A MEDIUM-TERM MACROECONOMIC FRAMEWORK OF ADJUSTMENT WITH GROWTH

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This paper develops a medium-term macroeconomic framework for assessing the impact of structural adjustment policies on the economic performance of developing countries. The salient feature of this analytical framework lies in the integration of a real model of resource allocation with a monetary model of stabilization. This integration makes it feasible to evaluate structural adjustment policies that include both demand-management and supply-side measures in a single consistent framework.
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INTRODUCTION

In the early 1980s an unprecedented number of developing countries adopted structural adjustment programs to restore macro balances and reduce sectoral distortions caused by previous inappropriate economic management and deterioration in external economic conditions. The ultimate goal of these programs to restore growth and maintain a viable balance of payments situation consistent with foreign capital inflows. To correct macro imbalances usually involves a realignment of appropriate demand with supply and a process of economic stabilization. Remedial actions taken for reducing sectoral distortions, on the other hand, aim primarily at improving the efficiency of the price system and bringing the domestic cost-price structure in line with that prevailing in the international market in order to enhance the external competitiveness.

The design of the structural adjustment program does not end with the identification of the causes of economic ills and the corrective policy measures. When an economy runs into severe imbalances evident in balance of payment difficulties, a high and variable rate of inflation, a low rate of economic growth, or a combination of these, the remedial actions required to restore the economy to equilibrium are not difficult to identify. Restoring fiscal balance is usually an important step in restoring the overall macro balance. Bringing the real exchange rate down (devaluation) to the equilibrium level is a common complementary action. Raising the real interest rate to mobilize savings is another. Coupled with these policies, liberalizing external trade is often advocated as a way to increase the competitiveness of
domestic industries and to exploit comparative advantage in international trade.

However, less obvious is the appropriate mix of policy measures and the intensity of each measure that should be used in a policy package to deliver the most desirable outcome. While precise quantitative answers to these questions are difficult to obtain and the impact of certain policy measures is not amenable to even imprecise quantification, quantitative frameworks provide the best alternative to answer these questions and evaluate the consistency of policy packages. Despite the limitations of quantitative frameworks, several authors of adjustment studies argue for the necessity of developing appropriate medium-term analytical frameworks for the evaluation of adjustment policies (Yagci and others 1985, Fisher 1986). 1/

More concretely, in several areas quantification could benefit the design of adjustment policies. First, despite wide consensus about the potential, long-run benefits of structural adjustment policies, it is still important to understand their impact during the transitional period of adjustment. Whether a program can or cannot be sustained depends largely on whether the economy, or some segments of it, can sustain the pressure of adjustment generated during the transition. With a proper quantitative perspective on the medium-term impact of a structural adjustment program, the program can be strengthened by not incurring unnecessary costs of adjustment.

1/ As Fisher (1986, p. 168) observes, "The alternative of forsaking models altogether and relying on general principles to guide advice giving and policy evaluation is not feasible: Policy cannot be evaluated without counterfactuals, and counterfactuals require the use of either an explicit or an implicit model."
The second area where quantification would be useful is the complementary of policy instruments in terms of their impact on the structure of the economy. For instance, to the extent that cutting fiscal deficit can reduce the balance of payment deficit, it complements devaluing the currency. Also, a larger devaluation may be required to support an import liberalization policy and achieve a prescribed balance of payment objective. Quantification can also contribute to the design of adjustment programs in closely related area, but one operating more on the time dimension, the sequencing of policy reforms. For example, should stabilization policy measures be adopted at the same time as liberalization measures? What would be the consequences on economic performance of alternative sequencing? 2/

Finally, quantification of the complementarity between adjustment and external finance would be useful. It is generally recognized that external finance combined with adjustment policies can ease the adjustment process. More often than not, countries undertake significant adjustment measures at a time of acute balance of payment problems. At the beginning of an adjustment program, external capital inflow plays a critical role in sustaining growth, which would otherwise falter, by allowing a continuous flow in imports. With time as adjustment policies become effective and contribute to growth, the borrowing country can start to repay the debt incurred earlier.3/ The

2/ Using a general equilibrium model, Khan and Zahler (1983, 1985) have investigated the macro effects of opening up and the issues of the time and sequencing of reforms.

3/ Selowsky and Van Der Tak (1986) have made an elegant statement of this issue.
need required for external resource financing during the adjustment process should probably be estimated to gauge the intensity of required adjustment efforts.

What are appropriate analytical frameworks for analyzing a structural adjustment program? To answer this question adequately we need first address the content of a typical structural adjustment program. The structural adjustment programs supported by the Fund and Bank are likely to encompass policy measures aimed at both correcting macro imbalances (demand-management policies) and improving resource allocation (supply-side policies) (Michalopoulos 1987). Foremost among policy measures aimed at restoring macro imbalances are fiscal policy measures that control the budget balance, improve the balance of payments, and restore investment and growth over the medium-term. The real exchange rate is devalued and the real wage reduced. Both are maintained at appropriate levels throughout the adjustment process to ensure external competitiveness and safeguard employment. 4/ The interest rate is kept at an appropriate positive level to mobilize savings, stabilize inflation, and promote growth.

The second kind of policy measures included in a typical structural adjustment program try to improve the incentive system and increase the efficiency of the price mechanism. The aim is to have a beneficial effect on resource allocation. The main policy measures include trade liberalization (reducing tariffs, streamlining the tariff

4/ It should be noted the real exchange rate and the real wage rate are not directly controllable policy instruments.
structure, and removing quantitative restrictions); financial liberalization; public sector reform; privatization of public enterprises; tax system reform; unification of exchange rates and creation of an auction market; and finally, the removal of distortions in domestic pricing of agricultural and energy products.

It is the impact of the second type of adjustment measures that is difficult to estimate. What can be said with regard to these measures is that they could contribute to improving the overall efficiency of the economy, so that it can operate closer to the production possibility frontier and be more resilient in withstanding shocks. For instance, some empirical evidence exists with regard to the favorable impact of trade liberalization on total factor productivity and, more generally, of a liberal trade regime on fostering growth and development. 5/

This dichotomy of structural adjustment policies serves a useful analytical objective in drawing attention to the time span within which each set of policies operate. Generally speaking, the supply-side policies require longer to be effective than demand-side policies because they call for a redeployment of resources -- both capital and labor -- among different economic sectors, new investment to take place, and a more competitive business climate. However, this distinction should not obscure the fundamental complementarity between demand

5/ Based upon the data from Korea, Turkey, Yugoslavia, and Japan, Nishimizu and Robinson (1983) have found that export expansion regimes are positively correlated with total factor productivity changes.
management policies that focus on economic stabilization and supply-oriented structural adjustment policies (Guitian 1987). For instance, significant supply-side structural adjustment measures can hardly be carried out with severe macro imbalances and instability, such as with high and variable inflation. Even if they are carried out in an unstable macroeconomic environment, they can rarely be sustained. For another example, by providing supplementary policy menus to stabilization measures and by recognizing the need for a medium-term perspective, the supply-side measures widen the scope of a structural adjustment program and thereby contribute to the formulation of a better policy package.

Finally, the analytical difficulty of classifying certain key structural adjustment measures into either set of policy measures, attests to the close relationship between the two. For example, anti-inflation stabilization measures could promote growth in the medium-term by reducing the distortions in the structure of relative prices (Hwa 1987; Genberg and Swoboda 1987). The devaluation of the exchange rate affects aggregate absorption and demand, and, if accompanied by a real devaluation, can also generate the intended effect on resource allocation.

The externalities of integrating stabilization and supply-oriented structural adjustment measures into a single framework are recognized by actual operations of adjustment programs. With the Fund largely responsible for stabilization policies and the Bank for supply-oriented structural adjustment policies, Fund and Bank economists increasingly operate under an integrated medium-term framework for
designing policy-based Structural Adjustment Lending (SAL) programs. Michalopoulous (1987, p. 47) indicates that "all countries that have received a SAL already had, or were awaiting imminent approval of, a Fund study or extended arrangement."

The above analysis clearly points out that the analytical framework used for the evaluation of structural adjustment policies should include a real economy component with sufficient sectoral details in order to handle real adjustment issues. A better arrangement would also include a financial sector that interacts with the real sector to incorporate the links among real sector adjustment, money, and domestic and external financing since stabilization policies are likely to be juxtaposed with supply oriented policies. 6/ The quantitative framework for policy evaluation most widely used in the Bank is the so-called Revised Minimum Standard Model (RMSM, World Bank 1980), 7/ which is based upon the well-known two-gap model (Chenery and Bruno 1962). The much more ambitious, computable general models, based on the Walrasian tradition (Dervis, De Melo, and Robinson 1982), that examine adjustment policies impinging on the incentive system, such as trade liberalization

6/ Fisher (1986, p. 180) discussed in great length the kind of economic models that are required for medium-term policy evaluation. He concludes by suggesting a research agenda to build "medium-term models of individual countries, first a small real model, and then models with developed financial sectors and nominal price determination features". 7/ As a framework for medium- and long-term analysis, RMSM has been criticized for lack of allowance for relative prices (Findlay 1984). As a policy framework, it lacks an explicit representation of policy instruments and their relationships with measurements of economic performance. RMSM, however, is rarely used in its stripped down form by Bank economists.
policies on resource allocation have had sporadic use. 8/ Both models are real sector models and lack the preview of monetary-real interaction. 9/ Hence, they cannot serve adequately the analytical need for the evaluation of medium-term structural adjustment policies when both demand management and supply oriented policy measures are considered in a single structural adjustment program. The main purpose of this paper is to present an integrated medium-term framework for structural adjustment and growth in the spirit of general equilibrium analysis. 10/

The framework incorporates the key policy instruments of a typical structural adjustment program, such as the size and composition of the public sector investment program, the nominal exchange rate, domestic credit, and the level of external borrowing. And it links these policy instruments to economic performance indicators such as growth rate, current account deficit, and inflation rate through behavioral as well as accounting relationships. 11/ Among the many

8/ Computable general equilibrium models can also be formulated in terms of quantity-clearing, in lieu of price-clearing.

9/ Khan, Montiel, and Haque (1986) have made an attempt to integrate the Bank's RMSM with the Fund's monetary approach to balance of payments. Within the Bank, John Holsen has developed a set of accounting relationships of financial flows for projections to accompany the projections of real variables based upon RMSM.

10/ Khan and Zahler (1983) have built a general equilibrium model with real and monetary sectors, as did the work of Montiel (1985). But these models lack an explicit analysis of both public and private sector investment and thus are largely models of economic stabilization rather than of stabilization and growth.

11/ The framework is built on a set of mutually consistent accounts of national income, input-output, balance of payments, flow-of-funds, and monetary survey.
variables whose time paths are traced in the framework, three are of particular interest to adjustment analysis: the real exchange rate, the real wage rate, and the real interest rate. Finally, the framework is developed along the lines of the structural model approach, with reference to the economic structure of the Philippines. 12/

The framework is analyzed in seven sections; each may be viewed as a partial equilibrium analysis. Section I discusses the neoclassical supply side, with a given structure of relative prices and demand. The section focuses on the determination of real output and employment by sector and of the real wage rate. It analyzes the impact of real depreciation and import liberalization on the resource allocation. Section II discusses the generation of national income, its distribution among wage earners, enterprises, and the government and between consumption and saving. Section III examines the determination of aggregate and sectoral domestic absorption (consumption and investment). Section IV discusses foreign trade and includes a summary discussion of the demand side of the model. Section V provides a general equilibrium analysis of the real economy in which all relative prices are determined. Sections I-V constitute the discussion of the real economy in which all nominal magnitudes are indeterminate. Section VI discusses the determination of the inflation rate, and the monetary

12/ Klein (1977) is the earliest proponent of employing structural models as opposed to reduced form models for policy evaluation. The other approach to the design and evaluation of policy evaluation is the so-called "performance indicator/monitorable policy instrument" approach. This approach can be formulated in either structural or reduced form or in combinations. (Genberg and Swoboda 1987)
and financial variables that interact with the real economy. In particular, this section shows that the money market equilibrium determines the underlying inflation rate while the flow-of-funds equilibrium determines the nominal interest rate. Section VII discusses the determination of the balance of payments and concludes the analysis of the complete model. This section demonstrates that the framework incorporates elements of both the Keynesian approach and the monetary approach to the balance of payments. The last section provides a summary and conclusion. Finally, the econometric results of behavioral equations and hypothesis-testing are presented in the Annex.

I. Output, Employment and the Wage Rate

The entire economy is aggregated into three productive sectors: those producing export-oriented products (or exportables), those producing import-competing products (or importables), and those producing home goods (or nontradables). This differentiation of the production economy focuses on two relative prices: the relative price between exportables and nontradables and that between importables and nontradables. The ratio between the two relative prices is the terms of trade, which is itself an important relative price. 13/

13/ If, however, the protection and incentive structures in the tradable sectors -- tariffs, subsidies and trade restrictions -- were to remain unchanged over time, it would be meaningful to consolidate the two tradable sectors into a single tradable sector. The relative price between the tradables and non-tradable or the real exchange rate would be the only important relative price.
Output is produced by the use of intermediate and primary inputs. For any given combination of factor inputs, output is also influenced by the so-called total factor productivity $\gamma$. We postulate that primary factors of production -- capital and labor -- are substitutes, but intermediate inputs can neither be substituted for primary inputs nor among themselves. The production technology can be described by a Cobb-Douglas function with constant returns to scale. Thus we can write:

$$y_i = e^{\gamma_i t \delta_i} L_i^\delta_i K_i(-1)^{1-\delta_i},$$

(1.1)

where:

- $y_i$ = output (value added)
- $L_i$ = employment
- $K_i(-1)$ = capital stock at the beginning of the period
- $\gamma_i$ = rate of change in total factor productivity

and:

$$q_i = y_i + \sum_j a_{ij} q_j,$$

(1.2)

where:

- $q_i$ = gross output
- $a_{ij}$ = the input-output coefficient.

