changes in output

least squares (OLS) or generalized least squares (GLS), as dictated by the data. The individual equation approach was preferred over the alternative approach—estimating the model as a system—as it allowed more efficient use of the limited data, particularly in cases where the available time series for the same country had uneven starting points. The sample period covered by the empirical work for the individual equations was the maximum allowed by the availability of the data.

To assess not just the general fit of the model but to be able to pinpoint where the specification weaknesses lie, an intermediate step was added to the evaluation process: the validity of a subset of the individual theoretical assumptions was tested. Particular attention was devoted to specifying output growth, savings behavior, and money demand, as the parameters in these equations are central to the analysis.

Finally, since the model was not estimated as a system, and because it was desired to highlight the effects of certain policies, the methodology adopted in this paper does not involve a direct comparison of the actual and fitted values of the endogenous variables. Instead, the estimated parameter values are used to construct reduced-form policy multipliers for each of the endogenous variables. The range of values these multipliers take, as the parameter values are allowed to vary, provide useful information on the robustness of the model's policy implications. Except for the production function, which includes a proxy for the labor force, the empirical work uses only those explanatory variables dictated by the theoretical model. In general, the specifications of the estimation equations allowed these explanatory variables to appear with a richer lag structure than that suggested by the theoretical model. In each case the data determined the relevant lag pattern for the explanatory variables. Details for each equation and each country are outlined in the remainder of this section.

How Well Can a Production Function Explain Output Growth?

To obtain estimates for the marginal product of capital, a_1, and the combined effects of changes in the size of labor and total factor productivity, a_0, a simple growth model was estimated that is derived from an aggregate neoclassical production function. As in Robinson (1971), International Monetary Fund (1988), and Khan and Reinhart (1990), the growth function estimated takes the form

$$DY_t = a_0 + a_1(dk/Y_{t-1}) + a_2DL'', \quad (8a)$$

where the uppercase D's indicate rates of change and L denotes the labor force, here proxied by population. Because the data were allowed to

Table 2. Production Functions: How Well Can These Explain Output Growth?

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
α_0	-0.07 (-2.25)	-0.04 (-1.06)	-0.07 (-1.35)	0.08 (6.91)	-0.02 (-0.66)	-0.05 (-2.10)	-0.07 (-2.61)
α_1	0.28 (2.60)	0.12 (1.79)	0.62 (5.01)	0.08 (2.58)	0.23 (2.61)	0.28 (2.01)	0.50 (6.08)
R^2	0.28	0.11	0.71	0.31	0.17	0.13	0.79
DW	1.81	1.10	1.51	1.12	1.38	1.27	2.83

Note: Figures in parentheses are the t-statistics, R^2 is the coefficient of determination, and DW denotes the Durbin-Watson statistic.

[1] The investment-output ratio has been detrended.

determine the lag pattern for the investment-output ratio, the particular form that equation (8a) assumed for each country is presented in Appendix II. The estimates presented in Table 2 were obtained by applying ordinary least squares to a form such as equation (8a) and imposing constant returns to scale, so that $a_2 = (1 - a_1)$.

This exercise has a twofold purpose: first, it yields the relevant parameter estimates; second, it serves as a "test" of the usefulness of an aggregate production function in explaining actual output growth. As Table 2 indicates, the estimates for the marginal product of capital are reasonable in sign and magnitude across countries, averaging about 0.29[9] (these are the parameter values used in the subsequent comparative static exercises). Unfortunately, however, a neoclassical production function does not explain much of the variation in actual output. A large proportion of output variation remains unexplained, perhaps reflecting that the specification traces a production possibility frontier when in reality a significant number of countries, particularly developing countries, are not operating at full capacity. As such, a host of macroeconomic and microeconomic factors, not embodied in the production function, can push actual output growth toward or away from its potential. While this variation of the incremental capital output relationship meets the criteria of simplicity, which makes it applicable even in countries with limited data, it has the considerable drawback of being unstable over time. Projections of output growth based on variants of a production function are routinely subject to large and variable errors, and yet a neoclassical

[9] This average is higher than the 0.2 value obtained by Khan and Reinhart (1990) for a cross-section sample of 24 developing countries but is in line with Tyler (1981), who obtained a value of 0.25. Balassa (1978) found the marginal product to be about 0.16.

production function is one of the key relationships of the growth block of the theoretical framework.

Given the empirical inadequacy of the "full capacity" assumption, one possible route for future research would be to incorporate persistent excess capacity (present in varying degrees in most developing countries). The theoretical model would then allow domestic and foreign "demand" variables to playa greater role in output determination. Empirically, this extension should help reduce the share of output fluctuations that remains unexplained.

Savings Behavior-Is the Savings Rate Constant?

