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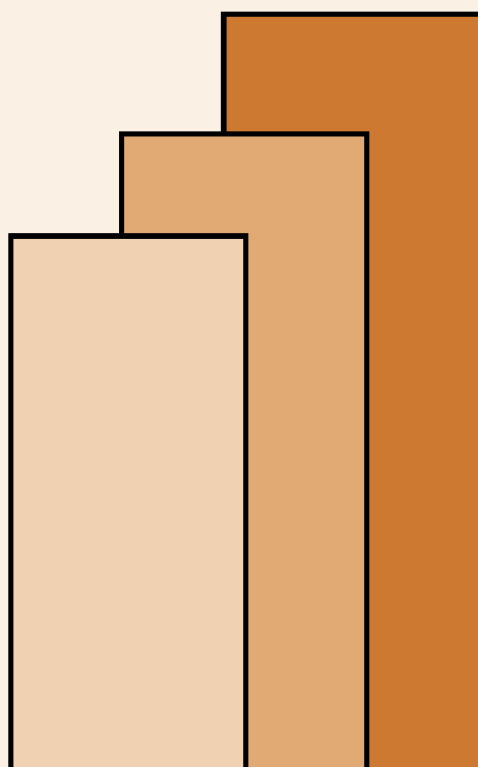
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INFLATION AND ECONOMIC GROWTH IN THE PHILIPPINES¹

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I. Introduction

"Inflation is dead" has been a popular adage for the past five years but it seems deep-seated problems have a way to resurrect themselves. This cavalier declaration by people like Lester Thurow and Roger Bootle is inaccurate and may be based on flawed theories or superficial empirical evidence.

In the Philippine context at least, inflation is still regarded as a clear and present danger to macroeconomic stability. After being maintained at single digit levels for the past four years, 1992-95, inflation reached double digit levels in the past nine months, averaging 11 percent over this period (see Table 1). The Philippines remains to be one of the high inflation countries in Asia.

What complicates the analysis of the relation between inflation and output growth are exogenous supply shocks in the past two decades and the manner in which economic managers responded to these shocks. Policies to stabilize the economy resulted in episodes of stagflation. Inflation subsequently declines but only after a lag while contractionary effects on output persist and eventually produce supply bottlenecks that contribute anew to inflationary pressure. Measures to dampen aggregate demand are again implemented but the vicious cycle is only repeated. This is another angle to the familiar boom-bust cycle.

This paper will describe the Philippine experience with inflation and economic growth. Section II explains the importance of controlling inflation by looking at the relationship of output and inflation. In Section III a brief review of the determinants of inflation in the Philippines will be presented. This will be the basis of the discussion on policy regimes in the Philippines in Section IV. Examination of pertinent data will show that heavy dependence on external finance and myopic macroeconomic management has led to a "fundamental problem of reconciling policies for economic growth and development with policies for moderating inflation." The adverse effects of stabilization measures will be summarized in Section V. Brief concluding remarks are given in the last section.

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II. The Costs of Inflation

The importance of sound money is one of two facets of the "Washington consensus," a term coined after the world's de facto capital. Here, the ideas were given a sense of formality by various multilateral institutions and think tanks including the International Monetary Fund and the World Bank. Sound money is of course synonymous to low inflation. The other facet of the "Washington consensus" is free markets and its concomitant programs of liberalization, deregulation and privatization.

In his critique of the "Washington consensus," Krugman (1995) states that estimates of the cost of inflation--defined as the overall reduction in real income--are "so low that they are embarrassing." He is quick to add, however, that bringing down inflation is undoubtedly a good thing and that very high inflation rates seriously disrupt the functioning of a market economy. He warns though that some of the methods used to achieve disinflation in developing countries have serious repercussions.

The direct costs of inflation could be examined at different levels. At the individual level, inflation exacts a toll on those with relatively fixed incomes. Relatedly, inflation favors debtors at the expense of creditors. Welfare analysis should be applied to determine the net impact of inflation.

At the firm level, the effects of inflation are usually couched in terms of menu costs. The relevant contributions are those of Rotemberg (1982, 1983), Naish (1986), Danziger (1988) and Benabou and Konieczny (1994). Inflation affects output when firms have to incur costs as they adjust to the new price level (e.g. changing their price list for customers).

At the macroeconomic level, studies have been more quantitative in nature. There has been recent cross-country evidence supporting the view that long-run growth is adversely affected by inflation. An oft-cited reference is that of Fischer (1993). The framework that is used is derived from endogenous growth theory which tries to determine the causes of difference in growth rates in different countries. The negative effect of inflation on output stems from the resulting macroeconomic instability which makes it more difficult for economic agents to plan efficiently thus reducing investment.

In the Philippine the direct costs of inflation have been measured by estimating its impact on output and its components. The welfare costs and distributional effects of the inflation tax have been largely ignored. In the PIDS Annual Macroeconometric Model (Reyes and Yap, 1993a), for example, a rise in sectoral prices and the general price level results in a decline in demand for the relevant sectoral output. This explains why the impact of a peso depreciation on total output is contractionary, particularly in the industry and service sectors.

Inflation as a proxy for macroeconomic stability also has a negative impact on real fixed investment in the PIDS model. Thus, controlling inflation will result in higher capital formation and expand the future productive capacity of the economy.

Lim (1996) has a similar investment equation, which is one of the four equations he estimates to trace the relationship between output growth and inflation. The first equation shows the logarithm of the consumer price index (LCPI) to be positively related to the moving average

of money supply (LMAMS), a moving average of wages (LMAW), a moving average of the price of imported inputs (LMAPM), and the past level of CPI (LCPI[-1]). The variables are all in logarithms. On the other hand LCPI is negatively related to the real interest rate (TBCPI) and, rather surprisingly, to the rate of capacity utilization (CAPU). In equation form we have

$$\text{LCPI} = f(\overset{+}{\text{LMAMS}}, \overset{+}{\text{LMAW}}, \overset{+}{\text{LMAPM}}, \overset{+}{\text{LCPI[-1]}}, \overset{-}{\text{TBCPI}}, \overset{-}{\text{CAPU}}) \quad (1)$$

The second equation shows the wage rate as proxied by the compensation of non-agriculture workers (LNQSE, which is a component of W in equation [1]) to be negatively related to the unemployment rate (UNEMPR) and positively related to a moving average of the rate of capacity utilization (MACAPU) and the past level of inflation which captures indexation (LCPI[-1]). In equation form we have

$$\text{LNQSE} = f(\overset{-}{\text{UNEMPR}}, \overset{+}{\text{MACAPU}}, \overset{+}{\text{LCPI[-1]}}) \quad (2)$$

Meanwhile, the unemployment rate is found to be negatively related to a moving average of the capacity utilization rate and the lagged unemployment rate, thus:

$$\text{UNEMPR} = f(\overset{-}{\text{MACAPU}}, \overset{+}{\text{UNEMPR[-1]}}) \quad (3)$$

Finally, we have the investment equation where the logarithm of gross domestic capital formation (LGDCF) is positively related to a moving average of GDP in logarithmic form and negatively to inflation. The specified equation is:

$$\text{LGDCF} = f(\overset{+}{\text{LNMAGDP}}, \overset{-}{\text{INFL}}) \quad (4)$$

All these equations are estimated using quarterly data for the period 1981-1994.

