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Monetary Policy in the Philippines During Periods of Financial Crisis and Changes in Exchange Rate Regime: Targets, Instruments, and the Stability of Money Demand

Prepared by David Goldsbrough and Iqbal Zaidi 1/

Authorized for Distribution by Donald J. Mathieson

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Abstract

This paper examines some of the key issues in the conduct of Philippine monetary policy since 1984, including the various shocks to the economy and the monetary authorities' choice of intermediate policy targets and instruments used to achieve those targets. Against this background, estimates of demand functions for various categories of monetary aggregates and tests of stability are reported. A monetary model of exchange market pressure is also estimated. The results suggest that even after the adoption of a floating exchange rate system, the authorities allowed changes in foreign reserves to continue to absorb most of the exchange market pressure.

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Summary

During the 1980s, Philippine monetary policy has faced a number of difficult challenges. First, inflation accelerated rapidly in the aftermath of the external financial crisis of late 1983, when the authorities were forced to request a standstill on most debt-service payments and imposed a centralized foreign exchange allocation system that severely restricted most imports. Second, the financial position of many banks weakened considerably as a result of the financial crisis and the subsequent recession in 1984-85, and periodic crises of confidence affecting much of the financial system have led to recurrent shifts from bank deposits to cash. Third, the adoption of a floating exchange rate system in October 1984 resulted in a much closer linkage between exchange rate and domestic credit policies and led to a number of changes in the intermediate targets of monetary policy.

This paper examines some of the key issues in the conduct of Philippine monetary policy since 1984 in the light of these developments. The paper discusses the factors underlying the monetary authorities' choice of intermediate policy targets and the instruments used to achieve those targets and reports on the estimation of demand functions for various categories of monetary aggregates. The results suggest that the demand for money functions (especially for M2) have been more stable than might have been expected given that the financial system has encountered many shocks and has been significantly transformed over time. However, the results support the conclusions that even if the demand for money and its components is reasonably stable in the longer term, there can be periods of temporary instability when variances around any predicted values may be large. This would argue for some caution in rigidly adhering to precise base money targets in the very short term, especially during periods of financial shocks.

A monetary model of exchange market pressure is also applied to the Philippine experience. The regression analysis shows that there is strong evidence of a negative relationship between the rate of domestic credit creation and the rates of change in exchange market pressure. The results also show that the measure of exchange market pressure does not depend on its composition between foreign exchange rates and foreign reserves. Moreover, even after the adoption of a floating exchange rate system in October 1984, the authorities allowed changes in foreign reserves to continue to absorb most of the exchange market pressure.

During the 1980s, Philippine monetary policy has faced a number of difficult challenges. First, inflation accelerated rapidly in the aftermath of the external financial crisis of late 1983, when the authorities were forced to request a standstill on most debt service payments and imposed a centralized foreign exchange allocation system that severely restricted most imports. The 12-month inflation rate reached a peak of over 60 percent in late 1984, in the wake of a rapid monetary expansion that quickly eroded the benefits of a series of devaluations (Chart 1). Second, the financial position of many banks weakened considerably as a result of the financial crisis and the subsequent recession in 1984-85. During this period, several commercial banks and a large number of thrift institutions and rural banks failed; in 1984-85 alone, financial institutions accounting for about 3 1/2 percent of the total liabilities of the financial system failed. Consequently, there have been periodic crises of confidence affecting much of the financial system that led to recurrent shifts from bank deposits to cash; similar shifts took place during periods of political instability. Third, the adoption of a floating exchange rate system in October 1984 resulted in a much closer linkage between exchange rate and domestic credit policies and led to a number of changes in the intermediate targets of monetary policy.

This paper examines some of the key issues in the conduct of Philippine monetary policy since 1984 in the light of these developments. Section I discusses the factors underlying the monetary authorities' choice of intermediate policy targets and the instruments used to achieve those targets. Section II reports on the estimation of demand functions for various categories of monetary aggregates and section III discusses various tests for the stability of these demand functions in light of the various shocks to the economy and the financial system. Section IV discusses the interaction between monetary and exchange rate policy, and reports on estimates of a model of exchange market pressure that analyzes the effect of excess money balances on both the exchange rate and net international reserves. Section V provides some concluding observations.