The second behavioral relationship in the model's growth block is the specification of the personal savings rate. The theoretical model assumes that real private savings is proportional to real disposable income. Variables that proxy the private sector's rate of time preference are not included in this specification. Similarly, other scale variables, such as wealth, are also omitted.[10]

Negative levels of private savings for some countries in the sample for a subset of the years in which the data are available precluded estimating a log linear savings function. Furthermore, the problem of heteroskedastic errors makes the use of levels inappropriate.[11]

Equation (9), however, implies that the marginal and average savings rates are equal. The average private savings rate, reported in Table 3, is used as the measure of s.[12] While this average provides numerical values for the savings parameter, it says nothing about the adequacy of assuming a constant stable savings rate. To assess the properties of savings behavior, in particular its stability, given these obstacles, consumption behavior was examined. Table 3 reports the results of an equation of the form:

$$Dc_t = c_0 + c_1 D(y - t)_t, \qquad (21)$$

where c represents real private consumption, c_0 is a constant term, c_1 is the average propensity to consume, and the D's indicate rates of change. The results of equation (21) were used to test the assumption of a constant savings rate. If the savings rate is constant, the null hypothesis of $c_0 = 0$ and $c_1 = 1$ should hold in the data. In other words, to maintain the savings rate constant, income and consumption would have to increase at equal

[10] For example, the role of wealth in consumption is emphasized in Haque and Montiel (1989).

[11] White's test for the presence of heteroskedastic errors was applied to the versions of the savings and consumption functions that were specified in levels.

[12] The construction of this variable is explained in Appendix I.

Table 3. The Savings Rate'

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
Average	0.03	-0.25	0.07	0.31	0.16	0.21	-0.06
Is the Savings Rate Constant?							
Unconstrained Equation							
y,	0.02	*0.04*	0.01	0.03	-0.01	*0.04*	*-0.04*
	(0.49)	(1.02)	(0.08)	(0.94)	(-0.52)	(278)	(-1.73)
c,	0.76	0.79	1.02	0.82	1.06	0.61	1.07
	(3.01)	(8.41)	(10.70)	(5.40)	(14.86)	(4.15)	(31.82)
R^2	0.32	0.79	0.86	0.60	0.92	0.48	0.99
DW	1.42	1.98	1.94	1.34	1.87	1.31	1.78
Unconstrained							
SSE	0.152	0.211	0.017	*0.043*	0.Q20	0.015	0.023
Constrained							
SSE	0.166	0.284	0.017	*0.047*	0.021	0.022	0.033
F-scat	0.62	108	0.21	0.91	0.26	172	1.98

Note: Figures in parentheses are the t-statistics, R^2 is the coefficient of determination, and DW denotes the Durbin-Watson statistic. SSE is the sum of squared residuals of the estimated equation, and the F-statistic tests for the significance of the difference between the unconstrained and the constrained versions of the equations.

'The sample period is 1961-86, except for Chile in which 1971-86 sample is used.

rates. This test of stability was preferred over the more traditional approaches, such as the Chow test, because in many instances splitting the sample was not advisable, given the limited number of observations available.

The results of an *F-test* comparing the residuals of the unconstrained (equation (21)) and the constrained equations indicate that in only one of the seven countries in the sample was the savings rate variable, making the assumption of a constant and stable savings rate reasonable for most instances. In effect, the constrained equation imposes the condition that the savings rate is stable while the unconstrained does not. If the savings rate is indeed unstable, then imposing the constraints would generate large errors relative to the errors of an unconstrained specification, and this would be apparent in the *F-tests* that compare the two versions of equation (21). The drawback of this test is that, even if the savings rate is found to be unstable, as for Honduras, this result could stem from misspecification-in particular the omission of the real rate of interest-and not from behavioral instability. If the interest rate belongs in the savings function, as several studies suggest (see, for example, Rossi (1988)) the constant term in a specification such as equation (21) could simply be picking up the systematic influence of the omitted variable.

Money Demand—Is Velocity Constant?

After obtaining estimates for the three parameters describing the growth block of the model and after evaluating the relative merits of the assumptions underscoring that portion of the merged model, the same test is performed for the monetary sector. The key behavioral relationship is the specification of money demand. As equation (14) indicates, it is assumed that since opportunity cost variables do not affect the demand for money, the income velocity of money is constant.[13]

As with the savings parameter, the historical averages of the ratio of money to income are used to approximate v, the inverse of the income velocity of money, and are reported for both narrow and broad definitions of money in Table 4.

To "test" the validity of the constant velocity assumption, a generalized version of equation (14) is taken, which (a) includes a constant term (which under the null hypothesis of constant velocity should be insignificantly different from zero); and (b) does not restrict the coefficients of output and prices to be identical, allowing for economies of scale in cash balances. This generalized specification is

$$DM_t = d_0 + d_1 DY_t + d_2 DP_t, \qquad (14a)$$

where d_0 is a constant term that represents $D(1/v)$, the rate of change in income velocity. This equation was estimated over the seven countries in the sample (using both narrow and broad definitions of money) both imposing and not imposing the restriction that $d_1 = d_2$. The results are presented in Table 4. At one end of the spectrum are Korea and Chile, with an insignificant constant term in all specifications, indicating that the null of no change in velocity cannot be rejected. At the other end, for Ghana and Pakistan, all specifications indicate that velocity is not constant. More generally, it is easier to reject the null hypothesis of constant velocity for broad definitions of money (five out of seven countries) than for narrowly defined money (only two out of seven).[14] The almost uniform poor fit of equation (14a) is another indication of the variability of velocity changes, since, where the rate of change in velocity is constant, equation (14a) would be an identity.