The first three equations combined will yield a short-run Phillips curve. Higher capacity utilization resulting from higher growth will lead to lower unemployment, higher wages and higher inflation. In practice the negative effect on the price level exerted by higher capacity utilization does not offset the impact of the higher wage rate.

Lim suspects that the negative coefficient of the variable CAPU in equation (1) is due to simultaneity, and is a reflection of the relationship between inflation and investment in equation (4). Note that investment and capacity utilization are directly related.

In general, when the direction of flow is from higher growth (originating from the supply side), a trade-off exists between inflation and unemployment. But an increase in the inflation rate brings down output growth via equation (4) and eventually leads to an increase in the unemployment rate. The relationship between inflation and unemployment is asymmetric and depends on whether the change is inflation-driven or output-driven.

A simple regression of the real growth rate of per capita GDP (g) on inflation (INFL) over the period 1970-1995 yields:

$$g = 3.909 - .241 \text{ INFL} + .572 g_{-1}$$

(5.20) (4.72)

Adj. $R^2 = .652$ D.W. = 1.84

ADF Test Stat = -3.08 MacKinnon 5% critical value = -1.96

Breusch-Godfrey LM test (4 lags): $N \cdot R^2 = 5.11$ Prob = .27

The figures in parentheses are the relevant t statistics. The results indicate a significant negative relation between inflation and per capita income growth although this may be caused by the episodes of stagflation.

To further investigate the relationship between output and inflation, we estimate a model similar to the one developed by Robert Lucas and Robert Barro and applied by Hanson (1980). A description of the model and the empirical results are presented in the Appendix.

The results show that only unanticipated inflation or monetary growth has a positive effect on the growth rate. Eight percentage points of unexpected inflation produce about one extra percentage point of growth. The results also show that an increase in expected inflation due to supply related developments (which means that money supply growth remains unchanged) leads to a decline in output growth rate. But the effect is small, supporting the observation made by Krugman.

III. Determinants of Inflation in the Philippines

Knowledge of the factors that significantly affect inflation will enable economic managers to target appropriate variables in their effort to maintain price changes at a moderate level. Most econometric inflation models for developing economies are based on mark-up over cost equations since external factors are readily incorporated. The latter is essential for open economies like the Philippines.

The first equation of the study of Lim (1996) shows that cost-push and demand-pull factors are important in the determination of the price level. The price of imported goods has the highest elasticity, followed by wages and money supply.

Reyes (1996), using a monthly inflation model, has similar findings. The price index for imports of non-fuels has the highest elasticity, followed by the liquidity variable and wage. The study of Reyes is an extension of the model of Mariano (1985). In the latter study, the variables with the largest elasticities are the liquidity variable, the import price index for non-fuels and the wage variable. The equation of Mariano shows, however, that food prices are also a significant

determinant of inflation. The models of Lim, Reyes and Mariano use the price level and not inflation per se as the dependent variable.

An earlier study is that of R. Bautista (1983) who estimated an inflation equation based on the annual growth of CPI. His results show that a large part of inflation for the period 1965-1982 can be attributed to foreign price increases and the depreciation of the peso. He does not find the growth of money supply and changes in the wage rate to be significant.

Meanwhile, a further refinement to the studies of inflation is the empirical model of C. Bautista (1991). By estimating a macroeconomic vector autoregression model (VAR) and applying variance decomposition, Bautista shows that the forecast error variance of inflation due to exchange rate movements is higher than that of money supply growth. This lends support to the BOP view of inflation which maintains that the exchange rate is the main cause of price changes. The empirical results do not show, however, that the fiscal view of inflation, which contends that the main determinant is money supply growth fuelled by fiscal deficits, is unimportant.

An interesting study is that of Lim (1987) which is based on the possibility that the working capital cost-push effect may offset the monetarist effect so that inflation may even rise after a reduction in money supply. The increase in inflation is caused by the rise in the interest rate which raises the cost of borrowing for working capital. The empirical results indicate a positive relation between relevant interest rates and inflation. Lim then concludes that "the simple quantity theory of money is oversimplified and hides the full impact of monetarist prescriptions to inflation and that it neglects the transmission mechanism of credit and monetary cutback which may entail a drastic fall in income, investments, personal consumption expenditure and most likely, government spending."

These studies show that adherence to the orthodox IMF prescriptions do not bring about the desired results. Inflation control is more effective through exchange rate stabilization and less import dependence. Moreover, contractionary monetary policy by raising interest rates and increasing the cost of working capital only exacerbates inflation.

IV. Policy Regimes: Stabilization and Output Growth

The economic structure of the Philippines has changed very little over the past two and a half decades and portrays much of a Latin American prototype economy: a dualistic structure in which a small proportion of the labor force is employed in a capital-intensive and highly protected manufacturing sector, while the larger share of the population is employed in typically low-productivity agriculture and urban informal services.

Over the past twenty-five years there has been a continuous struggle to maintain macroeconomic stability with growth being alternately limited by a foreign exchange constraint, a savings constraint and a fiscal constraint. The period 1970-79 is crucial since it was at this time that the Philippines accumulated a huge external debt burden which dictated the structure of economic policy in subsequent years. This is the reason this period is included in the analysis.

The following is a narrative of policy regimes from 1970-1995 based on Vos and Yap (1996). The basic data are shown on Table 2 while a summary is given in Table 3. The general theme is that economic managers, consistent with the econometric evidence, sought to control inflation by containing exchange rate movements and restricting money supply.

Unbalanced growth in the 1970s

Stagnation in the process of structural transformation might conceal the economic growth and changes that did take place in the 1970s and 1980s. The economy grew at an average rate of over 5 percent during the 1970s. This reasonable growth performance was largely fuelled by a protectionist incentive structure, a spillover of the import substitution program in the 1950s, and the massive support from public investment in infrastructure and energy financed largely by foreign borrowing during the 1975-1979 period.

Based on external shocks affecting the economy, economic performance in the 1970s can be meaningfully divided into two sub-periods: 1970-74 and 1975-79.

1970-74 (Consolidation phase)

This period is characterized by adjustment to the balance-of-payments and short-term external debt crisis which was built up during the late 1960s. An authoritarian regime is established which implements a macroeconomic stabilization program. Recovery is supported by a boom in commodity prices for Philippine exports towards the end of this period, leading to high growth rates by historical standards. Inflation accelerates to an annual average of 18.8 percent and is caused by cost-push factors (a major devaluation and the first oil price shock).

1975-79 (Period of debt-led growth)

This period begins with adjustment to the first oil price shock and falling prices of major Philippine export commodities, reflected in the deteriorating terms-of-trade starting in 1975. The supply-led external finance boom provides the required adjustment finance and allows an investment expansion led by import substituting industries and public infrastructure and energy programs. Real GNP growth reaches 6.1 percent per annum.