14/ Subscript E refers to the exportable sector, M the importable sector, and H to the nontradable sector. The summation $\sum$ runs over subscript $i$ for $i = E, M, H$, unless otherwise noted.
Given prices, wages, and initial capital stock, the desired demand for labor is derived by setting the marginal productivity of labor to the real wage rate. In logarithmic terms, the desired demand for labor is:

\[
\log L^*_i = \log \delta_i - \log \left( \frac{W_i}{PN_i} \right) + \log y_i,
\]

where:

- \(W_i\) = the nominal wage rate
- \(PN_i\) = the price of net output (value added).

Owing to the costs of adjusting factor inputs to the desired level, firms do not adjust factor inputs instantaneously. Employing the partial adjustment model, the short-run demand for labor can be written respectively as:

\[
\log L_i = \lambda_{L,i} \left[ \log \delta_i - \log \left( \frac{W_i}{PN_i} \right) + \log y_i \right] + (1-\lambda_{L,i}) \log L_i (-1), \quad 0 \leq \lambda_{L,i} \leq 1
\]

where \(L\) is the speed of adjustment for labor.

With a given production technology and capital stock, output is thus primarily determined by employment in the short run. Thus variations in real wages could have a great deal to do with the short-run adjustment of employment and output. Several previous studies (World Bank 1985, Lau 1983) conclude that labor markets in the
Philippines are quite competitive. On wage behavior, our point of departure is thus a competitive wage determination model, postulating that real wage adjustments respond to excess demand or supply in the labor market:

\[
\Delta \left[ \log \left( \frac{W}{P} \right) \right] = \lambda \frac{W}{W} \left( \log L - \log L^S \right),
\]

where:

\[\Delta = \text{the first difference operator, that is,} \Delta(x) = x - x(-1)\]

\[W = \text{the aggregate nominal wage rate}\]

\[P = \text{the deflator of GDP}\]

\[L^S = \text{the supply of labor force}\]

\[\lambda = \text{speed of adjustment, } 0 \leq \lambda \leq 1\]

and, finally, total employment is defined as:

\[L = \sum L_i. \] (1.6)

\[\lambda_W\] measures the flexibility of the wage rate in adjusting to the labor market conditions. Labor supply is postulated to be the product of the participation rate \(r\) and the population above 15 years of age \(N\):

\[L^S = rN. \] (1.7)
Given the overall labor surplus situation in the labor market, we postulate that employment is dictated by demand rather than supply.

We assume that nominal wage developments in different producing sectors follow the trends in the aggregate nominal wage. Without loss of generality, using the wage rate of the nontradable goods sector as the benchmark, we explain the sectoral wage behavior

\[
\frac{W_i}{P_{N_H}} = \alpha_i \left( \frac{W_H}{P_{N_H}} \right), \quad i = E, M
\]  \hspace{1cm} (1.8)

where \( \alpha_i \) is relative nominal wage rate.

Since the aggregate wage rate is defined as:

\[
W = \frac{\sum W_i L_i}{L}, \hspace{1cm} (1.9)
\]

employing \( W_H \) as the benchmark in equation 1.8 is equivalent to using \( W \) as the benchmark.

**Comparative Static Analyses**

To understand the working of the supply side, we will derive the reduced form equations and use them to analyze the impact of real depreciation, import liberalization, and the change in the terms of trade on sectoral output, employment, and the real wage.

Let all variables expressed in terms of their rates of change, say variable \( \hat{X} = \frac{\Delta (\log X)}{\Delta (t)} \). Labor demand and output equations can be rewritten as:
\[ L_i = \frac{\lambda_i}{1-\lambda_i \delta_i} (y_i - (\hat{w} - \hat{p}_{n_i})) + \frac{\lambda_i}{1-\lambda_i \delta_i} K_i (-1) + \frac{1-\lambda_i}{1-\lambda_i \delta_i} L_i (-1), \] (1.10)

where:

\[ w = \frac{W}{P_{NH}} \]

is the real wage in terms of the price of nontradables; (1.12)

\[ p_{n_i} = \frac{P_{n_i}}{P_{NH}} \]

is the relative price of tradables to nontradables, \( i = E, M \). It is clear that \( p_{n_H} = 1 \) and \( p_{n_H} = 0 \). (1.13)

The above equations show that the growth in employment and in output are positively related to increases in productivity \( \gamma \) and capital \( K \), but negatively related to the increase in the real product wage which is composed of two offsetting components: the average real wage \( w \) and the real price \( p_{n_i} \). Both components are expressed in terms of the nontradable goods price \( P_{NH} \).

In growth-rate terms, the equilibrium condition of the labor market \( (L = L^g) \) may be expressed as:
where $\theta_i$ is the sectoral employment share.

Substituting the labor demand equation 1.4 into the equilibrium condition 1.14 yields the equilibrium real wage rate as:

$$\hat{w}^* = \sum u_i y_i + \sum u_i p_{n_i} + \sum (1-\delta_i) u_i \hat{K}_i (-1) +$$

$$\sum \left( \frac{1}{\lambda_i} - 1 \right) u_i \hat{L}_i (-1) - \hat{L}^s,$$

where:

$$u_i = \frac{\theta_i \lambda_i}{1 - \gamma_i \delta_i}, \text{ and } \sum u_i = 1.$$

Owing to the adjustment lag in the wage-clearing process, we may postulate that the actual wage rate gradually converges to the equilibrium rate by the following Kyock model: 15/

$$\hat{w} = \lambda_w \hat{w}^* + (1-\lambda_w) \hat{w} (-1),$$

where $\lambda_w$ is the adjustment speed, $0 \leq \lambda_w \leq 1.$

15/ The formulation of a competitive model of wage adjustment by (1.16) is equivalent to the wage model expressed by (1.5).
To summarize, given the domestic relative prices \((pn_E, pn_M)\), the initial factor endowment (capital stock and population), and the production technology and adjustment parameters, the supply side of the model simultaneously determines the employment \((1.10)\), output \((1.11)\), and the real wage rate \((1.15)\) in terms of the price of nontradables. The aggregate output in terms of the price of nontradables \(PN_H\) is \(pn_E y_E + pn_M y_M + y_H\). Leaving aside the determination of capital stock for the time being, the supply side variables are summarized in the following table. This partial equilibrium solution is depicted in Figures 1 to 4.

Figure 4 portrays the relationship \(1.15\), in growth rate terms, between the equilibrium real wage rate (in terms of \(P_H\)) and the real exchange rate. The latter is defined as a composite index of relative prices between tradables and nontradables, that is, \(e = \sum \mu_i \hat{p}_i\). Since \(p_{nH} = 0\) and \(\sum \mu_i = 1\), the elasticity of the real wage rate with respect to the real exchange rate is thus smaller than unity, that is \(\mu_E + \mu_M \leq 1\).

Table 1: THE SUPPLY-SIDE VARIABLES

<table>
<thead>
<tr>
<th>Endogenous Variables</th>
<th>Predetermined Variables</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Gross</td>
<td>Capital Stock (K_i) (-1)</td>
<td>Total factor productivity (y_i)</td>
</tr>
<tr>
<td>Employment Wages</td>
<td>Population (N)</td>
<td>Labor share (\delta_i)</td>
</tr>
<tr>
<td></td>
<td>Relative Prices (pn_i (i=E,M))</td>
<td>Participation rate (\gamma)</td>
</tr>
<tr>
<td></td>
<td>Numeraire (W_i)</td>
<td>Input-output coefficients (a_{ij})</td>
</tr>
<tr>
<td></td>
<td>(price of nontradables)</td>
<td>Speed of adjustments:</td>
</tr>
<tr>
<td></td>
<td>(PN_H)</td>
<td>Labor (\lambda_{L,i})</td>
</tr>
<tr>
<td></td>
<td>Real wage rate (\lambda_W)</td>
<td>Relative wage rates (a_i (i=E,M))</td>
</tr>
<tr>
<td>Price level</td>
<td>(PN (i=E,M))</td>
<td></td>
</tr>
</tbody>
</table>
Now the response of wages, output and employment to changes in the relative prices can be analyzed in the comparative static framework discussed above. First, as earlier defined, the rate of change in the real exchange rate is \( e = \mu_E \hat{p}_E + \mu_M \hat{p}_M \). Assuming without loss of generality: \( \hat{p}_E = \hat{p}_M = \hat{p}_T \), an accelerated rate of real depreciation, \( \hat{p}_T > 0 \), will produce an acceleration in the rate of change in the real wage rate since from equations 1.15 and 1.16, \( \hat{\omega} = \lambda_w (\mu_E + \mu_M) \hat{\rho}_T \).

The rates of growth of output and employment in the nontradable section will therefore fall, but those in the tradable sector will rise. This is because the effect of a real devaluation on the real wage

16/ While the real wage expressed in the price of nontradables would necessarily increase as a result of a real devaluation, the real wage expressed in terms of the general price index \( PN \) need not necessarily increase. This finding is consistent with the analysis made by Cline (1983), which is based on the price index of a basket of consumer goods. Under our assumption, the general price index in terms of \( PN \), can be expressed in terms of the weighted average of the prices of tradables relative to those of nontradables. In growth rate terms:

\[
\hat{p}_N = \phi_E \hat{p}_E + \phi_M \hat{p}_M, \quad \phi_E + \phi_M + \phi_H = 1.
\]

The aggregate real wage rate in terms of the general price index \( PN \) is \( \hat{w}_N = \hat{w} / \hat{P}_N \). Since \( \hat{w} = \hat{w} / \hat{P}_H \) and \( \hat{p}_N = \hat{P}_N / \hat{P}_H \), \( \hat{w}_N = \hat{w} / \hat{p}_N \), or \( \hat{w}_N = \hat{w} - \hat{p}_N \).

Now \( \frac{3\hat{w}_N}{3e} = \frac{3\hat{w} - \hat{p}_N}{3e} = \frac{3\hat{w} - 3\hat{p}_N}{3e} \), by using (1.15), \( = 1 - \frac{3(\phi_E \hat{p}_E + \phi_M \hat{p}_M)}{3(\mu_E \hat{p}_E + \mu_M \hat{p}_M)} \).

The sign of \( \frac{3\hat{w}_N}{3e} \) is thus indeterminate. For instance, for \( \hat{p}_E = \hat{p}_M = \hat{p}_T \), the sign depends on whether \( \phi_E + \phi_M > \mu_E + \mu_M \).
Figure 1
Output and Price: Exportables

\[ \hat{p}_E \text{ Relative Price} \]
\[ \hat{y}_E \text{ Output} \]

Figure 2
Output and Price: Importables

\[ \hat{p}_M \text{ Relative Price} \]
\[ \hat{y}_M \text{ Output} \]

Figure 3
Output and Real Wage: Nontradables

\[ \hat{w} \text{ Real Wage Rate} \]
\[ \hat{y}_H \text{ Output} \]

Figure 4
Real Wage Rate and Real Exchange Rate

\[ \hat{w} \text{ Real Wage Rate} \]
\[ \hat{\epsilon} \text{ Real Exchange Rate} \]
rate is positive and smaller than unity: \( \frac{\delta w}{\delta p_T} = u_E + u_M \) and \( 0 \leq u_E + u_M \leq 1 \). The opposite holds with a real appreciation, \( \delta p_T < 0 \). \text{17/}

Second, the effect of import liberalization can be analyzed under the situation that \( \delta p_{nM} < 0 \). Other things being equal, this produces a fall in the real wage rate \( \hat{w} < 0 \), but the fall will be smaller than the decline in the price of importables since \( |\hat{w}| < |\delta p_{nM}| \). The result is an increase in the real product wage and loss out of employment and output of the importable sector. But output and employment in the exportable and nontradable sectors will both expand at the expense of the importable sector because their real product wage will fall. \text{18/} However, if import liberalization produces an improvement in the factor productivity of importable sector, \( \gamma_M \), the initial adverse effect of opening-up can be mitigated or even reversed over the medium term.

---

\text{17/} Recall that \( \hat{w}_i = \hat{w} \). For nontradables the real wage in terms of its own price \( P_{nM} \) would unambiguously rise as a result of a real depreciation, thus discouraging its employment and output. But for the tradable sectors the real wages are \( \hat{w}_i/p_{nM} \), which can be expressed as \( w/p_T \). Therefore the real wages would fall as long as \( \delta w < \delta p_T \), thus producing an increase in employment and output.

\text{18/} For the importable sector, the real product wage is \( w/p_{nM} \). Since \( \delta w/\delta p_{nM} = u_M \) and \( 0 < u_M < 1 \), the real product wage will accelerate as \( p_{nM} \) decelerates: \( w - p_{nM} = (u_M - 1) p_{nM} < 0 \). But for the exportable and nontradable sectors, since \( w \) falls along with \( p_{nM} \), this would unambiguously generate positive impact on employment and output.
If the country is a price taker in the world market, the terms of trade can be defined as the price ratio of exportables to importables, \( T = \frac{p_{nE}}{p_{nM}} \). The effect of the terms of trade on the real wage can be shown as, \( \frac{\mu_E \mu_M}{\mu_M - \mu_E} \). Since both \( \mu_E \) and \( \mu_M \) are positive and smaller than unity, the sign of \( \mu_M - \mu_E \) cannot be determined a priori. From equation 1.15, it is seen that employment shares \( \theta_i \), speed of adjustment \( \lambda_i \), and labor share in value added \( \delta_i \) of exportable and importable sectors all matter.

The above analysis indicates that changes in relative prices usually generate effects that are favorable to certain sectors at the expense of other sectors, leaving the effect on the aggregate output uncertain. If the sectors with a higher level of productivity are favorably impacted by the change in the relative prices, one would expect that the aggregate output would also increase as a result. On the contrary, policies leading to an expansion of sectors with a relatively low productivity at the expense of other sectors should inevitably generate a loss in the aggregate output.