As with the savings rate, these results must be interpreted with care. They do not imply widespread instability in the demand for money, but rather suggest that a specification such as equation (14) is likely to be too restrictive. In particular, it seems reasonable to expect that a developing country, becoming increasingly monetized over time, would show secular

[13] This assumption is, of course, extreme.

[14] When both restricted and unrestricted versions coincide, they are rejected.

Table 4. Velocity Behavior

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
Money plus Quasi Money							
Average	0.31	0.25	0.37	0.31	0.29	0.21	0.22
Narrow Money							
Average	0.204	0.19	0.25	0.10	0.25	0.11	0.07
Is Velocity Constant?							
Money plus Quasi Money							
Unrestricted							
d_0	0.11	0.14	0.14	0.11	0.06	0.12	0.17
	(1.87)	(3.35)	(5.25)	(1.23)	(2.09)	(-4.72)	(1.81)
d_1	0.77	0.39	0.53	0.70	0.29	0.57	0.09
	(1.27)	(0.90)	(1.34)	(1.17)	(0.62)	(1.50)	(0.13)
d_2	0.25	0.41	-0.32	0.57	0.32	-0.13	0.84
	(1.07)	(3.87)	(-1.50)	(1.62)	(1.61)	(-0.68)	(7.83)
R^2	0.10	0.42	0.16	0.17	0.12	0.13	0.88
DW	2.10	1.57	2.02	0.91	1.18	1.78	1.46
Restricted ($d_1 = d_2$)							
d_0	0.13	0.14	0.16	0.11	0.06	0.13	0.15
	(2.58)	(3.045)	(5.69)	(1.29)	(2.26)	(5.60)	(1.60)
d_1	0.23	0.41	-0.13	0.60	0.32	-0.03	0.86
	(0.98)	(3.96)	(-0.66)	(2.10)	(1.72)	(-0.16)	(8.15)
R^2	0.05	0.42	0.02	0.17	0.12	0.00	0.87
DW	1.99	1.57	1.92	0.90	1.20	1.77	1.86
Narrow Money							
Unrestricted							
d_0	0.07	0.11	0.14	0.10	0.03	0.08	0.08
	(0.93)	(2.52)	(-4.87)	(1.29)	(0.78)	(2.92)	(1.01)
d_1	1.06	0.38	0.69	0.48	0.26	0.74	0.20
	(1.33)	(0.79)	(1.73)	(0.92)	(0.46)	(1.82)	(0.32)
d_2	0.37	0.50	-0.40	0.47	0.62	0.07	0.82
	(1.20)	(-4.22)	(-1.86)	(1.54)	(2.54)	(0.35)	(8.15)
R^2	0.11	0.46	0.23	0.14	0.25	0.14	0.91
DW	2.06	1.62	1.29	1.78	1.71	2.05	1.73
Restricted ($d_1 = d_2$)							
d_0	0.10	0.11	0.15	0.10	0.02	0.09	0.07
	(1.53)	(2.56)	(5.64)	(1.33)	(0.62)	(0.37)	(0.81)
d_1	0.33	0.50	-0.15	0.48	0.57	0.17	0.84
	(1.11)	(-4.31)	(-0.73)	(1.89)	(2.52)	(0.82)	(9.18)
R^2	0.06	0.46	0.02	0.14	0.23	0.03	0.89
DW	1.95	1.65	1.74	1.78	1.81	2.01	2.27

Figures in parentheses are the t-statistics, R^2 is the coefficient of determination, and DW denotes the Durbin-Watson statistic.

Table 5. Approximating the Weight of Import Prices in the Aggregate Price Level

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
Share ≈ θ	0.252	0.114	0.158	0.181	0.096	0.306	0.201

changes in the income velocity of money. The significance of the constant term in many of the specifications presented in Table 5 may well arise as much from such institutional changes as from omitting other explanatory variables such as the nominal interest rate, inflationary expectations, and exchange rate changes. However, the results indicate that future extensions to the theoretical and empirical work should include more comprehensive specifications of money demand. In summary, the assumption of constant velocity, like the assumption of fully employed resources in the growth block, appears to be a weak link in the merged model.

The remaining parameter in the monetary component of the model is e, the weight of import prices in the general price level. This parameter was approximated by average share of imports in total (public plus private) consumption and is reported in Table 5.

Trade Balance

Two external sector relationships close the system: the balance of payments identity (equation (17)) and the trade balance responses to output and real exchange rate changes (equation (18)). These two remaining parameters (in the trade balance equation) to be estimated link the "real" and "monetary" sectors. The remainder of this section outlines how estimates for the parameters a and b were obtained. Because the trade balance changes in sign across countries and across time, a log-linear version of equation (18) cannot be estimated. Also, to avoid the problem of heteroskedastic errors, levels were not used. Instead, the trade balance was decomposed into its components-exports and imports. The relative price and income elasticities of import demand and export supplies were estimated using some variant of:

$$\log(z_t) = \delta_0 + \delta_1 \log(y_t) + \delta_2 \log(P_Z/P_{D,t}) \tag{22}$$

for imports; and

$$\log(x_t) = \varepsilon_0 + \varepsilon_1 \log(y_t^f) + \varepsilon_2 \log(P_x/P_{D,t}) \tag{23}$$

for exports.[15] For export demand, y^f denotes real GDP of the industrial

[15] The use of the relative price of exports, P_x/P_D, in this specification, in lieu of the real exchange rate, P_Z/P_D, is justified by the assumption of constant terms of trade in the theoretical model.