Manufacturing activity has the highest growth rate. The period's exceptional growth is also fuelled by an export-oriented program, which operates under a protectionist incentive structure and support from the expansion in public infrastructure. Encouraged by successful changes elsewhere in the region and sector support of multilateral agencies (the World Bank, in particular), specific government programs are set up to promote nontraditional manufactured exports. The program is successful to the extent that the share of manufactured exports increases from seven percent in 1970 to 75 percent in 1992. Deeper analysis shows that this export success is largely illusory : for instance, exports of semi-conductors contribute more than 10 percent of total export earnings, but less than 0.5 percent of total value added and around 0.1 percent of employment. Such stylized facts also apply to garments exports. Due to the high share of

imported inputs in both sectors, backward linkages with the rest of the economy are small, limiting the diffusion of the sectoral growth dynamics.

Agriculture growth, though below the performance of the economy, is not unsatisfactory compared with the performance of the sector in neighboring countries, reaching an all-time high of ten percent growth in 1976. Agricultural performance is aided by government support in the form of rural infrastructure and improved input supplies (fertilizers, credits and high-yielding seeds) in a number of important subsectors (especially rice) and regions.

The period also witnesses the aggressive expansion of the public sector mainly through newly created public enterprises. The consolidated public sector deficit reaches an all time high of 9.3 percent of GNP in 1976. The massive expansion of externally financed public investment is conditioned in part by a program of energy-saving, effective import substitution and, in part, by a program of political consolidation by the Marcos regime. Some analysts contend that public enterprises were used as a conduit of foreign loans which would otherwise have not been contracted.

GNP per capita almost doubles from US\$ 336 in 1974 to US\$ 586 in 1979; but this growth does not seem to trickle down in equal shares to all population groups. For the agricultural sector, relative prices (internal terms of trade) appear favorable at the start of the period, but decline towards the end of the decade. Data on real wages are scarce and have to be taken with caution, but available information on the real wage index for unskilled workers suggests a declining trend since the beginning of the decade. Falling terms of trade for agriculture, declining real wages, and employment growth falling behind output growth (particularly in industry) underlie the shift in income distribution toward urban profit incomes during this period of moderate to rapid GNP growth. Since the industrialization process is concentrated in the domestic market and basic consumer goods, this shift in income distribution signals an unbalanced sectoral growth path likely to run against demand constraints similar to industrialization experiences in Latin America.

Crisis and Adjustment in the 1980s

Adjustment to another set of external and internal shocks mark the three subsequent sub-periods: 1980-82, 1983-85, 1986-90.

1980-1982 (Pre-crisis stage)

This 'pre-crisis' period is characterized by coinciding internal and external shocks. External shocks are, in sequence, the second oil price shock, the steep increase in world interest rates, recession in the industrialized countries, and an additional (short-term) loan-supply shock. The domestic shock results from the external finance boom of the previous period and the subsequent excessive financial leverage of public and private firms. A World Bank-supported financial liberalization program pushes up domestic interest rates and provokes liquidity problems for many firms and banks, eventually leading to an internal financial crisis in 1981.

The government's attempt to selectively bail out favored, distressed firms leads to a severe loss of private investment confidence and massive private capital outflows.

The economy slows down during this period to an average growth rate of 3.6 percent; real GNP growth rate drops to 1.9 percent in 1982. The downward trend occurs despite the rise in public sector deficit from 3.4 percent of GNP in 1979 to 7.3 percent in 1981 in an attempt to counteract the impact of the external shocks.

1983-85 (Crisis stage)

A major balance of payments crisis emerges as terms of trade continue to fall and available external finance contracts, a consequence of the crisis in the international financial system following the default of major debtor countries. Adjustments to the crisis involve a moratorium on debt repayments, cuts in public expenditure, and a massive reduction in import volumes. These lead to a fall in private investment rates. The economy plunges into a major recession.

The growth of money supply (M3) falls to 12.3 percent in 1983-85 from around 18 percent in the preceding period. Reductions in public expenditures are partly offset by increased transfers required to keep the struggling public enterprises in business. The CPSD falls from 6.2 percent to 3.2 percent of GNP. Industrial capacity utilization drops severely as the allocation of foreign exchange impinges heavily on import-substituting industries, exacerbated by a high interest rate policy which attempts to arrest private capital outflows ('capital flight') and counteract the inflationary effects of devaluation. Real GDP falls by 7.3 percent in 1984.

The manufacturing sector suffers most, showing an 11.5 percent fall in output in 1984 and 15.8 percent in 1985. GNP per capita recedes to the levels reached in the late 1970s, as it declines from US\$ 723 in 1982 to US\$ 547 in 1985. The agricultural terms of trade increase, however, as successive devaluations push up average agricultural prices.

Next to the strong, mainly expenditure-reducing domestic adjustment, there are attempts to strengthen the traded goods sector. A series of devaluations, along with contractionary fiscal and monetary policies, result in a depreciation of the real effective exchange rate (REER), which is 17 percent in 1983 and 4.6 percent in 1984. This gives a boost to export growth and, along with the severe cuts in imports, creates a current account surplus in 1986.

Nevertheless, the crisis hastens the collapse of the political regime, as all economic sectors are affected and the domestic coalition supporting the Marcos regime sees its financial resources (domestic and foreign) dwindling.

1986-89 (Period of Difficult Recovery)

This period starts off with the internal shock of the collapse of the Marcos regime and the installation of a new government embarking on a program of quick recovery by pump-priming

current public expenditures while cutting public investment. External conditions are slightly less adverse than in the previous two periods, while debt rescheduling and new sources of external funding (official bilateral and multilateral flows) provide adjustment finance. Private and public demand expansion and enhanced import capacity stimulate a recovery of private investment. The sharp reduction in political uncertainty and worldwide acclaim for the peaceful transition also provide a boost.

Other external developments that aid the recovery are the fall in world prices of crude oil in late 1987, recovery of coconut prices, and the increase in the US sugar quota to the Philippines in 1986. Growth rebounds to over 5 percent. Because of the low inflation rate, the REER depreciates sharply in 1986 but fluctuates in a narrow band the rest of the period.

Unfortunately, the new government does not take advantage of its international popularity and immediately agrees to honor external debt obligations. This leads to a net capital outflow of \$7.7 billion between 1986 and 1991.

This is one reason the euphoria is short-lived. The economy reaches full capacity in 1988 and supply bottlenecks emerge. This is reflected in an acceleration of the inflation rate from 3.8 percent in 1987 to 10.6 percent in 1989. Another domestic shock in the form of the most serious coup attempt in 1989 shakes business confidence. Structural economic problems remain, thereby fuelling the sense of political instability. GNP per capita recovers to US\$ 700 in 1989, though it is still below the level reached at the beginning of the decade.