I. Targets and Instruments

1. Targets

Prior to the adoption of a floating exchange rate system in October 1984, the key intermediate target of monetary policy was generally the domestic component of base money--the net domestic assets (NDA) of the monetary authorities. Since then, monetary policy has been directed primarily toward maintaining the expansion of base money below a certain target path.

The choice of monetary targets and the conduct of exchange rate policy are closely connected. Under a regime of a freely floating exchange rate (defined here as one in which any net intervention by the Central Bank is only to achieve some predetermined target for international reserves that is independent of both the exchange rate and domestic monetary variables) there is, in practice, no difference between targeting base money and targeting NDA since the difference between the two--the net foreign assets (NFA) of the monetary authorities--is fixed. However, if the Central Bank's net intervention in the exchange market does adjust in response to movements in the exchange rate or in monetary variables, then the choice of target does affect the conduct of monetary policy. The results of section IV will show that the Central Bank did continue significant net intervention even after the adoption of the floating rate regime. In this situation, the choice between base money and NDA as targets requires the Central Bank to choose between sterilizing or not sterilizing, respectively, such additional net intervention in the exchange market.

This choice will be influenced, to some extent, by the relative priority given to combating inflation and by the likely causes of the increased exchange market intervention. In the Philippines, the switch to the targeting of base money reflected the high priority attached to arresting quickly the inflationary spiral that began in late 1983 as well as the possibility of substantial, unanticipated capital inflows. If such inflows occurred and the Central Bank intervened in the exchange market to offset part of the consequent upward pressure on the exchange rate, then the impact on domestic liquidity and hence prices could be substantial unless the resulting increase in NFA were offset by increased sales of open market instruments.

However, the impact on prices would depend, inter alia, on the causes of the external capital inflow. If the inflow reflected an unanticipated increase in the demand for money, then the increase in the money supply resulting from such intervention would not put upward pressure on prices. To accommodate such an unanticipated shift in money demand, the Central Bank's policy was to allow for a certain limited, upward adjustment in its targeted path for base money whenever its net international reserve position improved by more than a targeted amount. The maximum limits on such adjustments have been around 4 percent of base money.

In most countries, base money comprises the monetary authority's liabilities in the form of (a) currency outside banks, plus (b) deposit money banks' domestic currency holdings, plus (c) deposit money banks' deposits with the monetary authority. This definition will be referred to here as <u>reserve money</u>. In the Philippines, however, there are good reasons for focusing upon a somewhat broader definition as the key measure of monetary expansion. First, the Central Bank has allowed certain of its own security issues, as well as some government securities, to count as bank reserves in fulfilling reserve requirements. At their peak in April 1984, bank holdings of these reserve eligible securities were equivalent to about one half of reserve money (Chart 2). However, the Central Bank's policy has been to gradually retire these securities; by end-1988, they were equivalent to under 5 percent of reserve money. Second, there have been prolonged periods during which banks have had significant reserve deficiencies, reflecting the weak

CHART 1
PHILIPPINES
TRENDS IN BASE MONEY AND ITS COMPONENTS, 1982-88
(Annual percentage change)