Table 6. External Sector Parameters

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
Weighted real exchange rate elasticities							
Imports	-0.89	0.12	-1.38	-4.92	-0.38	-0.05	-3.2
Exports	0.09	0.31	-0.56	3.73	0.37	0.22	-0.26
Trade balance effect	-0.98	-0.20	-0.81	-8.65	-0.75	-0.26	-2.3
As a share of the external sector'	-0.37	-0.08	-0.21	-0.83	-0.40	-0.12	-0.59
Weighted income elasticities							
	0.69	1.20	1.00	0.64	0.62	1.28	1.81

Scaled by the size of the external sector, he re measured as the sum of average imports and exports (see Appendix I).

countries. The specific form that equations (22) and (23) assume for each country varies according to the lag pattern the data reveal. These details are in Appendix II.

Proxies for a and b were constructed by weighting the "disaggregated" parameter estimates (obtained by applying generalized least squares to the above equations) by the sample period averages of imports and exports, respectively. The results of the estimation of import demand and export supply as well as the derivation of the relevant weight and import demand are in Appendix II, while the "weighted" estimates for a and b are reported in Table 6. In all seven countries, the real exchange rate elasticity, $-a$, has the correct sign (negative), and an increase in domestic income worsens the trade balance-that is, b is positive.

III. Comparative Statics and Sensitivity Analysis

Summary of Findings in the Cross-Country Comparisons

Parametrizing the model is useful in comparing its ability to fit diverse circumstances but is only an intermediate step in evaluating its usefulness to policymakers. The purpose of this section is to construct the policy multipliers associated with the estimated parameter values and to add two related issues. First, the sensitivity of these multipliers to various parameter values is examined—the policy robustness question—and second, the relative precision of the forecasts for the target variables is assessed.

Table 7 summarizes the point estimates of the parameters of interest and these values generate the "core" set of policy multipliers. H t, as Table 8 shows, only limited confidence can be placed in ~he~w;~f:;

Table 7. Cross-Country Comparison of the Key Parameters

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile	Average
nQ	-0.07	-0.04	-0.07	0.08	-0.02	-0.05	-0.07	-0.03
(x,	0.28	0.12	0.62	0.08	0.23	0.28	0.50	0.29
s	0.03	-0.25	0.07	0.31	0.16	0.21	-0.06	0.07
v'	0.31	0.25	0.37	0.31	0.29	0.21	0.22	0.28
9	0.25	0.11	0.16	0.18	0.10	0.31	0.20	0.19
a	-0.37	-0.08	-0.21	-0.83	-0.40	-0.12	-0.59	-0.37
b	0.69	1.20	1.00	0.64	0.62	1.28	1.81	1.03

1 Uses the broad definition of money: money plus quasi-money.

estimates, since some of the parameters are unstable. Even in the instances in which the hypothesis of stability cannot be rejected, the precision of these point estimates tends to be quite low (that is, the standard errors tend to be large). For any analytical purposes, a band of parameter values must be considered. The upper and lower bounds of such a band were calculated by respectively adding to and subtracting from the point estimates one half of a standard error.

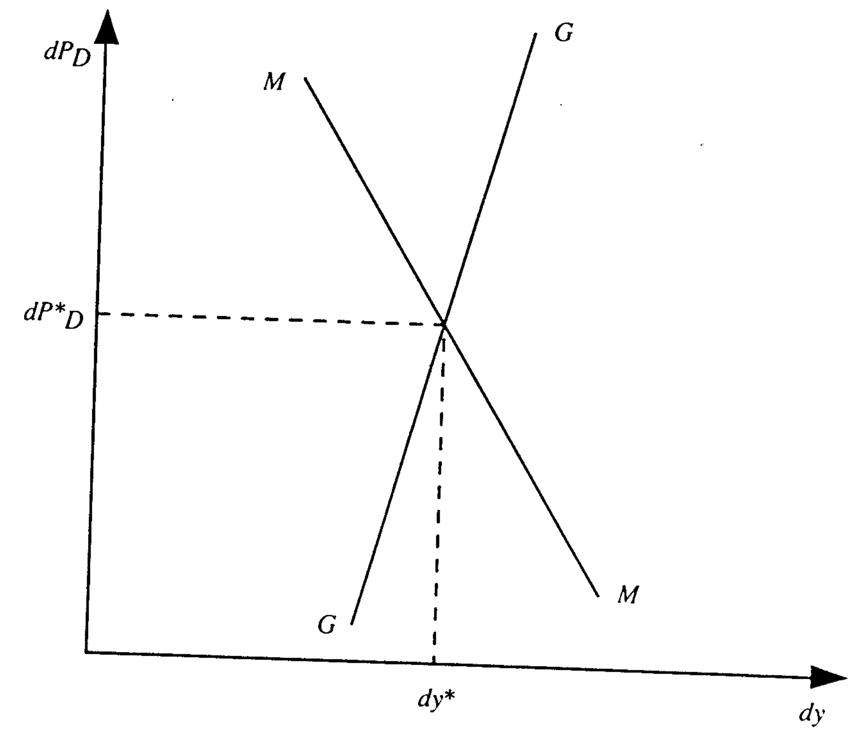
Chart 2 illustrates the configuration of the real and monetary sectors that the averages from the sample suggest. The actual numerical values of the slopes of the GG and MM schedules (and the range defined by the parameter band) are presented in Table 9 for the sample countries. The remainder of this section considers three policy exercises: an increase in domestic credit; an increase in government spending; and a devaluation. Since the model is static, the effects of policy are evaluated by comparing the pre-shock and post-shock steady states—that is, the relevant policy multipliers are calculated.