Recession and Recovery in the 1990s

1990-92 (Recession and Fiscal Constraint)

Another balance of payments crisis ensues towards the latter part of 1990, hastened by the rise in oil prices following the Iraq invasion of Kuwait. Economic recovery toward the end of 1991 is predicted, but this does not materialize because of a severe energy crisis that can be traced to a fiscal constraint with public investment in infrastructure cut back to well below two percent of GNP for most of the 1980s. To make matters worse, the biggest volcanic eruption this century occurs in mid-1991. GNP growth in this period averages a mere 1.8 percent, but staying below one percent in 1991-92.

The Aquino administration pursues trade liberalization measures with more vigor. AFTA takes center stage in 1992. A key policy measure is the liberalization of all regulations governing foreign exchange transactions, which takes effect in the last quarter of 1992.

The peso depreciates sharply in 1990 but recovers lost ground in 1992 after real interest rates rise again. The net result is an appreciation of the REER.

A new government is elected in 1992, promising drastic measures to address the energy crisis but it continues to paralyze economic activity throughout most of the year. In the island of

Luzon, where 80 percent of industrial output is produced, power outages are a daily experience. Economic performance is a far cry from the 6 percent growth target the Philippine government had set out for this period. This target is based on assumptions about adequate external finance, which has not been as forthcoming as expected, but obviously this is but one condition which cannot compensate for all the structural problems of the Philippine economy.

1993-95 (Economic Recovery and Reform)

The energy crisis is finally resolved spurring economic recovery. The economic platform of the Ramos administration crystallizes. Trade liberalization, deregulation and privatization programs are implemented. Among the affected sectors are telecommunications and shipping. Profitable state enterprises and prime government real estate are sold to the private sector. The high points are the approval of the GATT accord in late 1994 and the issuance of an executive order in July 1995 further reducing tariffs and setting a timetable for the eventual realization of uniform rates.

With a more liberal environment, capital flows pour into the country. While these are mainly speculative, the foreign exchange constraint is relaxed as reserves reach a historical high. The peso appreciates sharply in 1994 but depreciates as the Central Bank relaxes monetary policy. On the whole, the REER continues to appreciate in this period. Meanwhile, proceeds from the privatization program ease the fiscal constraint. What impedes more rapid investment is the decline in domestic savings relative to GNP.

The administration proudly announces that per capita GNP surpasses the \$1,000 threshold in 1995, three years ahead of schedule. However, no mention is made of the paradox that real GNP growth has been constantly below target in the past five years which only means that the currency is overvalued--a combination of inflation above target and an exchange rate below target. With tax effort still below the ASEAN norm, the question is whether growth will be sustained or the Philippines will go the way of the Tequila syndrome.

V. The Costs of Disinflation

Evidently the Philippines is one country which has been committed to the Washington consensus. When BOP crises ensue, the response is to devalue the currency and apply contractionary fiscal and monetary policies. Thereafter, efforts are focused on stabilizing the exchange rate to ease inflationary pressure.

Despite claims by the Philippine Central Bank to the contrary, the exchange rate has been a primary target of monetary policy as shown by Gochoco (1992). By comparing the volatilities of money aggregates and the exchange rate, she confirms that the defense of the exchange rate has been the overriding objective of monetary policy. Relatedly, Reyes and Yap (1993b) find no causality between money and prices during the period 1981-1992.

While the inflationary consequences of a devaluation is a major factor, another consideration for a stable exchange rate is the performance of the industrial sector which remains relatively inward-oriented. A more compelling reason though in the period after 1985 is the internal transfer problem wherein the government owes the bulk of the external debt (about 80 percent) but has to source the foreign exchange from the private sector. A strong peso, of course, mitigates the costs of repaying the external debt.

The consequence of this exchange rate policy is an overvalued currency which has been well documented (Medalla, et al. 1995). This can be also be observed by comparing the movement in the REER of the Philippines with other countries in the region, some of which are our closest competitors (Table 4). During the period 1970-993 Malaysia and Thailand had an average real effective exchange rate depreciation of 2.7 percent while that of Indonesia was 4.6 percent. In the case of the Philippines, the average was only one percent. This is rather surprising considering that the other countries had sounder fundamentals in terms of external balances, particularly in the last ten years.

An overvalued currency has several adverse effects. Table 5 shows that the ratio of tradeables to nontradeables value added has been falling since 1979. The price ratio of tradeables to nontradeables has also declined since 1987. As Montes and Lim observe: "The continuing shift in relative prices that makes real estate, financial speculation and retail trade (economic activity in new shopping malls) attractive vis-à-vis the industrial and tradeable sectors is a disturbing trend."

Another effect of an overvalued currency is a widening trade deficit (Table 1), which reached 12 percent in 1994 and 1995, the highest level at least for the past twenty-five years. The economy's propensity to import has been increasing (Table 6) while export performance has not kept pace. The ratio of exports to GDP even declined in 1992. In the past decade, remittances from overseas workers prevented the problem of a widening trade deficit from turning into a full-blown crisis. It should be apparent that dependence on OCW remittances cannot continue for long and measures must be implemented to increase exports (with the required backward linkages) and reduce import dependence.

The conservative debt management strategy of the Philippine government also reduced the flexibility in fiscal management. The task of maintaining the public sector deficit at manageable levels (to restrain inflation, of course) was made more difficult because total national government expenditures began to increase, with the expansion largely driven by interest payments on national government debt. From a six percent share of total national government spending in 1980, this item peaked at 35 percent in 1988 before settling at 31 percent in 1991 (Table 7). While the yield and elasticity of tax revenues increased, it was not enough to prevent the development of unsustainable budgetary trends.

Table 7 shows that as a share of total national government outlays, Maintenance and Operating expenditures (MOE) along with infrastructure spending were the categories that experienced the largest cuts. As a result of these reductions, public investment on a per capita basis declined by almost 50 percent between 1981 and 1991 (Table 8). Meanwhile, total public

sector expenditure on a per capita basis fell by slightly more than 31 percent during the same period.

The rather myopic fiscal policy caused the disruptive power outages in the early 1990s. Moreover, infrastructure has been deteriorating rapidly and new projects have not kept pace with economic expansion and population growth. This has created supply bottlenecks in many sectors of the economy. Lim (1995) presents diagrams showing that per capita length of roads and per capita length of bridges have been falling in the 1980s and early 1990s. The severe shortage in the supply of rice in the latter part of 1995 is related to this dearth in infrastructure. While weather conditions are the proximate cause, the deficiency in irrigation facilities is the root cause behind the structural decline in our rice-producing capability.

Tight monetary policy also has potential negative effects as seen from the study of Lim (1987). Aside from their inflationary impact, high interest rates have also taken their toll on private investment. As seen from Table 2, private investment as a share of GNP has not reached the 25 percent threshold recommended by the World Bank. Moreover, periods of low money growth are associated with low GDP growth and relatively high inflation (Table 1), supporting the hypothesis of the working capital cost-push effect.

VI. Conclusion

The Machiavellian approach to controlling inflation has not been effective in the Philippines. Certainly, Krugman's warning about the serious repercussions of some methods of disinflation is quite relevant especially when juxtaposed against the potential costs of inflation.