II. Income and Its Distribution

Given the relative prices, the supply side of the economy generates wages, output, and employment. Assuming the price of the nontradables \( \rho_{nH} \) or of the aggregate (net) output \( \rho_n \) is known for the time being, the nominal magnitudes in the economy can also be

\[
\frac{19}{aT} = \frac{3}{\beta w} \left( \frac{3}{\beta w} \right)^{-1} = \left( \frac{3p_{nE} - 3p_{nM}}{\beta w} \right)^{-1} = \frac{\mu_E \mu_M}{\mu_M - \mu_E} \text{ from (1.15).}
\]
determined. Gross profit (including dividends, interest receipts, and depreciation) can be determined as follows:

$$\Pi_i = PN_i y_i - W_i L_i.$$  \hfill (2.1)

The aggregate profit is then:

$$\Pi = \sum \Pi_i.$$  \hfill (2.2)

The gross domestic product at market prices, GDP, is defined as the sum of output at factor cost plus net indirect taxes:

$$GDP = \sum PN_i y_i + T_{id}.$$  \hfill (2.3)

Using equations 2.1 and 2.2, equation 2.3 can also be written:

$$GDP = \Pi + WB + T_{id}.$$  \hfill (2.3a)

where:

- \(T_{id}\) = indirect taxes net of subsidies
- \(WB\) = \(\sum W_i L_i\) is total wage bill.

GNP is defined as GDP plus net factor income from abroad:

$$GNP = GDP + WB_{f} + \Pi_{f}.$$  \hfill (2.4)
where:

\[ WB_f = \text{factor service payments from abroad due to labor}, \]

and:

\[ II_f = \text{factor service payments from abroad due to capital}. \]

**Household Income**

Household income \( Y_h \) derives primarily from wage income \( WB \) (compensation of employees), rental income \( II_h \) (entrepreneurship and property income of persons), factor service income from abroad \( WB_f \) (largely workers' remittances), and net transfers from the government \( TR_{h,g} \) (including social security benefits) and from abroad \( TR_{h,f} \):

\[ Y_h = WB + II_h + TR_{h,g} + TR_{h,f} + WB_f. \quad (2.5) \]

Household disposable income is derived by subtracting taxes paid to the government from household income:

\[ Y_d = Y_h - T_h. \quad (2.6) \]

Household disposable income is also the sum of consumption and saving:

\[ Y_d = C + S_h. \quad (2.7) \]
Corporate Profit

Gross profit generated from the domestic economy $\Pi$ plus the net return to capital from abroad $\Pi_f$ give rise to total return to capital, which accrues to households $\Pi_h$, corporations $\Pi_c$, government $\Pi_g$, and banks $\Pi_b$. The following equation determines $\Pi_c$:

$$\Pi + \Pi_f = \Pi_h + \Pi_c + \Pi_g + \Pi_b. \quad (2.8)$$

The explanations of $\Pi_f$, $\Pi_h$, $\Pi_g$ and $\Pi_b$ are discussed in Section VII.

Part of the gross corporate profit $\Pi_c$ is used to pay corporate income tax $T_c$; the rest goes into gross corporate saving $S_c$ (including depreciation):

$$\Pi_c = T_c + S_c. \quad (2.9)$$

Government Revenues

Government revenues consist of property and entrepreneurship income $\Pi_g$ and various tax and nontax revenues. Various taxes are defined in the following set of equations.

Personal income tax is based on household income.

$$T_h = t_h y_h. \quad (2.10)$$

Corporate income tax is based on corporate profit.

$$T_c = t_c \Pi_c. \quad (2.11)$$
Export tax is based on the value of exports of goods and nonfactor services:

\[ T_e = \sum t_{e,i} X_i. \quad (2.12) \]

Import tax is based on the value of imports of goods and nonfactor services:

\[ T_m = \sum t_{m,i} M_i. \quad (2.13) \]

Sales tax is based on the value of gross output:

\[ T_s = \sum t_{s,i} P_i q_i. \quad (2.14) \]

Sales, export and import taxes are combined to yield the indirect tax:

\[ T_{id} = T_s + T_e + T_m. \quad (2.15) \]

Similarly, income tax from households and corporations are combined to yield direct taxes:

\[ T_d = T_h + T_c. \quad (2.16) \]

The current account of the general government is given by the following identity:
\[ \Pi_e + T_d + T_{id} + TR_{g,f} = G + S + TR_{h,g} \quad (2.17) \]

where:

- \( \Pi_e \) = government property and entrepreneurship income
- \( TR_g \) = government net transfer receipts from abroad
- \( TR_{h,g} \) = government net transfers to persons
- \( G \) = government consumption expenditures
- \( S_g \) = government saving.

The above discussion relates to the current accounts of households, corporations, and the general government. They can be summarized into the following aggregate relationship between income, consumption, and saving:

\[ GDP + (W_f + \Pi_f) + (TR_{g,f} + TR_{h,f}) = C + G + S. \quad (2.18) \]

This relation states that the value of domestic production plus net foreign factor service incomes \( W_f, \Pi_f \) and net transfers \( TR_{g,f}, TR_{h,f} \) from abroad are the total revenue of the economy that may be used either for consumption \( C+G \) or saving \( S \), defined as:

\[ S = S_h + S_c + S_g. \quad (2.19) \]

Once the consumption decision is made, saving will be determined.
III. Domestic Absorption

Domestic absorption has two components -- final absorption consisting of consumption and investment, and intermediate absorption. The aggregate real private consumption is determined by real disposable income $Y_d$, the real interest rate, real money balance and lagged consumption:

$$\log \left( \frac{C}{PC} \right) = F \left[ \log \left( \frac{Y_d}{PC} \right), \log \left( \frac{M3}{PC} \right), \log \left( R - \log \frac{PC}{PC(-1)} \right), \log \left( \frac{C(-1)}{PC(-1)} \right) \right],$$

where $PC$ is the deflator of private consumption, $R$ is the nominal rate of interest, and $M3$ is the money supply whose definition is given in Section VI.

By employing the linear expenditure framework, we determine sectoral real consumption by allocating total consumption according to the marginal propensity to spend on each of the commodities $\beta_i$ with given relative prices:

$$c_i = cm_i + \left( \frac{\beta_i}{PF_i} \right) (C - cm), \quad \sum \beta_i = 1$$

where:

- $PF_i$ = the consumer price of goods $i$
- $cm_i$ = the subsistence consumption
- $cm = \sum PF_i cm_i$ = total subsistence spending on consumer goods
Total real private consumption is:

\[ c = \sum c_i. \quad (3.3) \]

The deflator of private consumption is defined as:

\[ PC = \frac{C}{c}. \quad (3.4) \]

Given (relative) consumer prices \( PF_i \) and the exogenously determined subsistence consumption \( cm_i \), the marginal propensity to spend \( \beta_i \), and financial variables such as money stock and the interest rate, the above systems of equations fully determine nominal and real private consumption and its allocation by sector.

Unlike private consumption, we assume that the nominal aggregate government consumption \( G \) is a policy variable. The real government spending on each sector, however, is determined by the consumer price \( PF_i \) as well as by the share of government consumption allocated to that sector, which is also a policy variable.

\[ g_i = \frac{\beta_i \cdot G}{PF_i}, \quad (3.5) \]

\[ g = \sum g_i, \quad (3.6) \]

\[ PC = \frac{G}{g}, \quad (3.7) \]
where:

\[ \theta_{g,i} = \text{government consumption allocation share determined by the government} \quad \sum \theta_{g,i} = 1 \]

\[ g = \text{real aggregate government consumption} \]

\[ PC = \text{deflator of government consumption}. \]

Besides consumption, the other major component of domestic absorption is gross domestic capital formation or simply, investment. We separate investment into fixed investment and inventory investment because of their distinctive characteristics. Fixed investment is further divided into private investment and public investment. Public investment and its allocation to producing sectors constitute the public investment program which is considered a policy instrument. Aggregate private investment and inventory investment, however, are explained by behavior equations discussed in Section VI.

Assuming that every producing sector purchases the same bundle of capital goods by paying a price \( PK \), the real fixed capital formation in each sector (or investment by destination) is related to nominal aggregate private and public investments according to the following formula:

\[
ifD_i = \frac{\theta_{pv,i} If_{pv} + \theta_{pb,i} (I_{pb} + I_g)}{PK},
\]

(3.8)

where:

\[ If_{pv} = \text{aggregate private enterprise investment} \]

\[ I_{pb} = \text{aggregate public enterprise investment} \]

\[ I_g = \text{government investment} \]
\[ \theta_{pv_i} = \text{share of aggregate private investment of sector } i, \]
\[ \sum \theta_{pv_i} = 1 \]
\[ \theta_{pb_i} = \text{share of aggregate public investment of sector } i \]
\[ \sum \theta_{pb_i} = 1. \]

While the investment share parameters of public investment \( \theta_{pb_i} \) in the above formula are assumed to be policy instruments, those of private investment \( \theta_{pv_i} \) are determined by the relative profit rate.

\[
\mu_i \theta_{pv_i} = \theta_{pv_i} (-1) (1-\lambda_i) + \lambda_i \left( \frac{\Pi_i/K_i(-1)}{\Pi/K(-1)} \right), \tag{3.9}
\]

where parameter \( \mu_i \)'s, which sum to unity, ensure total private investment equals the sum of sectoral investment, that is:

\[ \sum \mu_i = 1, \tag{3.10} \]

and \( \lambda_i \) measures the speed with which sectoral private investment responds to the change in the relative profit rate, \( 0 \leq \lambda_i \leq 1 \).

The capital stock is determined by the perpetual inventory method.

---

20/ Ideally private investment of each sector should be independently analyzed. However, this option is not available because data do not exist in the format we need. We thus choose to examine only the aggregate private investment and use (3.9) to determine sector investment once the aggregate is known.
\[
K_i = K_i (-1) + \delta_i K_i (-1), \quad (3.11)
\]

where \( \delta_i \) is the depreciation rate. The total capital stock is:

\[
K = \sum K_i. \quad (3.12)
\]

Given fixed investment made by each producing sector (3.8), the acquisition of capital goods from each capital goods producing sector (investment by origin) is given by:

\[
if_i = \frac{\sum \left( \theta_{ij} \cdot PK \cdot if^D \right)}{PF_i}, \quad (3.13)
\]

where \( \theta_{ij} \) is the demand for capital good \( i \) per unit of capital expenditure of sector \( j \); hence, \( \sum_i \theta_{ij} = 1 \).

The aggregate fixed investment may be defined as:

\[
if = \sum i_i. \quad (3.14)
\]

The deflator of capital of capital goods \( PK \) is defined as:

\[
PK = \frac{I_{f, pv} + I_{pb} + I_{g}}{if}. \quad (3.15)
\]

---

21/ It is clear that \( \sum if^D = \sum if_i = if \), that is, the sum of sectoral capital formation equals the aggregate fixed investment.
Given market prices $P_{Fi}$ and nominal inventory investment $V$, the real inventory investment delivered by sector $i$ for final use is:

$$v_i = \frac{\theta_i V}{P_{Fi}}, \quad \sum \theta_i = 1 \quad (3.16)$$

The aggregate real inventory investment and its deflator are respectively defined as:

$$v = \sum v_i \quad (3.17)$$

and:

$$PV = \frac{V}{v}. \quad (3.18)$$

This concludes the analysis of domestic absorption, but it is useful to summarize the aggregate relationship between nominal and real domestic absorption as follows:

$$C + G + I_{f,pV} + I_{pb} + V = \sum P_{Fi} f_{di}, \quad (3.19)$$

where:

$$f_{di} = c_i + g_i + i_{f_i} + v_i. \quad (3.20)$$

In this expression, consumer prices $P_{Fi}$ are given. $G$ and $I_{pb}$ are government fiscal policy instruments. The endogenous variables are $C$, $I_{f,pV}$, $V$, and real domestic absorption of final goods $f_{di}$.

Final real absorption $f_{di}$ when combined with intermediate absorption $i_{di}$ gives rise to total domestic real absorption $d_i$: 
\[ d_i = f_d + id_i, \]  \hspace{1cm} (3.21)

where the intermediate demand \( id_i \) is based on input-output relationships:

\[ id_i = \sum_j a_{ij} q_j. \]  \hspace{1cm} (3.22)

We further define nominal and real aggregate gross domestic capital formation, respectively, as:

\[ I = I_g + I_{pb} + I_{f, pv} + V \]  \hspace{1cm} (3.23)

and:

\[ i = if + v. \]  \hspace{1cm} (3.24)

IV. Foreign Trade

The previous sections have discussed the determination of income and domestic absorption under a given set of relative prices. Since relative prices themselves are endogenous variables in a complete general equilibrium system, we need to complete the loop by examining the remaining component of demand, that is, the determination of foreign trade.

First, imports, which like domestic goods are for the satisfaction of domestic absorption. As in other developing countries, in the Philippines imported goods consist mainly of raw materials and capital goods that cannot be easily replaced by domestic goods. For
tradables, the degree of substitution between imports and domestic goods can be conceptualized by a CES substitution framework:

\[ d_i = b_i \left( \delta m_i m_i + (1-\delta m_i) h_i \right)^{-\rho_i} \left[ -\rho_i + (1-\delta m_i) \right]^{\rho_i} - \frac{1}{\rho_i}, \quad i = E, M \quad (4.1) \]

where:

- \( m_i \) = real imports
- \( h_i \) = domestically produced goods
- \( \rho_i \) = substitution parameter
- \( \delta m_i \) = share of imports in domestic demand (absorption).