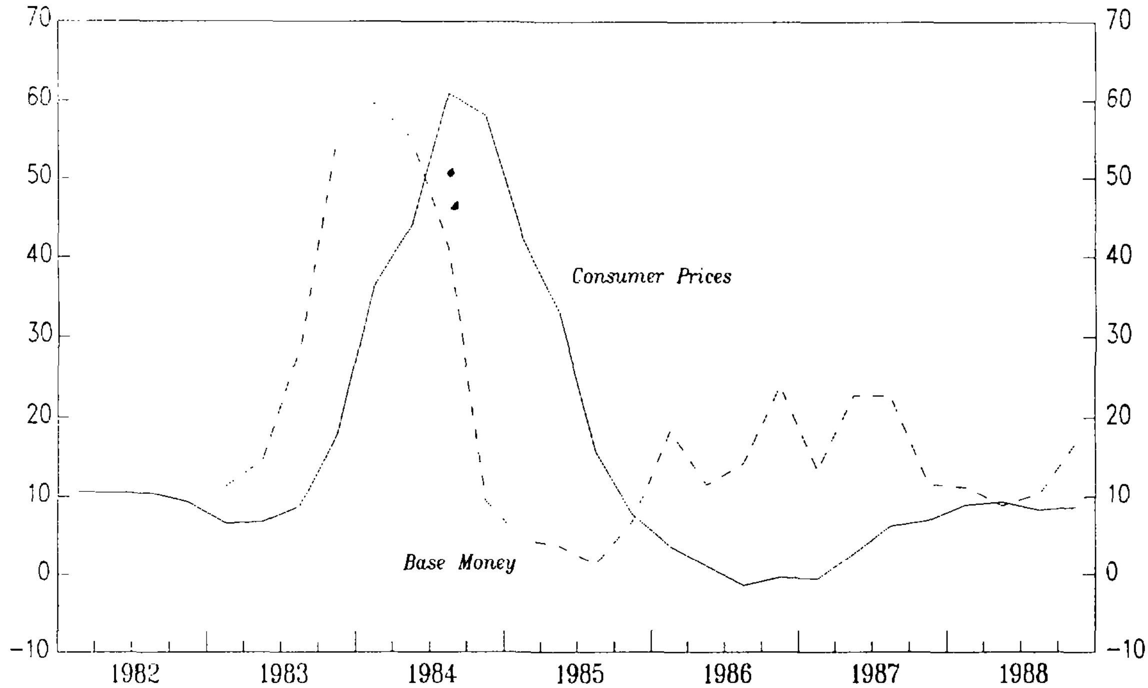
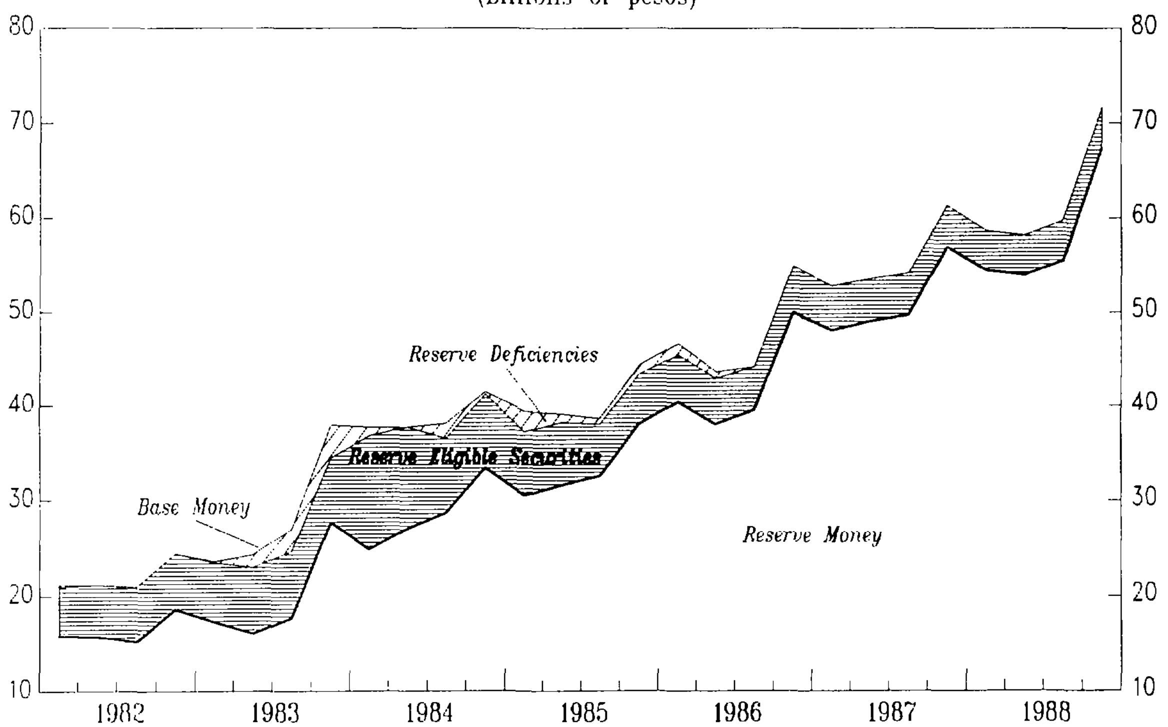


CHART 2
(Billions of pesos)



Source: Data provided by the Philippine authorities.

financial position of important segments of the banking system. The monetary impact of allowing prolonged deficiencies is similar to that of an increase in reserve money caused by increased Central Bank credit to the banks involved; these deficiencies could, therefore, be appropriately included in a broader definition of base money. At their peak in late 1983, these reserve deficiencies averaged over 10 percent of reserve money.