Financial managers responded appropriately during the crisis periods but were rather short-sighted during the recovery phases particularly during the period 1986-95. For one thing, a more aggressive debt management strategy should have been adopted. But even with the "honor thy debt" commandment in place, monetary, fiscal and exchange rate policy should not have been formulated in a manner that sacrifices long-term growth.

Definitely, an inflation of 10-15 percent could have been tolerated as long as the source was productivity-enhancing government expenditure. A steady depreciation to maintain a realistic real exchange rate could have been accommodated in this scenario.

As it stands now, economic managers have to contend with volatile capital flows and as a result, the wisdom of liberalizing the capital account ahead of the trade sector is being questioned. To prevent further appreciation of the real effective exchange rate in the presence of these capital flows, it has been proposed that instead of targeting monetary aggregates, the Central Bank targets interest rates and an appropriate real exchange rate (De Dios, 1995). Nevertheless, the key to macroeconomic stability is strong fiscal performance via a higher tax effort. This is what preoccupies the government at present and the outcome of the tax reform program still hangs in the balance.

Finally, it should be mentioned that one prominent source of inflationary pressure that did not figure in the discussion is the oligopolistic structure of the economy. This may well be the major impediment to economic development but this is a subject best left to other studies.

References

- Bautista, C. C. (1991), "Sources and Variability of Inflation in an Open Economy." University of the Philippines School of Economics Discussion Paper 9115.
- Bautista, R. M. (1983), "Determinants of Inflation in the Philippines." University of the Philippines School of Economics Discussion Paper 8309.
- Benabou, R. and J. D. Konieczny (1994), "On Inflation and Output with Costly Price Changes: A Simple Unifying Result," *American Economic Review* 84 (1), March.
- Danziger, L. (1988), "Costs of Price Adjustment and the Welfare Economics of Inflation and Disinflation," *American Economic Review* 78 (4), September.
- De Dios, E. S. (1995), "On Recent Financial Flows: Causes and Consequences" in Fabella and Sakai (eds.)
- Fabella, R. S. and H. Sakai, eds. (1995) *Towards Sustained Growth*. Tokyo: Institute of Developing Economies.
- Fischer, S. (1993), "Macroeconomic Factors in Growth." Paper presented at the World Bank Conference on "How do National Policies Affect Long-run Growth?"
- Gochoco, M. S. (1992), "Targets, Instruments, and Monetary Policy in an Open Economy: A GARCH Application." Working Paper NO. PB92-04 Federal Bank of San Francisco, Center for Pacific Basin Monetary and Economic Studies.
- Hanson, J. A. (1980), "The Short-Run Relation Between Growth and Inflation in Latin America: A Quasi-Rational or Consistent Expectations Approach" *American Economic Review*, 70 (5), December.
- Krugman, P. (1995), "Dutch Tulips and Emerging Markets" *Foreign Affairs*, 74 (4), July/August.
- Lim, J. Y. (1987), "The New Structuralist Critique of the Monetarist Theory of Inflation: The Case of the Philippines," *Journal of Development Economics* 25.
- Lim, J. Y. (1995), "Structural Shifts in Key Macro Parameters: Implications on the Sustainability of Growth" in Fabella and Sakai (eds.).

- Lim, J. Y. (1996), "On the Question of a Tradeoff Between Sustainable Growth and Price Stability" Manuscript.
- Mariano, R. S. (1985), *Forecasting Monthly Inflation in the Philippines*. PIDC Monograph Series No. 10.
- Medalla, E. M., G. R. Tecson, R. M. Bautista, J. H. Power and Associates (1995), *Catching Up with Asia's Tigers Volume II*. Makati: Philippine Institute for Development Studies.
- Montes, M. F. and J. Y. Lim (1996), "Macroeconomic Volatility, Investment Anemia and Environmental Struggles in the Philippines," *World Development*, 25 (2).
- Naish, H. F. (1986) "Price Adjustment Costs and the Output-Inflation Trade-off," *Economica* 53 (210), May.
- Reyes, C. M. (1996), "An Empirical Analysis of the Determinants of Inflation in the Philippines" Manuscript.
- Reyes, C. M. and J. T. Yap (1993a), "Re-estimation of the PIDS Macroeconometric Model" Manuscript.
- Reyes, C. M. and J. T. Yap (1993b), "Money and Prices in the Philippines, 1981-1992: A Cointegration Analysis," *Journal of Philippine Development*, Volume XX, No. 1.
- Rotemberg, J. (1982), "Monopolistic Price Adjustment and Aggregate Output," *Review of Economic Studies*, 49 (October).
- Rotemberg, J. (1983), "Aggregate Consequences of Fixed Costs of Price Adjustment," *American Economic Review* 73 (3), June.
- Vos, R. and J. T. Yap (1996) *The Philippine Economy: East Asia's Stray Cat?—Structure, Finance and Adjustment*. London: Macmillan.

Table 1
Selected Macroeconomic Variables
1970-1995

Year	Inflation (%)	GDP growth rate (%)	Money supply growth (%)	Exchange Rate (P/\$)	Trade Balance/GDP (%)	91-day T-bill (%)	External Debt (m US\$)
1970	15.00	3.76	4.92	6.02	-0.43	13.14	2297
1971	21.59	5.43	11.71	6.43	-0.67	11.95	2393
1972	8.41	5.45	13.16	6.67	-1.55	11.92	2732
1973	16.38	8.92	52.15	6.76	2.88	9.43	2886
1974	34.07	3.56	17.44	6.79	-3.03	10.05	3755
1975	7.18	5.56	36.21	7.25	-7.82	10.34	4939
1976	8.76	8.81	24.26	7.44	-6.20	10.19	6768
1977	9.95	5.60	22.37	7.40	-3.89	10.9	8069
1978	7.33	5.17	18.01	7.37	-5.76	10.89	10694
1979	17.67	5.64	10.65	7.38	-5.61	12.25	13352
1980	18.09	5.15	18.20	7.51	-5.97	12.14	17252
1981	13.29	3.42	21.08	7.90	-6.24	12.61	20893
1982	10.20	3.62	16.06	8.54	-7.12	13.81	24677
1983	9.95	1.87	19.90	11.11	-7.47	14.17	24816
1984	50.32	-7.32	7.20	16.70	-2.16	30.53	25418
1985	23.11	-7.31	9.87	18.61	-1.57	26.81	26252
1986	0.80	3.42	7.31	20.39	-0.68	14.43	28256
1987	3.72	4.31	12.12	20.57	-3.06	11.39	28649
1988	8.81	6.75	22.57	21.09	-2.86	14.06	27915
1989	12.20	6.21	27.98	21.74	-6.10	19.33	27616
1990	14.17	3.04	18.36	24.31	-9.07	23.4	28549
1991	18.66	-0.58	15.49	27.48	-7.07	21.35	29956
1992	8.95	0.34	11.04	25.51	-8.86	16.12	30934
1993	7.61	2.12	24.55	27.12	-11.44	12.25	34282
1994	9.03	4.42	26.58	26.42	-12.24	13.62	37698
1995	8.08	4.84	25.32	25.71	-12.09	11.35	40595 /a

Memo Item:
Average inflation for September 1995 to May 1996 is 11.2%..
/a - as of June 1995.