The unit cost of imports and home goods to users of the "composite good" \( d_i \) are, respectively, \( PWM_i (1+t_{m_i}) \) and \( PF_i \), where \( PWM_i \) is the world price of imports in domestic currency units and \( t_{m_i} \) is tariffs on imports. Consumers are assumed to be cost-minimizers, subject to the budget constraint:

\[ PF_i d_i = PWM_i (1+t_{m_i}) m_i + P_i h_i, \quad (4.2) \]

where \( P_i \) is the producer's price of domestically produced goods whose determination is discussed in Section V.

Producers' cost minimizing import demand can be shown as:

---

22/ This formulation does not take into account the import restrictions such as QRs, which could be handled in several ways. First, compute the tariff-equivalent of QRs and incorporate it into tariffs \( t_{m_i} \). The second way is to use an index of QRs to modify the import function either through \( \delta m_i \) or as an independent variable. The third possibility is to use a dummy variable.
\[
m_i = \left( \frac{\delta m_i}{1-\delta m_i} \right) \left( \frac{\text{PF}_i}{\text{PWM}_i (1+t_{m_i})} \right) \text{om}_i d_i, \quad i = E, M (4.3)
\]

where \( \text{om}_i = \frac{1}{1+p_i} \) is the elasticity of substitution.

The imports of nontradables (nonfactor services) is postulated to be proportional to the volume of trade:

\[
m_H = (1-\delta m_H) (m+x). \quad (4.4)
\]

The following identities define total real and nominal imports, and the deflator of imports of goods and nonfactor services.

\[
m = \sum m_i \quad (4.5)
\]

\[
M_i = \text{PWM}_i m_i \quad (4.6)
\]

\[
M = \sum M_i \quad (4.7)
\]

\[
\text{PM} = \frac{M}{m} \quad (4.8)
\]

From equation 4.2 it is seen that the nominal domestic absorption is fully spent on imports of goods and nonfactor services and on domestic goods, that is:

\[
\sum \text{PF}_i d_i = \sum \text{PWM}_i (1+t_{m_i}) m_i + \sum P_i h_i. \quad (4.9)
\]
From equations 2.13, 3.19, and 3.23, equation 4.9 can also be expressed as:

\[ C + G + I = M + T_m + H, \]  

(4.9a)

where \( H = \sum P_i h_i \).

Through imported prices, it is seen that world prices affect domestic prices. First, they directly contribute to the formation of consumer prices \( P_{F_i} \), and producer prices \( P_i \) (4.9). Their overall effect on \( P_{F_i} \) depends also on the share of imports in domestic absorption. Secondly, they influence the relative attractiveness of home goods compared with imports, with rising import prices associated with increasing demand for home goods and vice versa (4.3). Thus rising import prices tend to translate into rising home goods prices with the magnitude of transmission depending on the elasticity of substitution \( \sigma_{m_i} \). \(^{23/}\)

This analysis assumes that importers are "small" so that they can influence neither the dollar price nor the domestic currency price of imports. If this condition is not justified, the domestic currency price of imports need not fall in response to the decline of the dollar price.

---

\(^{23/}\) The same analysis applies to the effect of changes in import tariffs or the exchange rate.
Another important transmission mechanism from the global economy to the domestic economy is through exports. Departing from the assumption made for imports, we assume that goods produced for domestic consumption are perfect substitutes for goods produced for exports. Thus the supply price of exports is the same as the producer price of home goods, after allowing for incentive schemes such as export taxes or subsidies:

\[ PX_i = P_i (1 + t_{e,i}), \]  
\[ (4.10) \]

where:

- \( PX_i \) = the export price in domestic currency
- \( P_i \) = the producer price
- \( t_{e,i} \) = export tax rate per unit of exports.

From the world market point of view, there is a demand price of exports that can be found from the demand function of exports:

\[ x_i = \eta_i \left( \frac{\alpha x_i}{PX_i} \right)^{\beta x_i} (TW), \]  
\[ (4.11) \]

where:

- \( PWX_i \) = world price of exports in domestic currency
- \( TW \) = volume of world trade
- \( \alpha x_i \) = price elasticity
- \( \beta x_i \) = income elasticity
- \( \eta_i \) = scale variable.
Thus if the demand elasticity is infinitely large $\sigma_1 = \infty$, the demand price of exports will be completely determined by the world price of exports, $P_{X_1} = P_{WX_1}$, as is the domestic producer price $P_1$ from equation 4.10. This is the so-called small country assumption case. A simple test of this hypothesis is to see to what extent domestic prices of exportables deviate from their corresponding world prices. The other extreme case is $\sigma_1 = 0$, when world prices have no influence on the domestic price of exportables.

Total real and nominal exports of goods and nonfactor services and the deflator of exports of goods and nonfactor services are defined as:

$$x = \sum x_i \quad (4.12)$$

$$X_i = P_{X_i} x_i \quad (4.13)$$

$$X = \sum X_i$$

and:

$$P_{X} = \frac{X}{x} \quad (4.14)$$

The trade balance in domestic currency is:

$$TB = X - M \quad (4.15)$$
which, given the equilibrium conditions of exportables and importables, can alternatively be seen as the difference between domestic production and absorption of the tradables. This difference will become clear in a later discussion.

Trade balance plus factor payments from abroad $WB_f$ and $\Pi_f$, and foreign transfers of household and government $TR_h,f$ and $TR_g,f$ give rise to current account balance:

$$CAB = TB + WB_f + \Pi_f + TR_h,f + TR_g,f$$

(4.16)

V. Goods Market Equilibrium

We have discussed both supply and demand variables for three classes of commodities: exportables, importables and nontradables. The analysis has been made in terms of a given set of (relative) prices: net prices $PN_i$, consumer prices $PF_i$, or producer prices $P_i$. We now turn to the determination of these prices.

In essence, we postulate that in all markets prices would be sufficiently flexible to clear the market. The set of market clearing prices are producer prices $P_i$ from which all other sets of prices $PF_i$ and $PN_i$ are then determined. Since, empirically, the model is investigated by annual data, the market-clearing assumption in fact assumes that the adjustment lag of prices is smaller than or equal to one year. It should also be noted that since the capital stock is given for every market-clearing period, the market-clearing price may be interpreted as short-run equilibrium prices.

For the goods producing sectors the equilibrium condition from which the producer price $P_i$ is derived can be stated as:
\[ q_i + t_i = h_i + x_i, \quad i = E, M \] (5.1)

where:

- \( q_i \) = gross output
- \( t_i \) = indirect taxes at base-year prices
- \( h_i \) = domestic demand for domestic goods
- \( x_i \) = exports

The left hand side of the above equation is output sold in the market at the producer price \( P_i \). The right hand side says that this output is for home consumption \( h_i \) and export demand \( x_i \).

For the exportable sector, goods produced for home consumption and export are perfect substitutes. The equilibrium condition can alternatively be considered as the condition for determining the equilibrium export volume and export price as depicted in Figure 5.

**Figure 5**
Exportable Sector Equilibrium

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If, as discussed earlier, the export demand elasticity is infinite, the demand curve is horizontal and its position is entirely determined by the world price.

In the case of the importable sector, exports by definition are a small proportion of output and imports constitute a significant proportion of domestic absorption.

As noted earlier, the demand for home goods is determined jointly with the demand for imports, given the relative price between import PWM (1+tm) and home goods PM. This is shown in Figure 6, where point A is an equilibrium point corresponding to the producer price \( P_M^e \). If the producer price is increased from \( P_M^e \) to \( P_M^b \), then the slope of line aa will be tangent with the dd curve at point B corresponding to a lower level of domestic goods demand \( h_b \). Following this procedure, we draw a demand curve of home goods in Figure 7 which intersects with the supply curve at point A producing an equilibrium price \( P_M^e \) and quantity \( h_M^e \). The greater the elasticity of substitution between imports and domestic substitutes, the flatter the demand schedule will be.

A drop in the tariff rate (or in the world price, or currency appreciation) will reduce the demand for domestic substitutes; the demand curve, therefore, shifts downward intersecting the supply curve at a point with lower output and price. The more elastic the demand curve (a greater elasticity of substitution), the greater will be the change in both price and output for any given change in the tariff rate. In one extreme, the elasticity of substitution is infinite (the demand schedule is horizontal), the change in the domestic price of
Figure 6
Imports and Domestic Goods Substitution

Figure 7
Demand Curve of Import Substitutes
importables will fully reflect the change in the tariff rate, irrespective of the supply condition. This discussion is illustrated in Figure 8 where parallel demand curves a and a' have smaller elasticities of substitution than those of the parallel demand curves b and b'. An equal proportional shift in terms of changes in tariffs is seen to produce a larger reduction in output and prices of domestic import substitutes for demand curve b than demand curve a (comparing point B with point C).
The equilibrium condition of nontradables (home goods) is:

\[ q_H + t_H = d_H + x_H - m_H, \]  

(5.2)

where \( x_H \) and \( m_H \) stand for exports and imports of nonfactor services, respectively.

In the equilibrium conditions 5.1 and 5.2, the constant dollar indirect taxes at base year prices \( t_i \) are defined as follows:

\[ t_i = t^0_{s,i} q_i + t^0_{m,i} m + t^0_{e,i} x_i \]  

(5.3)

where \( t^0_{s,i} \), \( t^0_{m,i} \), and \( t^0_{e,i} \) are tax ratios of sales taxes, import tariffs, and export taxes at the base year.

Given the producer prices \( P_i \), we derive the net price \( P_{Ni} \) and the consumer price \( P_{Fi} \) jointly from the following two identities:

\[ P_i q_i = P_{Ni} y_i + \sum_j a_{ij} P_{Fi} q_j \]  

(5.4)

\[ (1 + t_{s,i}) P_i q_i + (1 + t_{m,i}) P_{WM} m_i = P_{Fi} d_i + P_i x_i. \]  

(5.5)

The first set of equations pertains to cost accounting, showing that the value of production at factor prices equals the cost of production, including the costs of both primary inputs and intermediate inputs. The second set of equations says that the value of supply is equal to demand at market prices.
**Numeraire and the Walras Law**

Recalling the analysis of Section I, where it is demonstrated that if the relative prices of exportables and importables $p_{E}$, $p_{M}$ can be determined, all the real variables can also be determined. Since all sectoral prices such as $P_{N}$ are now determined, so are the relative prices.

However, whether in terms of $P_{N}$, $P_{i}$ or $PF_{i}$, the prices of the three sectors are not independent due to the Walras Law, which states that if any two of the three markets are in equilibrium, so is the third market. Or, a community's income should be equal to its expenditure such that the aggregate budget constraint is satisfied. That the Walras Law is satisfied is proven below. From equation 5.5, we can show:

\[
\sum (1+t_{s,i}) P_{i} q_{i} + \sum (1+t_{m,i}) PW_{i} m_{i} =
\]

\[
\sum PF_{i} (fd_{i} + id_{i}) + \sum P_{i} x_{i}.
\]

(5.6)

Regrouping terms and adding export taxes $\sum t_{e,i} P_{i} x_{i}$ in equation 5.6 yields:

\[
\sum P_{i} q_{i} - \sum PF_{i} id_{i} + \sum (t_{s,i} P_{i} q_{i} + t_{m,i} PW_{i} m_{i}) +
\]

\[
t_{e,i} P_{i} x_{i} = \sum PF_{i} fd_{i} + \sum (1+t_{x,i}) P_{i} x_{i} - \sum PW_{i} m_{i}.
\]

(5.6a)

Using equation 5.4 and tax equations 2.10 - 2.16 the left hand side of equation 5.6a becomes:
\[ l.h.s. = \sum PN_i y_i + \left( \sum \sum a_{ji} PF_j q_j - \sum PF_i id_i \right) + T_s + T_m + T_x \]  

(5.6b)

From equation 3.22, it is seen that the term in the bracket is zero, so:

\[ l.h.s. = \sum PN_i y_i + T_s + T_m + T_x, \]  

(5.6c)

which, by virtue of equations 2.3 and 2.15, yields GDP. That is:

\[ l.h.s. : GDP \]  

(5.6d)

The right hand side of equation 5.6a, after using identities 3.19, 3.23, 4.7, 4.10 and 4.13 becomes:

\[ r.h.s. = C + G + I + X - M. \]  

(5.7)

Therefore from equations 5.6d and 5.7 we have:

\[ GDP = C + G + I + X - M. \]  

(5.8)

The above equation says exactly that a community's total income is fully spent, which is the aggregate budget constraint. Q.E.D.

Since sectoral prices are not independent, it is necessary to choose a numeraire against which all other prices and nominal magnitudes are measured. There are a number of choices. In the analysis in the
first section we chose the price of the nontradable sector \( P_{NH} \) as the numeraire. Alternatively, we can also choose any one of the sectoral prices. Since prices are simultaneously determined, we can easily replace one numeraire with another. One such numeraire is the GDP deflator defined as the ratio of nominal GDP to real GDP:

\[
p = \frac{\text{GDP}}{y}, \tag{5.9}
\]

where:

\[
y = c + q + i + x - m. \tag{5.10}
\]

Another useful choice is the value-added deflator (at factor cost):

\[
PN = \frac{\sum PN_i y_i}{\sum y_i} \tag{5.11}
\]

or:

\[
PN = \sum w_i PN_i \tag{5.11a}
\]

where:

\[
w_i = \frac{y_i}{\sum y_i} \text{ and } \sum w_i = 1.
\]

\[24/\text{Alternatively real GDP can also be derived as the sum of value added at factor costs } \sum y_i \text{ and indirect taxes } \sum t_i.\]
The above formula shows that anyone of the $PN_i$ can be chosen as a numeraire, in lieu of $PN$.

The Balance of Payment Constraint

The real economy, presented so far, omits the question of external financing. The implicit assumption is that the absorption of the private sector and the government can be financed over and above domestic production. This can be readily seen from the aggregate budget constraint of the economy (5.8), which can be rewritten by using equations 2.18 and 4.16 as the sum of national saving and current account deficit:

$$I = S - CAB, \quad (5.8a)$$

where $CAB$ is current account balance defined in equation 4.16.