In all cases considered, the sensitivity of these multipliers to changing parameter values is assessed. The policy implications of the model are said to be robust if the range of values assumed by the multiplier remains narrow despite changes in the parameters. This section concludes with a discussion of the relative predictability of the target variables.

Table 8. Testing the Assumptions of the Model

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile
Can constant velocity be rejected!							
Broad	no	yes	yes	no	yes	yes	no
Narrow	no	yes	yes	no	no	no	no
Can a constant savings rate be rejected!							
	no	no	no	no	no	yes	no
What percentage o(output variation is explained by a production (unction!							
	22	28	74	3.04	20	9	91

Chart 2. Parametrized System



Increase in Domestic Credit

~n increase in the rate of domestic credit expansion (assumed to ~ntIrely to the pnvat~ sector) creates a flow excess supply of man go Impact: In C~art .2, .the *MM* schedule shifts upward. At the initialere:e~ of output, thiS shIft mduces an increase in the price level which, in turn,

Table 9. Graphics of the Empirical Model

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile	Average
Slope o(the GG schedule								
Point estimate	7.9	76.9	2.7	16.2	9.2	18.6	0.-4	18.8
lower bound	10.8	82.2	.04.5	16.0	9.8	32.1	1.04	22.5
Upper bound	5.6	71.6	1.3	16.04	8.7	9.-4	0.1	16.0
Slope o(the MM schedule								
POint estimate	-1.7	-.04.8	-2.6	-0.9	-1..04	-5.6	-2.7	-2.8
Lower bound	-1.5	-.04.1	-2.6	-0.8	-1.1	--4.9	-2.5	-2.5
Upper bound	-1.8	-5.3	-2.6	-0.9	-1.6	-6.0	-2.8	-3.0

increases money demand. However, for a given level of import prices, the domestic price rise also produces a real exchange rate appreciation and a worsening in the current account deficit. The latter is mirrored by an increase in foreign savings and an increase in investment and output growth. Ultimately, inflation rises, output growth increases, and the balance of payments worsens.[16]

More formally, the increase in inflation is given by

$$\frac{\partial(dP_D)}{\partial(dD)} = (\Theta\gamma)^{-1} > 0$$

$$\Theta = 1 - \frac{\alpha\mu(b' + v)}{\beta\gamma} > 0$$

and, as before,

$$\beta = 1 - \alpha(s + b) > 0$$

$$\mu = \varepsilon_0 - \alpha.$$

The change in output growth is

$$\frac{\partial(dy)}{\partial(dD)} = -\frac{\mu\alpha}{\beta}(\Theta\gamma)^{-1} > 0$$

and the change in the balance of payments is

$$\frac{\partial(dR)}{\partial(dD)} = \left(\frac{b'\alpha\mu}{\beta} - \alpha\right)(\Theta\gamma)^{-1} < 0.$$

Using the estimated parameter values and the corresponding parameter bands, the multipliers for the three target variables are reported in Table 10. As an example, in the sample average case, a 10 percent increase in the rate of growth of credit increases inflation by about 15 percent (the range is 12-19 percent), increases output growth by 2 percent, and worsens the balance of payments by 6 percent.

Note the large discrepancy between the inflation multipliers, which are highly variable in most instances, and the relatively close values for multipliers for growth and the balance of payments. This suggests that the usefulness of the model, and/or the desirability of using credit as a policy instrument, will depend, to a large degree, on the form of the policy-maker's objective function. If the primary objective of policy is to meet an inflation target, then this framework of analysis, given the underlying parameter values, may not be the best to employ. If, however, the primary policy objective is a balance of payments or growth target, the model is more useful.

[16] See Khan and Montiel (1989) for a detailed discussion.