Sources: Philippine Statistical Yearbook, various years.
Bangko Sentral ng Pilipinas.

Table 2
Selected Economic Indicators of the Philippines, 1970-1995

Indicator	1970-74	1975-79	1980-82	1983-85	1986-89	1990-92	1993-95
I. Income							
Per Capita Real Income, pesos	9831	11589	12669	13328	10871	11461	11525
Real GNP (% growth)	5.7	6.1	3.6	-4.9	5.5	2.3	4.1
Real GDP	5.4	6.2	4.1	-4.3	5.2	0.9	3.8
Agriculture	2.8	4.5	2.8	-2.1	3.3	0.7	1.9
Industry	8.0	7.9	4	-8.9	5.8	-0.2	4.9
Services	5.0	5.4	4.9	-1.1	5.6	2.0	3.9
Investment (%share to GNP), real							
Private	14.89	18.1	20.49	16.75	15.09	17.03	18.41
Public	1.97	5.90	5.89	6.35	2.96	3.91	3.97
Real GDP (% shares)							
Agriculture	27.4	24.5	23.3	23.2	23.9	22.6	22.2
Industry	35.3	39.6	40.7	38.0	35.2	34.9	34.8
Services	37.4	35.9	36	38.8	40.9	42.5	42.9
II. External Sector							
Degree of Openness (% of GNP) ^{1a}	34.3	37.3	38.3	36.1	39.0	45.3	54.1
Current Balance/GNP (%)	0.7	-5.3	-6.8	-4.1	-0.6	-3.1	-4.0
BOP/GNP (%)	1.8	-1.2	-2.4	0.7	2.0	2.4	1.1
Terms of Trade (index) ^{1b}							
Real Effective Exchange Rate (index) ^{1c}	97.6	72.9	70.8	82.1	85.7	69.4	64.6
	98.9	96.8	102.5	86.4	68.8	71.2	79.3
III. Public Sector							
Public Sector Deficit/GNP (%) ^{1d}	n.a.	5.7	6.2	3.2	2.6	2.2	0.3
IV. Monetary Sector							
Money Supply (M3) (growth rate)	19.9	22.3	18.4	12.3	17.5	15.0	25.5
Gross International Reserves, m\$	743	1767	2480	937	2207	3894	6814
V. Labor Sector							
Open Unemployment Rate (%)	5.6	7.1	8.9	11.2	10.4	8.6	8.6
Underemployment Rate (%)	13.4	11.8	26.3	30.8	24.8	10.0	9.5
Real Wage Index (unskilled, urban)	227.3	157.1	119.2	105.2	110.6	105.3	126.0
Sectoral Employment (% shares)							
Agriculture	52	52.1	51.6	50.0	47.6	44.0	45.0
Industry	15.8	15.3	14.7	14.5	14.7	15.7	15.5
Services	32.2	32.5	33.8	35.5	37.7	38.8	39.5
VI. Prices							
Inflation Rate (%) ^{1f}	18.8	9.9	13.4	26.8	5.9	13.9	8.2
GDP deflator (growth rate)	17.4	10.0	11.4	28.4	7.3	12.5	8.0
Wholesale Price Index (growth rate)	25.7	8.9	14.6	33.7	7.8	9.4	3.4
Internal Terms of Trade (% change) ^{1g}	7.0	-3.1	-7.2	1.4	-2.2	-13.1	22.3
VII. Population (mil., end of period)							
Population growth rate (%)	41.1	47	50.8	54.7	60.1	63.7	68.6
	2.8	2.7	2.6	2.5	2.4	2.8	2.5
VIII. Income Distribution							
Poverty Incidence	n.a.	n.a.	n.a.	44.2	40.2	39.2	35.7
Gini Ratio	n.a.	n.a.	n.a.	0.4466	0.4446	0.4680	0.4507
No. of families below poverty threshold (m)	n.a.	n.a.	n.a.	4.355	4.230	4.781	4.559
IX. GNP per capita (US\$, end of period)							
Real pesos of 1995 (end of period)	336	586	723	547	698	1100	1090
	10465	12329	12868	10461	11638	11000	11433

Notes:

- a/ Defined as [(Imports+Exports)/GNP] in constant prices.
- b/ Relative price of unit price index of merchandise exports over unit price of imports.
- c/ Trade weighted real exchange rate; monthly average, December 1980=100.
- d/ Includes general government, state-monitored corporations and Central Bank.
- e/ Defined as occupied workers working less than 40 hours per week.
- f/ Prices based on 1988=100.
- g/ Rate of implicit GDP deflator of agriculture to that of non-agriculture.

Sources:

National Income Accounts, various years.
Philippine Statistical Yearbook, various years.
Family Income and Expenditure Survey, various years.
Bangko Sentral ng Pilipinas.

Table 3
Major Economic Shocks and Policy Responses in the Philippines
1970 - 1995

	1970-74	1975-79	1980-82	1983-85	1986-90	1990-92	1993-95
External Shock	Foreign debt crisis Commodity price boom Oil price shock	Cheap foreign credit Increased foreign investment Deteriorating terms of trade	Oil price shock Recession abroad High world interest rates Restricted foreign credit	Stoppage of foreign debt inflow	Negotiated debt rescheduling inflow Resumed multilateral and bilateral loan inflows Net resource outflow due to debt payment	Gulf war	Surge in speculative capital inflows Sharp rise in OCW remittances
Domestic Shock	Rise of strong nationalist movement/ Martial Law declaration		Dewey Dee financial crisis	Assassination of Aquino	Takeover of Aquino gov't. Coup attempt	Volcanic eruption, energy crisis, Presidential election	Mid-term elections Rice and sugar crisis Concern over criminality
Monetary Policy	Tight due to inflationary pressures from devaluation	Expansionary, subsidized credit to priority areas	Highly expansionary and counter-cyclical, financial liberation	Restrictive and deflationary high interest rates	Expansionary in earlier years; tight with high interest rates in later years	Tight, lower real interest rate due to inflation surprise but recovery in 1992	Established an independent Central Bank More relaxed policy
Fiscal Policy	Tight due to inflationary pressures from devaluation	Expansionary, particularly on government investment	Counter cyclical	Contractionary, concentrated on debt service and bailout of government corporations	Expansionary in earlier years but became tight with concentration on domestic borrowings and tax reforms	Tight, cutback operation and expenditures on capital outlays	Large scale privatization NG surplus
Trade and Industry Policy	Devaluation, export promotion	Export promotion, protection of import substitute, failed plan for heavy industrialization	Removal of QR's	Suspension of trade lib, taxation of tradeables, rationing of foreign exchange devaluation	Trade liberalization,	Forex liberalization, focus on AFTA, sharply appreciating peso, emphasis on energy projects	GATT accord Timetable for uniform tariff
Combined Effects	High growth, high inflation	High growth, shift to non-traditional exports	Slow growth, inflation	Deep economic recession, high inflation	Economic recovery up to 1989, increasing current account deficits	Recession, high inflation in 1991 Peso appreciation	Economic recovery Large increase in exports Fluctuations in
Private Response	Favorable, high investments	Favorable, high savings and investments	Unfavorable, reduced savings, capital flight but continued investments spurred by gov't pump-priming	Collapse of business confidence	Renewed confidence initially, erratic behavior in later years	Renewed confidence due to peaceful transition of power, sharp decline due to energy crisis	Investment still disappointing but signs of greater confidence

Note: Summary of key events is based on Table 3.1 of M. Lamberte, J. Lim, R. Vos, J. Yap, E. Tan, and S. Zingapan. Philippine External Finance, Domestic Mobilization and Development in the 1970s and 1980s, PIDS: Makati, 1990.