As the above equation clearly suggests, capital formation is a residual, which is determined by whatever level of the current account deficit the economy happens to bring about, as well as by national saving. The implication is that the higher the current account deficit, the higher will be capital formation. This could be true only if capital inflow would always be forthcoming to match the current account deficit. Needless to say, this cannot be a general case. To make a general case, a balance of payment constraint needs to be added to the model, as follows:

$$CAB - \Delta F = 0, \quad (5.12)$$
where \( \Delta F \) is the change in net foreign assets \( F \), which is for the time being assumed to be an autonomous flow. 25/

If \( \Delta F \) is predetermined, there is no reason to expect that it should exactly match the current account position, ex ante. To achieve the balance of payments equilibrium, the nominal exchange rate should be allowed to play an important role. If the exchange rate is completely flexible, the balance of payment should be in equilibrium. On the other hand if the exchange rate is fixed, domestic macroeconomic policies would need to be adjusted to achieve the external balance. However, with a given macro policy stance and an autonomous capital inflow, it is convenient to postulate a flexible exchange rate regime to assure the balance of payment equilibrium. 26/

Combining equations 5.8a and 5.12 yields:

\[
I = S - \Delta F. \quad (5.8b)
\]

25/ A minus sign for \( \Delta F \) implies an inflow of capital and a positive sign, an outflow.

26/ Under a situation of payments disequilibrium, developing countries often resort to import restrictions as a way of rationing foreign exchange instead of devaluation for fear of the inflationary consequences generated by devaluation. Import restrictions create a wedge between domestic prices of imports and foreign prices of the same commodities, with the domestic exceeding the foreign. The difference between the two prices is rent, which directly benefits importers and domestic import-competing industries, especially when the elasticity of substitution is high. The domestic price of imports \( P_{WMi} \) can no longer be considered as exogenously determined by the world price. It is now determined by the notional demand function (4.3), given the rationed supply.
Thus the macro equilibrium is implicitly achieved by the so-called neo-classical closure rule in which gross domestic investment is determined by national saving and net foreign capital inflow. Since public investment is considered a policy variable, equation 5.8b in fact determines the investment of households and corporations as a residual. The level of investment so determined need not be consistent with the ex ante, desired capital stock. To resolve this inconsistency, we need to consider the role of interest rates as an equilibrating variable. And this will be the subject of the next section.

To summarize, the real model's major policy instruments pertain to fiscal policies. These are public investment program, government consumption, and various tax and tariff rates. Monetary policies are secondary in importance since the real money stock and real interest rate only influence private consumption. The main exogenous variables are international commodity prices and net capital inflow. The main endogenous variables are output, employment, the relative prices of tradables (real exchange rates), the real wage rate, the nominal exchange rate, and final demand. 27/

VI. Asset Market Equilibrium

The real model presented in previous sections leaves the numeraire of the model -- or the absolute price level -- unexplained. First, if changes in the numeraire could produce proportional changes in  

27/ At present the distinction between real and nominal is trivial because the price level (the numeraire) is an exogenous variable.
all other prices and nominal magnitudes, it would not be necessary to explain the behavior of the numeraire since the real magnitudes would not be altered by it. But the fact is that a change in the numeraire will not necessarily produce an equal proportional change in all prices. For instance, since the domestic price of exportables and importables is partly determined by world prices, they would be at least partially rigid with respect to changes in the numeraire. Thus, an increase in the price of nontradables, say due to excess supply of money, would produce a real appreciation leading to a reallocation of productive resources toward the production of nontradables. Another example is that the rate of inflation has been found to impact government expenditure and revenues in an asymmetrical way in developing countries. While government expenditure generally keeps pace with the rise in the price level, government revenue frequently cannot, resulting in an ever expanding deficit in real terms (Tanzi 1977). These examples indicate that the behavior of the numeraire could affect real magnitudes in a significant way.

Second, the real economy model deals mainly with the current accounts of economic agents. The capital account, in the form of an aggregate relationship between investment, saving, and capital inflow implicitly given by equation 5.8b is rudimentary. As noted earlier, ex-ante investment has not been reconciled to ex ante saving and capital inflow. Because of the lack of an explicit analysis of the capital account, the financing of domestic absorption is ignored. This omission denies the role played by the banking system in the economy and ignores its relationship with public and private sectors. It will become clear
that an articulation of this relationship is essential to the understanding of the determination of prices, interest rates and other monetary variables and the interaction of these variables with real variables.

Third, the real model so far assumes that the nominal exchange rate is flexible enough to ensure balance-of-payments equilibrium. While this assumption is appropriate for a flexible exchange rate regime, monetary authorities would be sure to intervene in the foreign exchange market in order to defend the parity under a fixed exchange rate regime. In this case it is essential to allow for the linkages between balance of payments, money stock, and prices. Since a pure floating exchange rate regime rarely exists in the real world, an integration of the current account with both capital and monetary accounts needs to be achieved to accommodate the reality.

The capital account is separated into two, one for the general government (national plus state) and the other for corporations and households. Equation 6.1, the government account, says that acquisition of capital goods (investment) is financed by three sources: government saving, net borrowing from domestic banking system, and net borrowing from abroad (or sales of foreign securities):

\[ I^g + I^{go} = S^g + \Delta DC^g - \Delta F^g, \]  

(6.1)

where:

\[ I^g = \text{government investment} \]
In the government account investment, capital transfers, and the change in net foreign assets are exogenously determined policy variables. With savings given from its current account (2.17), the capital account (6.1) explains the change in net domestic credits, that is, the required net borrowing of the government from the domestic banking system.

This assumption is consistent with the observations of Mario B. Lamberte (1985, p. 7) who observes that "...the Finance Minister usually finds it easier to raise revenue through inflation tax rather than through raising ordinary taxes to finance certain activities since he is also a member of the Monetary Board. Indeed, recent experience shows that in times of great need, the Finance Minister resorted to such practice."

Households and corporations hold both capital goods and monetary assets, as in equation 6.2. And these holdings are financed in a manner similar to the government by their own saving, borrowing from the domestic banking system and from abroad: 28/

---

28/ The present analysis ignores financial assets other than monetary assets because the banking system in the Philippines still dominates the financial system in the Philippines.
\[ I_{pb} + I_{pv} + \Delta MS = I_{go} + S_h + S_c + \Delta DC_{hc} - \Delta F_{hc} \]  

where:

- \( I_{pb} \) = public enterprise investment
- \( I_{pv} \) = private enterprise investment
- \( S_h \) = household saving
- \( S_c \) = corporate saving
- \( \Delta DC_{hc} \) = change in net domestic credits of households and corporations
- \( \Delta F_{hc} \) = change in net foreign assets of households and corporations
- \( \Delta MS \) = change in the broadly defined money supply, including currency and demand deposits M₁, savings, time deposits and deposit substitutes TD, and other monetary assets \( M_0 \)
  
  \[ M_0 = M_1 + TD + M_0. \]

For the household and corporation account, we postulate that public enterprise investment \( I_{pb} \) and domestic credit of the banking system \( DC_{hc} \) are policy instruments. The residual category of monetary assets \( M_0 \) is an exogenous variable. This leaves three financial assets, \( M_1, TD, \) and \( F_{hc} \), and one real asset (capital goods) \( I_{pv} \) over which households and corporations have discretion. The choice of each asset depends on, among other things, their rates of return and the rates of return of competing assets.
For currency and demand deposits, the own rate of return is zero. For saving and time deposits, the own rate of return is RT. For net foreign assets, the own rate of return is RF. We postulate that the net foreign assets $F_{hc}$ is an exogenous variable; $RF$ has therefore no impact on domestic interest rates. Lastly, the rate of return of capital goods is the rate of increase in the output price $\hat{p}$. In addition to the own rate of return, the interest rate on securities $R$ (open market interest rate) should also appear in the asset demand functions since it reflects an opportunity cost of holding these assets.

The demand for and supply of each asset determines the price (the rate of return) and quantity of each asset. The model has three asset demand functions all of which are functions of interest rates on securities and time deposits, inflation rate, and real output (Table 2, column 3). It has two asset supplies that are assumed to be known for the time being. One is the monetary aggregate of $M1$ and savings and time deposits $TD$; the other is the capital stock. The model thus has four equations to determine five variables: $RT$, $R$, $\hat{p}$, $M1$, $TD$. The solution of the model is therefore indeterminate, because while there are two monetary assets with two demand functions,

---

29/ The econometric evidence presented in the Annex on the determination of the interest rate tends to support this hypothesis. This is due to the fact that capital mobility is controlled by the Philippine authorities.

30/ As will be made clear later, the equilibrium condition in the capital goods market is expressed in terms of the equality between the demand for and supply of loanable funds.

31/ Two of these equations express the market-clearing conditions for the money stock ($M1 + TD$) and capital goods.
Table 2: Asset Demand

<table>
<thead>
<tr>
<th>Assets</th>
<th>Nominal Own Rate of Return</th>
<th>Asset Demand Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Currency and demand deposits</td>
<td>M1</td>
<td>0</td>
</tr>
<tr>
<td>Saving and time deposits</td>
<td>TD</td>
<td>$R_T$</td>
</tr>
<tr>
<td>Net foreign assets</td>
<td>$F_{hc}$</td>
<td>$R_f$</td>
</tr>
<tr>
<td>Capital goods</td>
<td>$K_{pv}$</td>
<td>$p$</td>
</tr>
</tbody>
</table>

there is only one supply function based on the aggregate of M1 and TD.

A solution to this problem is to introduce a supply function for time deposits. For instance, we could assume that the interest rate on time deposits $R_T$ is set by monetary authorities, thereby effectively adding an infinitely elastic supply curve for time deposits. The model would then have two independent markets for M1 and TD, respectively. However, this assumption does not fit well with the current realities of the financial markets in the Philippines, because interest rates have been completely liberalized since 1983.

Under a floating interest rate regime interest rates on deposits are expected to move very closely with those on securities.

32/ There are four markets involved in this model: the money market (narrow money), the time deposit market, the capital good market, and the security market. By Walras' Law, if three of the markets are equilibrated, the fourth must also be. Accordingly, it is necessary to take only three of the markets explicitly into account. We have chosen the markets for M1, TD, and capital goods.
Banks will adjust the rate paid on time deposits based on changes in the interest rate on securities, because an increase in the rate on securities will increase their incentive to attract funds in the form of time deposits in order to invest in securities or protect existing deposits which might otherwise be converted to securities. The argument also works the other way. The interest rate on time and saving deposits represents interest cost to the banking system. If the banking system has to pay a higher rate to attract deposits, it must also raise the interest charges on loans which is expected to be competitive with the open market interest rate. The interest rate on deposits has been almost perfectly synchronized with the open market treasury bill in the Philippines since the 1983 interest rate liberalization. The accompanying chart demonstrates this synchronization; the dotted line represents the treasury bill rate and the solid line the deposit rate. With this observation we add an additional equation that explains $R_T$ by $R$:

$$\log R_T = f(\log R). \quad (6.3)$$

We next discuss the money market equilibrium condition in which the rate of inflation is determined and then the loanable fund market equilibrium condition in which the rate of interest is determined.

Money Market Equilibrium

The supply of money is determined from the asset side of the consolidated balance sheet of the central bank and deposit money banks.
Chart: INTEREST RATES

MS = DC_g + DC_{hc} + DC_o + F_b, \quad (6.4)

where:

DC_g = net domestic credit of the government sector
DC_{hc} = net domestic credit of households and corporations
DC_o = other domestic credits
F_b = net foreign assets of the banking system.

The money supply equation 6.4 is abstracted from a detailed analysis of the banking sector behavior. It assumes that monetary authorities control the amount of credit extended to the private sector $DC_{hc}$ through monetary instruments such as open market operations and
reserve requirement ratios. Domestic credit extended to the government (DC\textsubscript{g}), however, is assumed to be determined by equation 6.1. That is, as reasoned earlier, monetary authorities would accommodate the fiscal gap with an inflationary tax. Net foreign assets of the banking system F\textsubscript{b} is another source of money supply. Under a fixed exchange rate regime, the level of net foreign assets depends on the overall developments in the balance of payments. However, under a flexible exchange rate regime, F\textsubscript{b} could not be an important source of monetary disturbance. All other domestic credits expressed by the variable DC\textsubscript{0} are postulated as an exogenous variable.

The demand for money is analyzed from the liability side of the balance sheet of the domestic banking system. Total money stock can be separated into M\textsubscript{1} (the narrowly defined money), which is the sum of currency and demand deposits, time and savings deposits, TD, and a residual category M\textsubscript{0}. All monetary assets compete with real assets and hence the rate of inflation \( p \) has a negative impact on the demand for money. For currency and demand deposits (M\textsubscript{1}), nominal interest rates \( R_T \) represent the opportunity cost of holding money and should have a negative impact on holding them. The transaction demand for money is represented by

---

33/ If the analysis is conducted in terms of separate balance sheets of the central bank and commercial banks, it can be shown that the credit to the private sector DC\textsubscript{hc} is a function of reserve money, reserve-requirement and currency-deposit ratios.

34/ TD also included deposit substitutes. The degree of substitution among time and saving deposits and their substitutes are sufficiently high to treat them as a single group.
real output. Further, we postulate that the demand for real balance adjusts to the desired level with a Kyock lag structure: 35/

\[ \log m_1 = F [\log y, \log R_T, \hat{p}^e, \log m_1 (-1)], \]  

(6.5)

where:

- \( m_1 \): real balance of \( M_1 \), defined as nominal money balance deflated by the GDP deflator \( P \)
- \( y \): real output
- \( R_T \): nominal interest rate on deposits
- \( \hat{p}^e \): expected rate of inflation (proxied by the actual rate).