Table 10. A 10 Percent Increase in Domestic Credit[1]

(In percent)

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile	Average
Inflation multiplier[2]								
Point estimate	115	31.3	9.7	8.8	111	28.7	1.8	15.3
Lower bound	15.3	37.8	12.8	9.2	14.1	36.3	4.8	18.6
Upper bound	11.7	26.4	5.9	8.4	12.1	20.2	0.8	11.8
Output multiplier[3]								
Point estimate	1.7	0.4	16	0.5	1.4	1.5	4.2	1.9
Lower bound	1.4	0.5	2.8	0.6	1.4	1.1	3.5	1.6
Upper bound	2.1	0.4	4.6	0.5	1.4	2.2	5.2	2.3
Balance of payments multiplier[4]								
Point estimate	-6.2	-10	-5.6	-7.6	-6.1	-5.4	-8.7	-6.1
Lower bound	-6.4	-14	-5.3	-8.0	-6.3	-5.5	-8.6	-6.1
Upper bound	-6.1	-2.7	-6.2	-7.3	-6.0	-5.8	-9.1	-6.2

[1] The upper and lower bounds refer to adding to and subtracting from (respectively) the underlying structural parameters—not the multipliers themselves—one half of a standard deviation.

[2] $\partial(dP_D)/\partial(dD)$.

[3] $\partial(dy)/\partial(dD)$.

[4] $\partial(dR)/\partial(dD)$.

Increase in Government Spending

An increase in government spending, maintaining taxes and the rate of change in domestic credit at initial levels, shifts the GG schedule in Chart 2 to the left. The rise in fiscal spending translates into a higher deficit and, therefore, less public savings. The decline in savings reduces capital accumulation and output growth. As output growth falls, reducing the flow demand for money and creating an excess supply, inflation must rise to ensure that the money market clears. With output falling and prices rising, the impact of the fiscal expansion on the balance of payments is theoretically ambiguous and must be determined by the data. The effects of a change in real government spending on inflation growth and the balance of payments are listed below, while Table 11 summarizes the relevant set of policy multipliers.

$$\frac{\partial(dP_D)}{\partial g} = \frac{\Theta^{-1}\alpha\mu(b' + v)}{\beta\gamma} > 0,$$

$$\frac{\partial(dy)}{\partial g} = -\Theta^{-1}\alpha/\beta < 0$$

and

$$\frac{\partial(dR)}{\partial g} = \frac{\alpha}{\beta}\Theta^{-1}[b' - \alpha'(b' + v)\mu] \gtrless 0.$$

Table 11. A 10 Percent Increase in Government Spending[1]

(In percent)

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile	Average
Inflation multiplier[2]								
Point estimate	4.8	6.1	24.1	0.7	3.3	20.6	14.6	10.7
Lower bound	3.3	5.0	18.0	0.7	2.6	11.8	10.9	7.5
Upper bound	6.8	7.2	33.1	0.8	4.1	35.0	19.4	15.2
Output multiplier[3]								
Point estimate	-2.9	-1.3	-9.3	-0.8	-1.4	-3.7	-5.5	-3.7
Lower bound	-2.2	-1.2	-7.0	-0.8	-2.4	-2.4	-4.3	-2.9
Upper bound	-3.7	-1.4	12.7	-0.8	-2.5	-5.8	-7.0	-4.8
Balance of payments multiplier[4]								
Point estimate	0.2	1.0	4.2	-0.1	0.2	2.3	1.4	1.3
Lower bound	0.1	0.6	2.7	-0.1	-0.1	1.0	0.8	0.7
Upper bound	0.6	1.5	6.5	-0.1	0.4	4.9	2.2	2.3

[1] The upper and lower bounds refer to adding to and subtracting from (respectively) the underlying structural parameters-not the multipliers themselve~e half of • standard deviation.
[2] d(dPo)/d(g).
[3] d(dy)/d(g).
[4] d(dR)/d(g).

Once again, the fiscal multipliers for output and the balance of payments are bounded by a fairly narrow range. In the case of a change in credit-a monetary shock-the bulk of the adjustment falls on the nominal variable (inflation), with output growth and the balance of payments remaining relatively unaffected. This result is not surprising, given the very steep GG schedules that the estimated parameter values trace. What is more surprising is that a change in government spending-a real shock-also has a greater (and more variable) impact on inflation than on the real variables. For all seven countries, the balance of payments improved after the shock, indicating that the contractionary output effect dominated the relative price effect.

Devaluation

A devaluation is both a real and a nominal shock, and consequently shifts both schedules in Chart 2. At the initial price of domestic goods, a devaluation increases the aggregate price level through an increase in the price of imports. This increases the flow demand for money. At the same time, the shift in relative prices induces lower consumption of the importable and higher production of the domestic good, leading to an improvement in the balance of payments and an expansion in the flow

~upply of money. If substitution effects are dominant, then the increase In the flow supply of money more than accommodates the rise in demand and the MM schedule shifts to the right-this effect is expansionary. I~ ~he "real" sec~or the foreign component of savings is lower, owing to 'the Im'p~ovement In the balance of payments; this reduces capital formation, ~hlftIng the GG sc.hedule to the left-a contractionary effect. As shown In Khan and Montlel (198~), the latter effect dominates, and output falls. Ta~le ~2 prese~ts numencal multipliers of a devaluation; the partial derIvatIves are lIsted below:

$$\frac{a(dP_D)}{a(de)} = (fl\text{-}y)^{-1}[a' - vYoO - (X11](b' + v)/131 > 0$$

for growth:

$$\frac{a(dy)}{a(de)} = \frac{(X11]}{T}(fl\text{-}y)^{-1} vYo < 0$$

and the balance of payments:

$$\frac{a(dR)}{a(de)} = (a - b'\frac{(X1)}{13}1](fl\text{-}y)^{-1} vY_O > O.$$

Table 12. A 10 Percent Devaluation[1]