Table 4
Comparison of Real Effective Exchange Rate
Selected Countries
(1980=100)

Years	Philippines	Taiwan	Malaysia	Thailand	Indonesia
1970	96.35	91.01	132.54	130.11	115.85
1971	100.32	86.09	129.70	122.04	101.95
1972	93.45	78.81	130.51	107.41	89.73
1973	93.22	77.92	133.02	104.67	97.39
1974	111.20	105.27	137.40	116.67	121.05
1975	102.20	100.20	129.35	109.05	117.82
1976	100.27	96.74	118.74	108.99	129.30
1977	97.63	92.10	112.29	102.47	128.27
1978	88.10	85.94	103.04	88.36	110.41
1979	95.94	90.99	104.89	92.53	91.50
1980	100.95	99.14	103.81	101.49	98.34
1981	101.32	107.11	102.51	104.23	99.50
1982	105.18	102.73	110.66	109.91	114.76
1983	86.91	96.41	111.82	109.51	85.70
1984	82.93	94.25	113.04	100.97	83.26
1985	89.41	89.27	104.29	87.15	86.28
1986	71.45	82.15	82.77	74.31	63.84
1987	67.11	91.32	77.04	69.50	41.46
1988	66.04	95.82	70.46	68.19	40.02
1989	70.71	107.51	70.35	67.76	41.32
1990	69.20	105.01	68.70	70.82	41.35
1991	68.18	103.24	65.83	70.45	40.01
1992	76.37	109.34	70.71	69.38	38.81
1993	74.65	103.91	70.58	68.85	38.89
1970-74	98.9	87.8	132.6	116.2	105.2
1975-79	96.8	93.2	113.7	100.3	115.5
1980-82	102.5	103.0	105.7	105.2	104.2
1983-85	86.4	93.3	109.7	99.2	85.1
1986-89	68.8	94.2	75.2	69.9	46.7
1990-92	71.3	105.9	68.4	70.2	40.1

Source: Bangko Sentral ng Pilipinas.

Table 5
Comparison of Tradeable and
Non-tradeable Sectors

Year	Ratio of Value added (T/NT)	Ratio of Price Index (T/NT)
1970	64.166	0.909
1971	63.082	0.891
1972	64.095	0.877
1973	70.446	0.914
1974	66.274	0.947
1975	63.599	0.962
1976	62.575	0.947
1977	63.911	0.963
1978	65.723	0.984
1979	65.997	1.007
1980	63.371	0.978
1981	58.686	0.960
1982	54.204	0.941
1983	51.610	0.963
1984	55.955	1.070
1985	55.158	1.000
1986	53.471	0.995
1987	54.658	1.024
1988	54.057	0.998
1989	50.904	0.977
1990	48.846	0.957
1991	48.767	0.969
1992	46.886	0.948

Source: J.A. R. Tan III (1995): "Modelling
 Real and Financial Sector Interaction in a
 Credit Rationing Economy: Implication on
 Central Bank Policy", Dissertation UP
 School of Economics.

Table 6
Analysis of Trade Performance

	1991	1992	1993	1994	1995	1Q'96
1) Ratio of Exports to GDP	19.4	18.5	20.9	21.0	23.5	24.5
2) Ratio of Imports to GDP	26.5	27.4	32.4	33.3	35.8	38.4
3) Ratio of Imports of Capital Goods to Fixed Investment	32.4	36.3	43.4	45.3	48.5	n.a.
4) Ratio of Imports of Consumer Goods to Total Personal Consumption	3.0	3.1	3.8	4.4	5.1	n.a.
5) Ratio of Imports of Raw Materials, Intermediate Inputs and Fuel to GDP	16.8	16.6	18.1	18.2	19.7	n.a.

Note : A similar table appears on page 19 of Lim (1995).

Source of Basic Data: Bangko Sentral ng Pilipinas and National Statistical Coordination Board.

Table 7
Total Government Expenditure
Percentage Share

Year	Maintenance and Operating (MOE)	CURRENT OPERATING EXPENDITURE				CAPITAL OUTLAYS			TOTAL GOVERNMENT EXPENDITURE
		Interest Payments (INTPAY)	Personal Services (PERSERV)	Others (OTHERS)	Total (TCOE)	Infrastructure (INFRA)	Others (OTHERS)	Total (TCAPOUT)	
1976	39.52	3.65	29.72	4.79	77.68	13.25	9.08	22.32	20338
1977	41.72	3.94	27.61	4.56	77.83	10.36	11.81	22.17	22766
1978	35.72	4.37	28.53	5.33	73.96	14.03	12.01	26.04	26002
1979	30.62	6.36	28.44	5.75	71.16	14.76	14.08	28.84	28959
1980	28.68	6.13	24.92	5.74	65.47	19.62	14.91	34.53	37443
1981	23.89	5.15	22.55	4.38	55.97	21.15	22.88	44.03	47150
1982	26.16	7.06	21.13	8.64	63.00	13.44	23.56	37.00	50392
1983	23.57	9.86	27.39	7.32	68.13	13.71	18.16	31.87	50670
1984	19.85	16.65	26.97	5.13	68.59	10.02	21.39	31.41	82503
1985	16.83	18.68	29.20	5.78	70.48	7.02	22.50	29.52	78424
1986	15.76	22.67	26.21	5.55	70.19	8.18	21.63	29.81	95349
1987	16.73	32.71	28.83	6.37	84.64	6.47	8.89	15.36	112830
1988	14.96	35.10	31.22	5.66	86.94	6.43	6.63	13.06	130652
1989	15.93	32.51	30.52	6.98	85.93	7.78	6.29	14.07	168312
1990	14.10	33.19	29.02	7.97	84.29	6.21	9.50	15.71	214248
1991	14.99	30.93	29.98	6.63	82.52	7.29	10.19	17.48	241508

Source: Department of Budget and Management.