As for the demand for the real balance of saving and time deposits, the interest rate on saving and time deposits represents its own rate of return and therefore should have a positive impact on holding them. As in the case of \( M_1 \), the inflation rate would have a negative impact on saving and time deposits. Combining the interest rate and inflation rate effects, the real interest rate would have a positive impact on saving and time deposits. The real output, as a scale variable, also would have a positive effect. Allowing for partial adjustment toward the desired level, the demand for the real balance of saving and time deposits can be specified as:

35/ The interest rate on securities \( R \) is dropped from the demand functions of \( M_1 \) and \( TD \) because, for the reasons given earlier, it is highly collinear with the interest rate on deposits \( R_T \).
\[ \log \text{td} = F [\log y, R, p, \log \text{td}(-1)], \quad (6.6) \]

where:

\[ \text{td} = \text{real balance of deposits TD, defined as nominal deposit balance deflated by the GDP deflator } P. \]

The sum of the narrowly defined money M1 and TD is called M3:

\[ M3 = M1 + TD. \quad (6.7) \]

Lamberto (1984) argues that M3 would be the most appropriate definition of money from the conduct of monetary policy in the Philippines, because the relationship of M3 with monetary instruments has been more stable than any other definition of money such as M1 and M2.

Total money stock is the sum of M3 and the residual category M0:

\[ MS = M3 + M0. \quad (6.8) \]

Given real output and the nominal interest rate, the equilibrium condition of the money market is ensured by continuous adjustments in the rate of inflation. More precisely, the equilibrium rate of inflation is obtained by equating the demand for money and the supply of money, both in real terms. Graphically, the monetary equilibrium is expressed in Figure 9. Given real output and the nominal
rate of interest, the demand for real money balance \( md \), which is expressed in terms of \( M3 \), is negatively related to the rate of inflation (see equations 6.5, 6.6, and 6.7). The real supply of money in terms of \( M3 \) can be defined as:

\[
ms = \frac{M3}{P} = \frac{M3}{(1+p)P(-1)},
\]

which, given the level of money supply \( M3 \) and the price level of the previous period, is a hyperbolic function with respect to the rate of inflation \( p \). The intersection of the demand and supply curves determines the rate of inflation. Figure 9 shows a stable equilibrium with the demand curve intersecting the supply curve from above.
An increase in the nominal interest rate would increase the demand for time and savings deposits TD, but reduce the demand for M1. The net effect on the demand for real balance M3 depends on the relative interest elasticities. If the interest elasticity of TD outweighs that of M1, a higher interest rate would increase the demand for money, manifesting a shift of curve md outward to md'. This would lower the rate of inflation and raise the real money balance and vice versa. Raising interest rates can thus be an effective inflation stabilization tool. On the other hand, a tightening of credits to households and corporations DC_{hc} by the monetary authorities would decrease the nominal money stock (M3) and shift the supply curve toward the origin, thereby intersecting the demand curve at a lower level of inflation, but at a higher real money balance (Figure 9, point C).

**Capital Market Equilibrium**

We now turn to the demand for capital goods. From the point of view of portfolio choice, real assets compete with financial assets. Thus the demand for capital stock would be negatively related to the rate of interest, but positively related to the expected rate of inflation or summarily to the real rate of interest. Real output,

36/ As early as the fifties, Taiwan had successfully controlled her hyper-inflation with a high-interest rate strategy (Tsiang, 1984).

37/ Modern theories of investment suggest that the user cost of capital, which includes fiscal policy variables, is a more complete concept to represent the opportunity cost of owning capital stock. The present analysis, however, does not intend to study the fiscal aspect of capital spending and therefore employs instead the simpler concept of the real rate of interest.
on the other hand, would exert a positive effect on the desired capital stock $K^*$. Hence we postulate:

$$K^* = F(R - p, y).$$

Employing the Kyock lag model, actual capital stock is determined by:

$$\frac{K}{K(-1)} = \left[\frac{K^*}{K(-1)}\right]^{\lambda_K},$$

where $\lambda_K$ is the speed of adjustment of capital stock.

After some algebraic manipulations, the demand for real private gross fixed capital formation in logarithm can be derived from equations 6.10 and 6.11 as:

$$\log(i_{f,pv}) = F(R - p, \Delta \log y, \log i_{f,pv}(-1)),$$

where:
- $i_{f,pv} = \text{real private gross fixed capital formation}$
- $\Delta \log y = \log y - \delta \log y(-1)$
- $\delta = \text{depreciation rate}$

---

38/ See the Annex for the derivation of the investment equation, which is an ex-ante function and, therefore, does not take into account the disequilibrium situation, such as credit rationing corresponding to a controlled, below-market interest rate.
The demand for inventories is postulated as a positive function of final sales and thus inventory investment as the change in final sales and last period's inventory investment: 39/

\[ v = F(\Delta s, v(-1)) \]  

(6.13)

where:

\( s \) = real final sales (gdp - \( v \)).

The sum of \( V \), which is the product of \( v \) and \( PV \) (see equation 3.18), and \( I_{f,pv} \) is the total nominal investment demand of households and private corporations:

\[ I_{pv} = I_{f,pv} + V. \]  

(6.14)

Corresponding to the nominal investment demand is the demand for loanable funds in the capital market. The higher the interest rate the lower will be the demand for loanable funds, and vice versa. On the supply side of the loanable fund market, household and corporate savings \( S_h \) and \( S_c \) are the major sources, augmented by domestic and external borrowings; \( \Delta DC_{hc} \) and \( -\Delta F_{hc} \). Household saving positively responds to the real rate of interest as seen in equation 3.1. The equilibrium condition of the loanable fund market is in fact given by equation 6.2.

39/ The real rate of interest could also be an important factor for determining the demand for inventory investment, but this hypothesis has not been supported by Philippine data.
To analyze the equilibrium in the capital market, heuristically we divide equation 6.2 by an aggregate price deflator, say the GDP deflator $P$, and substitute it for the private investment and household saving functions. This yields a flow-of-fund account in real terms:

$$i \left( R - \hat{p}, y \right) + \frac{I_{pb}}{p} + \Delta ms = s(R - \hat{p}, y) + \frac{I_{go} + S_c + \Delta DC_{hc} - \Delta F_{hc}}{p}. \quad (6.2a)$$

All variables in this equilibrium condition are either predetermined or exogenous except for the nominal interest rate $R$. The determination of the real money stock $ms$, the inflation rate $\hat{p}$ and real output $y$ has been discussed in previous sections. Public investment and $I_{pb}$ and net domestic credit $DC_{hc}$ are policy variables, while foreign assets $F_{hc}$ is an exogenous variable. It is clear then that, other things being equal, the equilibrium condition is ensured by the adjustment of the nominal interest rate. 40/ Figure 10 illustrates this equilibrium. An increase in net domestic credits $DC_{hc}$ would shift the supply schedule of loanable funds downward (the dotted line), yielding a lower interest rate and higher saving and investment.

In the above example, when net domestic credits are increased, one cannot hold the real balance and inflation rate constant. The

40/ This hypothesis of interest rate determination is supported by the econometric test reported in the Annex. If on the contrary, there is complete mobility of capital, for a small open economy like the Philippines, domestic interest rates will be completely determined by foreign interest rates. Given the foreign interest rate, either equation 6.2 or 6.2a will determine the demand for net foreign assets $\Delta F_{hc}$. This demand will be satisfied by the infinite supply of foreign capital.
analysis in the money market indicates that the real money balance will fall and inflation will rise. It is the simultaneous attainment of equilibrium in both the loanable fund market and the money market that jointly determines the nominal interest rate and the inflation rate (therefore the real rate of interest), real money balance, saving and investment, with given output $y$, nominal net domestic credit $D_{hc}$, and nominal net foreign assets $F_{hc}$.

This equilibrium is drawn in Figure 11, where line $mm$ represents the equilibrium condition in the money market and line $gg$, the equilibrium condition in the capital market. The downward sloping
Figure 11
Money and Capital Markets Equilibria

The line mm is produced by assuming that an increase in the nominal interest rate would increase the demand for the real money balance (the broad money), thereby creating an excess demand for money at the existing inflation rate. This will result in a fall in the inflation rate as the demand for capital correspondingly falls until the equilibrium in the money market is restored. Therefore, any point to the right of line mm corresponds to an inflation rate that is higher than the equilibrium rate and to an excess demand for the real money balance (EDM); inflation will tend to fall. Conversely, any point to the left of line mm
corresponds to an excess supply of real money balance (ESM); inflation will tend to rise.

In the capital market with other things being equal, an increase in the nominal interest rate would correspondingly increase the real rate of interest. This would discourage investment but promote savings and create an excess supply, which would need to be offset by an increase in the rate of inflation to restore the market to equilibrium. Thus the loci of the nominal interest rate and the inflation rate that ensures the equilibrium in the capital market is a positively sloped line such as gg. Any point to the left of line gg represents an excess supply (ESG) in the market while any point to the right represents excess demand (EDG).

Holding output constant, if monetary authorities supply more credits to the private sector line gg will shift to gg' and line mm to mm', yielding a higher rate of inflation. But this will have an ambiguous outcome on the nominal interest rate because the money market calls for an increase while the capital market calls for a decrease in the interest rate to restore equilibrium. 41/ However, the real interest rate, which is the critical variable to saving and investment decisions, is likely to fall as a result. If this happens, there will be a substitution away from real money balances toward real capital.

41/ Since the position of gg depends on the real money balance and as inflation rises the real money balance will fall, line gg therefore will not shift by as much as that caused by the original change in domestic credit. Consequently, the nominal interest rate in the capital market will not fall by as much as implied by line gg'.
The above analysis characterizes the equilibrium situation of the present day Philippine financial market. Since repressed financial regimes are still common in many developing countries, it would be worthwhile to draw the implications for capital accumulation and economic growth from the framework presented here.

A central feature of a repressed financial regime in developing countries is controlling deposit interest rates below their equilibrium levels. The early analysis of the demand for money suggests that, under these circumstances, the demand for money would be low compared with that which might prevail under equilibrium. Correspondingly, the supply of domestic credit to finance the investment demand would also be low. On the other hand, the low deposit rates tend to produce low lending rates which, in turn, induce business investment demand above the equilibrium level. This creates a situation of excess demand for credits. Hence, actual business investment would be strictly rationed by the availability of funds. That is to say, equation 6.2 determines the investment until the real interest rate reaches equilibrium when the ex-ante investment function becomes binding. Thus when the deposit rate is raised toward equilibrium, the supply of loanable funds will increase and so will business investment. This result can be seen more

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42/ This can be readily seen from the monetary survey equation 6.4. With given government domestic credit DC, net foreign assets F, and other credits DC0, the reduction of demand for money would translate into a reduction of banking system’s credits to households and corporations DhC.

43/ It should also be noted that the quality of a given investment, as determined by the availability of funds, should also be enhanced as the interest rate moves toward equilibrium because previously, unprofitable investment projects, evaluated at the equilibrium interest rate, would be reduced.
clearly from a more detailed analysis of the flow-of-funds than provided by equation 6.2.

Suppose households hold money and non-productive assets such as housing and speculative stocks which are financed entirely from savings $S_h$. This is shown by the budget constraint:

$$I_h + ΔM = S_h.$$  \hspace{1cm} (6.2a)

It may be postulated that households allocate savings into holdings of money and non-productive assets in accordance with the real interest rate. An increase in the real interest rate, on the margin, would increase the demand for money and, correspondingly, reduce the demand for other real assets.

Corporations' investment demand is financed from savings $S_c$, domestic bank loans $ΔDC_{hc}$, and foreign credits $-ΔF_{hc}$: 44/

$$I_{pb} + I_b = S_c + ΔDC_{hc} - ΔF_{hc}.$$  \hspace{1cm} (6.2b)

44/ In equation 6.2b $I_{pb}$ is public investment demand which is an exogenous variable. After adjusting for government capital transfer $I_{go}$, equations 6.2a and 6.2b should add up to 6.2.
Since the increase in the demand for money would increase the supply of loanable funds of the banking system $ΔDC_{hc}$ (see equation 6.4), private business investment $I_b$ would, therefore, increase. 45/

VII. Balance of Payments

After all, a major target variable of a structural adjustment program is the balance of payments. What does the framework have to say about the determination of the balance of payments? The answer to this question is the main topic of this section.

45/ If net foreign capital $ΔF$ also responds to domestic interest rates, raising interest rates toward equilibrium provides another source of investment capital, and it would raise investment above the level supported solely by domestic bank loans.

The above analysis assumes that households undertake investments that are unproductive. If some households also undertake productive investments, the gain in productive business investment would be weakened by the loss in productive household investments as the real interest rate is raised. Another similar effect is suggested by van Wijnbergen (1981). As a portion of productive investment is financed by the funds in curb markets in some developing countries, the channeling of household money to organized banking system as a result of higher interest rates would reduce the funds available to curb markets. As a result, interest rates in the curb markets would be higher and investment there lower. More analyses of the disequilibrium interest rate regime can be found in Fry (1982).