(In percent)

	Tanzania	Ghana	Pakistan	Korea	Myanmar	Honduras	Chile	Average
Inflation multiplier[2]								
Point estimate	5.7	2.2	6.4	7.3	6.1	3.9	9.6	5.9
Lower bound	5.9	2.9	5.8	7.8	6.4	4.0	9.1	6.0
Upper bound	5.6	1.6	7.5	6.8	6.0	4.6	10.5	6.1
Output multiplier[3]								
Point estimate	-0.4	-0.1	-0.9	-0.1	-0.3	-0.2	-0.3	-0.3
Lower bound	-0.3	-0.1	-0.7	-0.1	-0.3	-0.1	-0.2	-0.3
Upper bound	-0.5	-0.1	-1.2	-0.1	-0.-4	-0.3	-0.4	-0.4
Balance of payments multiplier[4]								
Point estimate	1.9	0.7	1.7	2.3	1.8	1.0	0.8	1.-4
Lower bound	1.7	0.6	1.5	1.9	1.6	0.8	0.9	1.3
Upper bound	2.1	0 8	1.8	2.7	1.9	1.1	0.6	1.6

[1] The Upper and lower bounds refer to adding to and subtracting from (respectively) the underlying structural parameters-not the multipliers themselves-one half of a standard deviation.
[2] d(dPo)/d(de).
[3] d(dy)/d(de).
[4] d(dR)/d(de).

Two general characteristics are worth noting. First, the multipliers of a devaluation are relatively low when compared with those associated with credit and fiscal changes, suggesting it takes large devaluations to affect the target variables in any meaningful way. Second, as with monetary and fiscal policy-although not quite as pronounced-the effects of a devaluation on inflation are greater than those of output or the balance of payments, indicating that the desirability of either employing this framework, using devaluation as a policy tool, or both, depends on the relative importance to policymakers of the inflation target. .

IV. Conclusions

The objective of this paper was to apply to a diverse group of developing countries a model that in principle is simple enough to be used operationally in countries where data are limited and is comprehensive enough to enable a useful analysis and evaluation of growth-oriented policies to be undertaken.

The first step of this evaluation was to estimate the model and test its underlying assumptions. The estimated parameter values were in accordance with the theoretical priors, but two weak building blocks in the framework were identified: that output is assumed to expand at a rate determined by technology and endowment, and that the income velocity of money is assumed to be constant. . The low explanatory power of a neoclassical production function suggests that future extensions to this framework should attempt to incorporate excess capacity, which characterizes most developing countries. Similarly, the empirical variability in velocity indicates the need for a less restrictive specification of money demand that allows for the secular effects of monetization in developing economies as well as for the impact of a variety of opportunity cost variables. Finally, the model is static and consequently does not incorporate the possibility of slow adjustment and the role of expectations in the analysis. The second part of the evaluation used the estimated parameter values to construct reduced-form multipliers and to analyze the effects of a variety of policy exercises. The robustness of the model's policy implications were found to depend heavily on two factors.

First, robustness varies with the target variable considered. For output growth and the balance of payments, the range for multipliers is narrow, despite sizable variation in parameter values. For inflation, the range of values the policy multipliers assumed are quite broad. This suggests that the forecast errors are likely to be large if this model is employed to forecast the effects of policy changes on inflation. In effect, the usefulness of this model for policymaking (given the parameter values) depends

~rucially on t~e policymaker's objective function. In general, the model IS less useful If ~he primary objective of policy is to meet an inflation target, whereas If th~ balance of payments or growth are the principal targets, then the projected outcomes suggested by this model are more useful.

. Second, the. reliabili.ty of the policy implications depends on the policy Instrument bemg considered. Based on the multipliers calculated in this ~aper, the effects of a devaluation (on all target variables) are less sensitive to p~r~meter changes than the multipliers of changes in credit or fiscal poliCies.

While some po~sible extensions to the theoretical framework have ~lready been mentlO~ed, there are a number of ways in which the empirIcal work can be ennched. In particular, when maintaining a consistent methodology acr~ss countries is not a binding constraint, as it was in this paper, more effiCient use can be made of the greater data availab'l't Ilym . ~ome ~~untnes. Th IS would allow for more rigorous tests of parameter mstability and would enable the estimation of the model as a system and a more formal assessment of forecasting errors.