Table 8
Public and Private Investment
On per capita basis (pesos in 1985 prices)
(1980-1991)

Year	Public Investment	Public Expenditure	Private Investment
1980	722.33	1760.83	2171.76
1981	1036.57	2019.38	2150.14
1982	914.74	1943.19	2367.29
1983	1121.47	2079.19	2370.55
1984	965.91	1845.05	1574.38
1985	552.81	1348.89	1096.29
1986	442.29	1222.04	1168.38
1987	415.98	1214.36	1246.83
1988	418.68	1269.21	1435.69
1989	524.61	1402.40	1730.37
1990	579.46	1517.00	1796.71
1991	525.39	1386.66	1513.98

Public Investment = Public Construction + Public Durable Eqpt.
Private Investment = Private Construcion + Private Durable Eqpt.
Public Expenditure = Public Investment + Public Consumption

Source: National Income Accounts.

APPENDIX

A Simple Model of Output Growth and Inflation

I. The Basic Model

Consider the Lucas-Phelps aggregate supply function:

$$Y_t = a_0 + a_1(P_t - P_t^E) + a_2 Y_{t-1} + a_3 \text{time} \quad (1)$$

where:

Y_t - log of aggregate output at time t

P_t - log of price level at time t

P_t^E - $E(\log of P_t | \text{Information available at time } t)$.

E is the expectations operator and at the moment we neglect error terms.

Instead of specifying an aggregate demand function, it is assumed that money demand adjusts until aggregate demand equals aggregate supply. Hanson (1980) notes that it should be further assumed that monetary disturbances do not spill over to the world economy because of variations in the effective exchange rate. A common demand for money equation derived from the quantity theory and popularized by Harberger is as follows:

$$P_t = M_t - b_1 Y_t + b_2 \text{time} \quad (2)$$

where M_t is the log of money demand at time t . The relevant opportunity cost of holding money is omitted for the sake of simplicity. Subsequent empirical results show that this simplification is valid. The time variable is added in (2) to capture trend elements in money demand, particularly those affecting velocity such as the development and growing sophistication of financial institutions, credit facilities, and the like.

We first take expected values of (1) and (2), obtaining:

$$Y_t^E = a_0 + a_2 Y_{t-1} + a_3 \text{time} \quad (3)$$

$$P_t^E = M_t^E - b_1 Y_t^E + b_2 \text{time} \quad (4)$$

Note that in (1) the expected price forecast is zero so that the second term disappears in (3).

Substituting (3) into (4) yields:

$$P_t^E = M_t^E - a_0 b_1 - a_2 b_1 Y_{t-1} + (b_2 - a_3 b_1) \text{time} \quad (5)$$

Substituting (5) and (2) into (1) yields:

$$Y_t = a_0 + a_1 (M_t - M_t^E) + a_2 Y_{t-1} + a_3 \text{time} \quad (6)$$

where $a_1^* = a_1/(1 + a_1b_1)$. (6) is the equation estimated by Barro.

The equation of interest to Hanson is derived by simply substituting (2) into (1):

$$Y_t = a_0^* + a_1^*(M_t - P_t^E) + a_2^*Y_{t-1} + c_3\text{time} \quad (7)$$

where $a_0^* = a_0/(1 + a_1b_1)$, $a_2^* = a_2/(1 + a_1b_1)$, and $c_3 = a_1^*b_2 + a_3/(1 + a_1b_1)$.

By taking time derivatives we obtain the equation to be estimated for this study, thus:

$$DY_t = a_0^* + a_1^*(DM_t - DP_t^E) + a_2^*DY_{t-1} + c_3\text{time} + u_t \quad (8)$$

where u_t is a white noise error term. Hanson estimated (7) and (8) for various Latin American countries.

II. Empirical Results

In order to estimate (8), a proxy for the unobservable DP_t^E must be obtained. We use the extrapolative predictor where the information set utilized is limited to lagged values of the actual variable, which in this case is DP_t . The estimated equation using OLS is:

$$\begin{aligned} DP_t = & .107 + 1.01 DP_{t-1} + .137 DP_{t-2} - .504 DP_{t-3} \\ & (5.21) \quad (.52) \quad (2.07) \\ & - .484 DP_{t-4} + .590 DP_{t-5} + .020 DP_{t-6} \\ & (2.03) \quad (2.44) \quad (.08) \\ & - .268 DP_{t-7} - .001 \text{time} - .502 DY_{t-1} \\ & (1.55) \quad (2.45) \quad (2.01) \\ & + .215 DY_{t-2} + .059 DY_{t-3} - .005 DY_{t-4} \quad (9) \\ & (.80) \quad (.22) \quad (.02) \end{aligned}$$

Adj. $R^2 = .910$ D.W. = 1.98 1983.4 - 1994.4

ADF Test Stat = -2.49 MacKinnon 5% critical value = -1.95

Breusch-Godfrey LM test (4 lags): $N \cdot R^2 = 2.98$ Prob = .56

The figures in parentheses are the relevant t values. The estimated value of DP_t or DP_t^E is then used as a proxy for DP . Note that we include the time variable and lagged values of DY to avoid inconsistency in the second stage of estimation.

Equation (8) is estimated using OLS as:

$$DY_t = .003 + .125 (DM_t - DP_t^E) + .610 DY_{t-1} + .010 DY_{t-2}$$

$$\begin{array}{ccc}
 (2.51) & (3.41) & (.05) \\
 + .144 DY_{t-3} - .170 DY_{t-4} & & \\
 (.78) & (1.18) &
 \end{array}$$

Adj. R² = .769 D.W. = 2.10 1983.4 - 1994.4

ADF Test Stat = -1.96 MacKinnon 5% critical value = -1.95

Breusch-Godfrey LM test (4 lags): N*R² = 3.01 Prob = .55

The presence of DM_t in Equation (8) leads to simultaneity bias and hence the estimates using OLS are not consistent. Using IV estimation, we arrive at the following results:

$$\begin{array}{ccc}
 DY_t = .003 + .123 (DM_t - DP_t^E) + .614 DY_{t-1} + .010 DY_{t-2} & & \\
 (2.32) & (3.35) & (.05) \\
 + .144 DY_{t-3} - .172 DY_{t-4} & & \\
 (.78) & (1.18) &
 \end{array}$$

Adj. R² = .769 D.W. = 2.10 1983.4 - 1994.4

ADF Test Stat = -1.97 MacKinnon 5% critical value = -1.95

Unfortunately, the LM test is not applicable when OLS is not used. But since the estimates using OLS and IV are quite similar, then the LM test for the OLS estimation can be used as an approximation. The results support the hypothesis of no serial correlation up to 4 lags. Also the unit root test indicates that the residuals are stationary and hence the regression is a valid one (i.e. it is not spurious).

The time variable was omitted because it turned out to be insignificant. Including a cost of money variable (in this case the 91-day Treasury bill rate) did not improve the fit of the model. This justifies the exclusion of this variable from the original model.

The estimate of a₁* is .12, which is quite close to the values obtained by Hanson for the Latin American countries he studied. This value means that approximately eight percentage points in unanticipated inflation or monetary growth leads to a one percentage point increase in the growth rate.

The work of Hanson was criticized for failing to account for fiscal and external variables in the determination of DP_t. The issue boils down to an empirical question and since we obtained satisfactory results in both equations (9) and (8'), the model is considered to be adequate.