The growth implication of liberalizing a repressed financial regime depends critically upon the productivity of the assets being rationed in the credit market. If the productivity investment is being rationed, the above analysis shows that liberalizing interest rates benefits growth. If however, unproductive assets are being rationed, the growth implication could be negative, although liberalization could enhance welfare. The latter can be characterized by the U.S. financial regime before the abolishment of regulation Q by the Federal Reserve System. Until such time, the housing investment had effectively been rationed in the credit market.
The flow-of-fund accounts of the government, households and corporations (6.1) and (6.2) can be combined with the monetary account of the banking sector (6.3) to yield the following identity that links investment, savings and capital flows:

\[ I_g + I_pb + I_pv - (S_g + S_h + S_c) = - (\Delta F_g + \Delta F_h + \Delta F_b). \]  

(7.1)

Using equations 2.19 and 3.23, we can rewrite equation 7.1 as:

\[ I - S + \Delta F_g + \Delta F_h \cdot \Delta F_b = - \Delta F_b. \]  

(7.1a)

Combining equations 5.86 and 7.1a we can derive an equation for total capital flow exactly as the sum of its components:

\[ \Delta F = \Delta F_g + \Delta F_h + \Delta F_b. \]  

(7.2)

Recall that the analysis in Section 1 assumes that \( \Delta F \) is an autonomous capital flow and the exchange rate is flexible. In terms of equation 7.2, this assumption implies that all the components of \( \Delta F \) are autonomous. Without much doubt, capital flows of government \( \Delta F_g \) can be considered a policy variable. Capital flows of household and corporations, \( \Delta F_{hc} \), however, are influenced by their portfolio decisions. But because the Philippine authorities practice capital controls, it is convenient to treat \( \Delta F_{hc} \) as an exogenous variable as we have done so far.
That the change in net foreign assets of the banking system $\Delta F_b$ is predetermined implies a balance of payment target. The balance of payment target can be expressed in terms of months of imports or other criteria. If, however, the exchange rate is fixed, the developments in the balance of payments, namely, in both current and capital accounts, must be reflected in the change of net foreign assets of the banking system. Since in this case the monetary authorities need to intervene in the foreign exchange market in order to defend the exchange rate parity, $F_b$ ceases to be an exogenous variable.

From equation 7.2 the balance of payments account in equation 5.12 can be rewritten as:

$$-CAB + \Delta F_g + \Delta F_{hc} = -\Delta F_b. \quad (5.12a)$$

Given capital flows of government $\Delta F_g$ and household and corporations $\Delta F_{hc}$, equation 5.12a shows that a decline (an increase) in the net foreign assets of the banking system, $|\Delta F_b| < 0$, is compatible with an increase (decrease) in the current account deficit or a reduction (increase) in the surplus. Equation 7.1a on the other hand, suggests that it is also compatible with investment being greater (smaller) than saving. The fact that these two identities co-exist in the model suggests that the balance of payments problem could stem from either an investment-saving imbalance or a current account imbalance or from both. All these interpretations of the balance of payment behavior are also consistent with the monetary approach to balance of payments. The monetary approach stipulates that the decline in net foreign assets
of the banking system reflects the fact that the growth in domestic credit growth is greater than that of the demand for money. This assertion can be seen from the monetary survey identity 6.4. The analytical framework presented in this paper is thus consistent with both the Keynesian approach and the monetary approach to the balance of payments (Frenkel, and others 1980).

Interest Receipts and Rental Incomes

In the analysis on the determination of incomes carried out in Section II, we did not explain various rental incomes. For medium to long term analysis, it is important to explain an important component of the rental income, namely, the interest income derived from foreign and domestic interest-yielding assets.

Interest receipts from net foreign assets of households and corporations, government, and the banking system are respectively, $R_F \left(\frac{F_{hc}}{ER}\right)$, $R_F \left(\frac{F_g}{ER}\right)$, and $R_F \left(\frac{F_B}{ER}\right)$. Therefore, the total interest receipts from abroad is $R_F \left(\frac{F_{hc} + F_g + F_B}{ER}\right)$, which is a significant part of total factor service payments from abroad due to capital $\Pi_f$ as defined in equation 2.14. Thus we define the following equation:

$$\Pi_f = R_F \left(\frac{F_{hc} + F_g + F_B}{ER}\right) + \Pi_f^0, \quad (7.3)$$

where $ER$ is the nominal exchange rate and $\Pi_f^0$ is other capital income from abroad which is assumed to be exogenous.

46/ The Keynesian approach to the balance of payments would use equations 5.12a, 4.3-4.8 and 4.10-4.16. The monetary approach, on the other hand, would use equations 6.4-6.8.
Similarly, nominal net interest income from net domestic assets of households and corporations, government, and the banking system are respectively, $R(TD - DC_{hc})$, $R(-DC_g)$, and $R(-TD + DC_{hc} + DC_b)$. 47/

The government rental income $\Pi_g$ can then be partly explained by interest receipts from domestic and foreign assets:

$$\Pi_g = R(-DC_g) + R_{F}(F_{hc}/ER) + \Pi^o_g,$$

where $\Pi^o_g$ is other government rental income that is assumed to be exogenously determined.

The interest income of households and corporations is $R(TD - DC_{hc}) + R_{F}(F_{hc}/ER)$, which should be a significant part of the rental income of households and corporations $\Pi_h + \Pi_c$. However, this aggregate information is still not sufficient to estimate separately the rental income of households $\Pi_h$ and corporations $\Pi_c$. We are compelled to make the following simple assumption:

$$\Pi_h = a_h [R(TD - DC_{hc}) + R_{F}(F_{hc}/ER)],$$

where $a_h$ is a proportionality factor. Finally, the rental income of the banking system is determined by:

$$\Pi_b = R(DC_g + DC_{hc} - TD) + R_{F}(F_b/ER).$$

47/ We assume that time and saving deposits are the only monetary assets that earn interest.
The rental income of corporations $\Pi_c$ then is determined from 2.8.

VIII. Summary and Conclusions

The paper presents an analytical framework for the evaluation of medium-term structural adjustment programs. There, of course, can be many variants of this framework depending on how detailed the economic sectors can be classified, how behavior relationships can be specified, and generally on how closure rules are chosen, etc. And these choices have to be made in accordance with the particular characteristics of the economy to which this framework is to be applied and with the particular set of issues at hand. Depending on the analytical objectives, the framework can also be extended in many directions; for example, the financial sector can be made more elaborate, etc. But these variations will not alter the basic theme of the framework, which is the integration of real and monetary elements of structural adjustment into a single consistent framework. This integration makes possible the evaluation of a medium-term structural adjustment policy package that includes measures aimed at economic stabilization, adjustment and growth.

The analytical framework has also combined both the Keynesian and monetary approach to the balance of payments over the medium term by an explicit incorporation of some of the factors relevant for the medium- and long-term balance of payments analysis. Chief among them are supply, investment, saving, and portfolio behavior (Frenkel and others 1980). Needless to say, the analysis made in this paper on these
important behavioral relationships could be further improved. Furthermore, there is significant scope for more quantitative research on estimating the impact of supply-oriented policy reforms on total factor productivity. 48/ As alluded to in the introduction, research in this area has begun, but much more remains to be done. What is important for medium- and long-term growth is the efficiency with which resources are used, as well as the resources themselves.

48/ The present paper takes the temporary equilibrium approach that in the short-run, the capital stock is fixed. Hence the short-run variations in capacity utilization are expected to be a significant influence on measured productivity growth. Recent empirical work on temporary equilibrium models of production can be found in Berndt and Fuss (1986).
ANNEX: Econometric Evidence

This Annex contains econometric estimates of several key behavioral hypotheses formulated in the main text. These pertain to the wage rate, private fixed investment, inventory investment, household consumption, export demand, import demand, demand for M1, demand for time and saving deposits, and the interest rate. The important finding is that the econometric results generally support the hypotheses formulated.

1. The Wage Rate Equation 1.5. Abstracting from the sectoral details to test whether the labor market is competitive in the aggregate, we first derive from the aggregate equilibrium condition of the labor market the market-clearing real wage rate. Parallel to equation 1.3, the aggregate labor demand function may be written as:

\[
\log L = \log \delta - \log \left( \frac{W}{PN} \right) + \log y.
\]

Given the equilibrium real wage rate, the dynamics of wage determination can be formulated in terms of either the money wage rate or the real wage rate (no money illusion). The decision should be made on empirical grounds. If formulated in money wages, the wage hypothesis is:

\[
\Delta \log W = \lambda_w (\log W^* - \log W (-1)),
\]
where $W^*$ is derived from the equilibrium condition of the labor market and depends on the expected price $PN^e$, $y$, and $L^g$. Substituting the equilibrium wage rate into the above yields:

$$\Delta \log W = \lambda_w \log y + \lambda_w \log \left(\frac{L^g}{L^g}\right) + \lambda_w (\log PNe - \log W(-1)),$$

The regression estimate is reported below:

$$\begin{align*}
\Delta \log W & = 1.094 \log \left(\frac{y}{L^g}\right) + 0.799 \log P - 0.767 \log W(-1) \\
& \quad (10.2) \quad (13.9) \quad (-13.6) \\
& -3.760 \quad (-5.2)
\end{align*}$$

$$R^2 = 0.965 \quad D.W. = 2.04 \quad \text{Sample period: 1975-1985}$$

where $\log P$ is based on the deflator for GDP. The wage data used are based on the national-income-account concept of compensation of employees. All the variables in the dynamic wage equation have expected signs and are statistically significant. The coefficients of $\log P^e$ and $\log W_{-1}$ are almost equal as predicted by the hypothesis and then are smaller than unity. This, coupled with the fact that the coefficient of output-labor ratio approximates unity, implies that the underlying production function may better be represented by a constant-elasticity-substitution production function. The long-run elasticity of wage

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49/ In these regression results Rs are adjusted for the degrees of freedom. The numbers underneath the respective coefficients in parentheses are t-statistics. All regressions have been estimated by the ordinary least square measured.
adjustments with respect to changes in the expected price $P^e$, which is approximated by the actual price $P$, approximates one; while in the short-run it is 0.8. The coefficient of $\log W_{-1}$ suggests the average adjustment lag is 1.3 years.

If formulated in real wages, the wage hypothesis is:

$$\Delta \log W = \lambda \log \delta + \lambda \frac{\log y}{L} + \lambda \left( \log PN - \log W(-1) \right)$$

$$+ (1-\lambda) \Delta \log PN.$$  

At the empirical level, the difference between the two hypotheses lies in one term, $\Delta \log PN$, which does not prove to be significant as seen below:

$$\Delta \log W = 1.015 \log \left( \frac{y}{L} \right) + 0.718 \left( \log PN - \log W(-1) \right)$$

$$+ 0.107 \Delta \log PN - 3.431.$$  

(7.5) (8.4) \(1.2\) \(-3.6\)

2. Private Investment Equation 6.12. Given a desired capital stock $K^*$, the actual capital good can be adjusted toward that level with a time lag. The time lag is associated with the time required to undertake investment decisions in response to new investment opportunities and to produce and deliver capital goods. We postulate a Koyck lag structure to approximate the time lag:

$$K = \frac{1-\lambda K}{1-\lambda K^*} K^*,$$
where \( 0 \leq \lambda_K \leq 1 \) is the speed of adjustment parameter and \( L \) is the lag operator. The average lag is \( \frac{1}{1-\lambda_K} \).

The growth of capital stock equals new investment net of depreciation. Using the familiar perpetual inventory formulation, we can write the capital accumulation equation as:

\[
K = K(-1) + i_{f,pv} + (1-\delta)K(-1),
\]

or equivalently:

\[
K = \frac{1}{1-(1-\delta)L} i_{f,pv}^*,
\]

where \( i_{f,pv} \) is the real gross private domestic investment, and \( \delta \) is the rate of depreciation of private capital stock. Combining the above two equations yields:

\[
i_{f,pv}^* = \frac{(1/\lambda_K) [1-(1-\delta)L]}{1-\lambda_K L} K^*,
\]

which can be rewritten as:

\[
i_{f,pv} = \lambda_K i_{f,pv} (-1) + (1-\lambda_K) [1-(1-\delta)L] K^*.
\]

Following the neoclassical theory of the firm, we postulate that the desired capital stock is positively related to expected output, which is proxied by actual output, and negatively related to the cost of capital, which is the represented by the real rate of interest. This
rate is defined as the difference between the nominal treasury bill rate and the inflation rate measured by the capital good price PK.

Substituting the desired capital stock into the investment function yields:

\[ i_{f,pv} = \lambda_k i_{f,pv}(-1) + a_0 (1-\lambda_k) D(y) - a_1(1-\lambda_k) D(R-pK), \]

where \( D(y) = [1-(1-\delta)L] \log(y) \) and \( D(R-pK) = [1-(1-\delta)L] (R-pK) \).

For the purpose of estimation, we derive from the national income account data the depreciation rate \( \delta \) of approximately 0.046. The nominal interest rate \( R \) used is the treasury bill rate. The ordinary least squares estimates are given below.

\[
\log(i_{f,pv}) = 0.959 \log(i_{f,pv}(-1)) + 3.415 \log[D(y)] - 0.661 D[(R-pK)(-1)] - 1.594
\]

\[
(18.4) \hspace{1cm} (5.0) \hspace{1cm} (3.6) \hspace{1cm} (2.2)
\]

\[ R^2 = 0.956 \hspace{1cm} D.W. = 2.12 \hspace{1cm} \text{Sample period: 1968-1984} \]

All variables in this regression are significant at the one percent significance level. The real interest rate lagged by one year, rather than the current rate, turns out to be significant. As indicated by the coefficient of lagged investment, the adjustment lag seems to be unusually long. The short-run elasticity of investment with respect to the change in output is 3.4; while, if the real interest rate is increased by one percentage point (say, from 5 to 6 percent), investment
would be reduced by 0.66 percent. The real interest rate elasticity does not seem to be large. This finding is consistent with that of Andal (1985) who reported an elasticity of 0.50 with a deflated user cost variable and an output elasticity of 3.0.