In conclus~on, the pr~~ent model is ~ useful starting point for the design of growth-on~nted poliCies, although ItS usefulness across countries is by no mea~s Uniform. There are countries where none of the theoretical assumptIOns appear to be adequate-Honduras-and where, consequently: the effects of macr.oeconomic policies suggested by the model ~re subject to much uncertamty. ~~ere ar~ countries where the assumptIOns a~pe~r to. ha~e greater empmcal validity-Korea and Chile-and ~he. policy ImplicatIOns are relatively more robust. In general, analysis mdlcates that a re~sonable next step in enhancing the operational usefulness ~f the ~aslc model would be to relax some of the more rigid ass~~ptlOns while attempting to keep the added degree of complexity to a minimum.

APPENDIX I

Data Definitions and Sources

~ource ~.: IInternat~onal Monetary Fund, *International Financial Statistics'* and Ource . ~t~rnatIOnal M0!1etary Fund, *World Economic Outlook.*

pe~~~~fimtIOn of the vanables used in the estimations are, in order of ap-

y_t = ~eal GDP (Source B).

dk_t/y_{t-1} = mvestment-output ratio (Source B).

L_t = population (Source B).

s = average ~rivate savings rate-constructed by subtracting government savmgs from gross savings (Sources A and B).

References

Bacha, Edman, and Sebastian Edwards, eds., "Seminar on Macroeconomic Adjustment and Growth," *Journal of Development Economics,* Vol. 29 (November 1988), pp. 249–404.

Balassa, Bela, "Exports and Economic Growth: Further Evidence," *Journal of Development Economics* (June 1978), pp. 181-89.

Blejer, Mario I., and Ke-young Chu, eds., *Fiscal Policy, Stabilization, and Growth in Developing Countries* (Washington: International Monetary Fund, 1989).

Chenery, Hollis B., and Alan M. Strout, "Foreign Assistance and Economic Development," *American Economic Review* (September 1966), pp. 679–733.

Corbo, Vittorio, Morris Goldstein, and Mohsin Khan, eds., *Growth-Oriented Adjustment Programs* (Washington: International Monetary Fund and World Bank, 1987).

Fry, Maxwell J., "Terms-of-Trade Dynamics in Asia: An Analysis of National Saving and Domestic Investment Responses to Terms-of-Trade Changes in 14 Asian LDCs," *Journal of International Money and Finance,* Vol. 5 (March 1986), pp. 57-73.

International Monetary Fund, *The Monetary Approach to the Balance of Payments* (Washington: International Monetary Fund, 1977).

---, *Theoretical Aspects of the Design of Fund-Supported Adjustment Programs,* IMF Occasional Paper, No. 55 (Washington: International Monetary Fund, September 1987).

---, *World Economic Outlook* (Washington: International Monetary Fund, April 1988).

Haque, Nadeem U., and Peter Montiel, "Consumption in Developing Countries: Tests for Liquidity Constraints and Finite Horizons," *Review of Economics and Statistics,* Vol.71 (August 1989), pp. 408–15.

Khan, Mohsin S., "Macroeconomic Adjustment in Developing Countries: A Policy Perspective," *World Bank Research Observer,* Vol. 2 (January 1987), pp.23-42.

---, and Malcolm D. Knight, *Fund-Supported Adjustment Programs and Economic Growth,* IMF Occasional Paper, No. 41 (Washington: International Monetary Fund, November 1985).

Khan, Mohsin *S.,* and Peter J. Montiel, "Growth-Oriented Adjustment Programs: A Conceptual Framework", *Staff Papers,* International Monetary Fund, Vol. 36 (June 1989), pp. 279–306.

Khan, Mohsin *S.,* Peter Montiel, and Nadeem U. Haque, "Adjustment with Growth: Relating the Analytical Approaches of the IMF and the World Bank," *Journal of Development Economics,* Vol. 32 (January 1990), pp. 155–79.

Khan, Mohsin S., and Carmen M. Reinhart, "Private Investment and Economic Growth in Developing Countries," *World Development,* Vol. 18 (January 1990), pp. 19–27.

Robi~hek, E. Walter, "Financial Programming as Practiced by the IMF" (unpublished; World Bank, January 1985).

Robinso~, Sherma?", "Sources of Growth in Less Developed Countries: A Cross-SectIOn Study, *Quarterly Journal of Economics* (August 1971), pp. 391–406.

Rossi, Nicola, "Government Spending, the Real Interest Rate, and the Behavior of Llqutdlty-Co.nstramed Consumers in Developing Countries," *Staff Papers,* InternatIOnal Monetary Fund, Vol. 35 (March 1988), pp. 104–140.

Sato, K~~,o, "Inter:tationaI Variations in the Incremental Capital-Output Ratio, *Economic Development and Cultural Change,* Vol. 19 (July 1971), pp. 621–40.

Tyler, William ~:' "Gr~wth an,? Export Expansion in Developing Countries: Some Empmcal EVidence, *Journal of Development Economics* Vol 23 (March 1981), pp. 121-30.

Wai, U Tun, "A Study of ICOR in Developing Countries," *Finafrica Savings and Development,* Vol. 9, No.3, 1985.

White,. H., "A Heteroskedasticity-Consistent Covariance Matrix Estimator and Direct Test for Heteroskedasticity," *Econometrica,* Vol. 48, No.4 (1980), pp.817-38.