Over the period of estimation most nominal interest rates have been subject to ceilings. This has created situations in which credit rationing was necessary; especially when the real rate of interest was kept artificially low. Thus, the level of real credit would be an important factor in the determination of investment behavior, perhaps more so than the real interest rate. We thus add the real credit of households and corporations to the above equation with the following result:

$$\log (i_{f, pv}) = 0.976 \log [i_{f, pv} (-1)] + 2.291 \log [D(y)]$$

(19.1) \( (2.3) \)

$$-0.679 D[(R-p_K) (-1)] + 0.281 \log [D (\frac{D_{Chs}}{PK})]$$

(19.2) \( (2.3) \)

$$-1.110.$$  

(1.5)

\[ R^2 = 0.959 \quad D.W. = 1.91 \quad \text{Sample period: 1968-1984} \]

The real credit variable has the correct sign, but is not significant even at the 10 percent significance level. All other variables remain significant.
3. **Inventory Investment Equation 6.13**

\[ v = 257.431 + 0.446 \Delta s + 0.468 v(-1). \]

\( (0.28) \quad (0.39) \quad (2.66) \)

\[ R^2 = 0.746 \quad DW = 1.88 \quad \text{Sample period: 1961-1984} \]

Change in real sales \( \Delta s \), as defined as output minus change in stock, proves to be a significant variable in the inventory investment equation. The adjustment of inventories with respective to change in sales occur with a time lag. The real rate of interest might be expected to have a negative impact on inventory investment. When this is the case, its impact is found to be statistically insignificant.

4. **Household Consumption Equation 3.1.** Real consumption is a function of real disposable income, real money balance, real rate of interest rate on deposits, and lagged consumption:

\[ \log \left( \frac{C}{PC} \right) = -0.146 + 0.225 \log \left( \frac{Yd}{PC} \right) + 0.054 \log \left( \frac{M3}{PC} \right) - 0.083 \]

\( (-0.6) \quad (3.9) \quad (2.87) \quad (-2.6) \)

\[ [R_T - \log \left( \frac{PC}{PC(-1)} \right)] + 0.739 \log \left( \frac{C}{PC} \right)_{-1}. \]

\( (22.5) \)

\[ R^2 = 0.999 \quad DW = 2.42 \quad \text{Sample period: 1974-1984} \]

All variables are above 5 percent significance level. The impact of real interest rate on consumption is small. Consumption reacts to changes in income with a time lag, as theoretically expected.
5. **Export Demand Equation 4.11.** The export demand function has been estimated as a function of the relative price and volume of world trade:

\[
\log X = 1.282 - 0.954 \left( \log \left( \frac{PX}{PWX} \right) \right) + 0.573 \log TW,
\]

\[
(1.47) \quad (-5.76) \quad (10.57)
\]

\[R^2 = 0.945 \quad \text{DW} = 1.075 \quad \text{Sample period: 1960-1984}\]

where \( PWX \) is the peso price of the unit value index of world exports and \( TW \) is the volume of world exports in millions of pesos of constant 1979 prices; both are derived from the International Financial Statistics. \( PX \) is the export price index in pesos.

The equation shows that both relative price and world trade significantly determine exports. The price elasticity is slightly below unity and appears low. The estimate could be biased downward because of the OLS estimation and partly because of the protectionist measures adopted against Philippine exports. The elasticity with respect to the volume of world trade is less than unity, suggesting that Philippine exports have lost their market share over time.

After accounting for inertia, the dynamic formulation of export demand based on Koyck lag is estimated as:

\[
\log X = 1.425 - 0.573 \left( \log \left( \frac{PX}{PWX} \right) \right) + 0.157 \log TW
\]

\[
(3.10) \quad (-5.86) \quad (2.63)
\]

\[+ 0.630 \log X (-1).
\]

\[
(7.87)
\]

\[R^2 = 0.982 \quad \text{D.W.} = 2.302 \quad \text{Sample period: 1961-1984}\]
This equation shows that the short-run price elasticity is considerably smaller than the long-run price elasticity, which is approximately 1.5. This result suggests that elasticity pessimism is not warranted for the Philippines, even in the face of protectionism.

6. **Import Demand Equation 4.3.** It is assumed that the share of imports in domestic absorption is a function of the relative price between home goods and the price of imports:

\[
\log m = -4.137 - 0.365 \left( \frac{P_{WM}}{P_{F}} \right) + 1.201 \log d,
\]

\[
\begin{align*}
(-5.39) & \\
(-4.35) & \\
(22.52) & 
\end{align*}
\]

\[R^2 = 0.981 \quad DW = 1.48 \quad \text{Sample period: 1960-1984}\]

where PWM is the import price index, PF the deflator for domestic absorption, d is real domestic absorption (consumption plus investment).

All the variables have expected signs and are significant. The price elasticity of import demand is -0.365, which is significantly below unity. The low price elasticity may be explained by two factors. First, a lot of imports are non-competing capital goods and materials that do not offer much substitution possibilities with home goods. Second, the import restriction measures adopted by the Philippine authorities could also lower the import elasticity. The income elasticity is 1.2, implying import intensity is likely to increase over time.

7. **Money Demand Equations 5.5 and 5.6.** We have estimated money demand functions for currency and deposits (M1) and time and saving
deposits (TD). For real demand for M1 the expected inflation rate, which is approximated by the actual inflation based on the deflator for consumption expenditures, does not turn out to be a significant variable. Neither is the lagged real money balance. The estimated equation without these variables is as follows.

$$\log \left( \frac{M1}{PC} \right) = 5.421 + 0.302 \log y - 0.345 \log R_T,$$

$$R^2 = 0.617 \quad D.W. = 3.08 \quad \text{Sample period: 1974-1984}$$

where output and the nominal deposit rate are significant and have correct signs, but the income elasticity seems low. The equation has been corrected for the first order serial correlation with a coefficient of -0.588.

In the real demand function for time and savings deposits, the real interest rate is the most significant variable, followed by real output. The lagged real deposits is not too significant:

$$\log \left( \frac{TD}{PC} \right) = -1.002 + 0.698 \log y$$

$$+ 1.217 [R_T - \log \left( \frac{PC}{PC(-1)} \right)] + 0.285 \log \left( \frac{TD}{PC} \right)_{-1},$$

$$R^2 = 0.905 \quad D.W. = 2.05 \quad \text{Sample period: 1974-1984}$$

The above two equations suggest that an aggregate equation for M3, which is the sum of M1 and TD, may be estimated as follows:


\[ \log \frac{M3}{PC} = 0.761 + 0.830 \log y + 1.003 [R_T - \log (PC/PC (-1))]. \]

\( (0.48) \quad (6.44) \quad (3.27) \)

\[ R^2 = 0.879 \quad DW = 1.72 \quad \text{Sample period: 1974-1984} \]

All variables are significant and have theoretically expected signs. The income elasticity is slightly below one, which is a more reasonable estimate than that estimated for either component of M3. The data of several other developing countries (Fry, 1982) has also confirmed that the real rate of interest exerts a positive impact on the real money balance based on a broader defined concept of money than M1.

8. **The Interest Rate Equation 6.2.** In the context of the Philippine economy, there are a number of interest rates one should mention. First, there are various deposit rates; good examples are the Manila Reference Rates (MRRs). There are also various loan rates; the best example is the primary rate (Zialcita 1983). For a barometer of the credit market condition, the weighted average of treasury bill rates may be more appropriate.

For the present analysis, we use the treasury bill as the reference rate, assuming that all deposit rates and lending rates tend to move in the same direction. 50/

Since 1983 the interest rates have been completely liberalized (Suleik 1983). It is reasonable to postulate that domestic interest rates are determined by the supply of and demand for loanable fund. The

50/ This appears to be a reasonable assumption from the observed movements in the interest rates since they were liberalized in 1983.
flow-of-fund accounts (or capital accounts) of the government and of households and corporations are summarized by equations 6.1 and 6.2 respectively.

We postulate that the government's uses and sources of funds are insensitive to interest rates. Therefore, the flow-of-fund account (or capital account) of households and corporations is hypothesized as the condition for the determination of the equilibrium interest rate, since both the decision to acquire real and financial assets or to save, and the net inflow of capital, are sensitive to the interest rate. This hypothesis is tested as follows.

From equation 6.2, it is seen that its main stochastic components are real private investments, real money demand, real household saving, and net capital inflow. Both domestic credit and the capital transfers from the government are assumed to be exogenous variables. Since the underlying stochastic equations are expressed in real terms, the nominal variables in equation 6.2 need to be deflated in order to derive the equilibrium interest rate. The result is equation 6.2a. For simplicity, all structural relationships are expressed in linear form with intercepts suppressed:

Investment: \[ -\alpha_I (R - \hat{p}^e) + \beta_I y \]

Demand for money: \[ \alpha_M (R - \hat{p}^e) + \beta_M y \]

Household Saving: \[ \alpha_S (R - \hat{p}^e) + \beta_S y \]

51/ The aggregate demand for money equation is employed here for simplicity.
Net capital inflow: \( \alpha_F \left[ R - R_w \cdot \frac{E^e}{E^e(-1)} \right] \), 52/

where \( \alpha_f \) and \( \alpha_s \) are propensities associated with the interest rate \( R \), expected inflation rate \( \hat{p}^e \), and real output \( y \). They are all assumed to be positive. \( R_w \) is the world interest rate and \( E^e \) is the expected exchange rate. Substituting these functions into equation 6.2a and rearranging the terms, yields the equilibrium nominal interest rate:

\[
R^* = (1-\beta) \hat{p}^e + \beta \left[ R_w \cdot \frac{E^e}{E^e(-1)} \right] + \gamma y + \theta (DCFHR + Z),
\]

where \( DCFHR \) is change in real domestic credit of households and corporations; \( Z \) represents other non-intermediate sensitive variables in equation 6.2a such as real government capital transfers, and:

\[
\beta = \frac{\alpha_F}{(\alpha_M - \alpha_s - \alpha_F)}.
\]

\[
\gamma = \frac{\alpha_s - \beta_I - \beta_M}{(\alpha_M - \alpha_I - \alpha_s - \alpha_F)},
\]

\[
\theta = \frac{1}{(\alpha_M - \alpha_I - \alpha_s - \alpha_F)}.
\]

The signs of \( \beta \), \( \gamma \), and \( \theta \) depend on various combinations of propensities in the underlying structural relationships. We may conjecture the following. First, the effects of the world interest rate and expected depreciation are positive. If the world interest rate is increased, this will prompt capital to flow out of the country and both

52/ This is a covered interest rate arbitrage equation, omitting the risk premium.
reduce the supply of funds and raise the domestic interest rate, and vice versa. Hence, the sign of $\beta$ is positive which implies that $a_M - a_I - a_S - a_F$ is negative since $a_F$ is positive. This in turn implies that $\theta$ is negative; the effect of an increase (decrease) in real domestic credits would be to reduce (increase) the interest rate. If the income propensity to save is smaller than the sum of the income propensity to invest and hold the money balance, output will have a positive effect on the interest rate; otherwise, the effect is negative.

Other things being equal, a one percent increase in the expected inflation would raise the equilibrium nominal rate by $1-\beta$ percent. However, if capital inflows are completely controlled by the monetary authorities, the response of capital inflows to the interest rate differential could be nil, and hence $a_F = 0$ and $\beta = 0$. In this case,

$$R^* - \hat{P}^e = \gamma \gamma + \theta (DCFHR+Z).$$

The equilibrium real rate of interest would be a function of output and the change in the real domestic credit to households and corporations.

If, on the other hand, capital inflows respond to change in interest rates with infinite elasticity, that is $a_F = \infty$, $\beta$ approaches to unity and $\gamma$, $\theta$ to zero. In this case, the nominal interest rate would be determined by the world interest rate alone:

$$53/ \beta = \frac{1}{a_M - a_I - a_S - 1}.\frac{1}{a_F}$$
The actual observed interest rates may not be the market-clearing rate if excess demand (supply) of loanable fund does not push the interest rate up (down) instantaneously to its equilibrium level. We thus postulate the partial adjustment model to explain the interest rate behavior:

\[ R - R(-1) = \gamma (R^* - R(-1)). \]

Substituting \( R^* \) in the above equation yields:

\[
R = \gamma (-\beta) p^e + \gamma \beta (Rw \cdot ER^e/ER[-1]) + \lambda \gamma y \\
+ \lambda \theta (DCFHR + Z) + (1 - \lambda) R(-1),
\]

which can be rearranged to make the real interest rate as the dependent variable:

\[
R - p^e = \lambda \beta (p^e - \{Rw \cdot ER^e/ER(-1)\}) + \lambda \gamma y \\
+ \lambda \theta (DCFHR + Z) + (1-\lambda) (R(-1) - p).
\]

The OLS estimated coefficients of this equation in log-linear form are reported below:

\[
-\lambda \beta = -0.011 \\
(-0.10)
\]
$\lambda_Y = 0.286$
\[\text{(1.7)}\]

$\lambda = -1.215$
\[\text{(5.7)}\]

$(1-\lambda) = 0.474$
\[\text{(2.8)}\]

Constant = -2.149
\[\text{(-1.28)}\]

Sample period: 1967-1984  
D.W. = 2.29

The domestic interest rate used in the regression is the treasury bill rate. The world interest rate is approximated by the short-term US treasury bill rate. Expected inflation rate and exchange rate are approximated by the actual inflation rate, assuming perfect foresight. Variable Z (real government capital transfers, etc.) is omitted because of the lack of consistent time series. The results show that while all explanatory variables have correct signs (numbers in parameters are t-statistics), the significant variables are changes in real domestic credit and lagged interest rate. The output variable is significant at 10 percent significance level. 54/ The most insignificant variable is the differential between the inflation rate and the foreign interest rate. One might then conclude that domestic interest rates in the Philippines are largely determined by domestic credit market conditions. Since domestic interest rates do not clear

54/ When the foreign interest rate is dropped from the equation, output becomes significant at 2 percent significance level.
the loanable funds market instantaneously, net capital flows of the private sector fill the gap between domestic demand and supply of loanable funds at given interest rates.


Montiel, Peter (1985) "Long-Run Equilibrium in a Keynesian Model of a Small Open Economy," International Monetary Fund, Washington, D. C.