To take account of these factors, the principal aggregate used to measure the stance of monetary policy in the Philippines has been base money, defined as reserve money plus bank holdings of reserve eligible securities plus reserve deficiencies. As Chart 2 illustrates, use of this broader definition can lead to somewhat different judgments on the relative tightness of monetary policy.

2. *Instruments*

The principal instruments used by the Central Bank to control monetary aggregates have been changes in reserve requirements 1/ and open market operations. In principle, the Central Bank can also directly affect the level of bank reserves by varying the level of its credit to the banks under its regular rediscounting and special assistance facilities. In practice, however, variations in such lending have not been a major instrument to influence monetary aggregates; in particular, the weak financial position of many banks has made it difficult to reduce the level of such lending when a tighter monetary policy was desired. Moreover, the Central Bank's task of controlling base money was complicated by significant losses it incurred on various quasi-fiscal activities, including swap and forward cover operations, that it undertook in the early 1980s.

In 1984, the Central Bank began to issue substantial quantities of its own securities (primarily short-term bills with maturities of 30-90 days), which quickly became the principal open market instrument used in the effort to tighten monetary policy in the face of rapidly rising inflation. At their peak in early 1986, the stock outstanding of these bills reached the equivalent of over 7 percent of GNP, as large as total base money and considerably larger than the existing stock of equivalent treasury securities. However, the concurrent sale of similar securities by the Central Bank and the Treasury was viewed as complicating interest rate policy and the management of the domestic public debt;

1/ Separate reserve requirements are imposed for deposits with a maturity of above and below 730 days. At end-1988, the required reserve ratios on deposits with a maturity below 730 days (the bulk of deposits) was 21 percent and the reserve ratio for longer-term deposits was 5 percent. The Central Bank pays a relatively low interest rate (currently 4 percent) on banks' reserve deposits, so the high reserve requirements represent a fairly significant implicit tax on financial intermediation.

consequently, the Central Bank bills were gradually phased out during 1986-88. The principal open market instrument now consists of the sale of treasury securities beyond the Government's own financing requirements, with the surplus funds deposited in special accounts of the Central Bank.

II. Estimation of Money Demand Functions

The setting of target paths for monetary aggregates is predicated on the existence of reasonably stable relationships between the demand for money and the level of prices and real output. This section discusses the estimation of such relationships for various categories of broad and narrow money: M1 (currency plus demand deposits); M2 (currency plus demand, time and savings deposits); and M3 (M2 plus various deposit substitutes). 1/ The exact definition of each variable and the data sources are discussed in the Appendix. Since shifts between different components of money, especially between currency and bank deposits, also affect the "derived" demand for base money, the estimated demand functions for these various components are also reported.

1. Specification of the functional form

In general terms, the demand for real money balances can be related to a scale variable such as real income, the return on money holdings, and the opportunity cost of maintaining wealth in the form of money. More formally, the function can be written as follows:

$$(1) \quad \left(\frac{M_t^d}{P_t}\right) = f(y_t, rf_t, rm_t, \pi_t)$$

where M_t^d is the demand for nominal money balances, P_t is the price level, y_t is the scale variable, rf_t is the rate of return on alternative financial assets, rm_t is the rate of return on money holdings and π_t is the rate of inflation expected to prevail. For the purposes of estimation, the basic model (1) can be specified in log-linear terms as:

$$(2) \quad \log\left(\frac{M_t^d}{P_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 rf_t + \beta_3 rm_t + \beta_4 \pi_t$$

The log form has been used except for the rate of return and inflation variables. Interest rates can at times be quite low, and it may be a

1/ Banks issued a variety of interest-bearing securities to their depositors during the 1970s, partly in an effort to avoid interest rate ceilings on deposits; however, these deposit substitutes were also subject to interest-rate ceilings during 1976-81.

better approximation simply to use the level of interest rate in an equation like (2) instead of the log of the rate. 1/ Under fairly general assumptions of assets holders' preference functions, the desired stock of money will be an increasing function of the rate of return on money and the scale variable, and a decreasing function of the rate of return on alternative assets. Thus, β_1, $\beta_3 > 0$ and β_2, $\beta_4 < 0$.

The most appropriate nominal rate of return variables to represent rf and rm will depend on the monetary aggregate being considered. For currency and noninterest-bearing-demand deposits, the principal return consists of an increased ease of conducting transactions, which cannot be accurately measured. The closest substitutes for these aggregates are probably time and savings deposits, so that interest rate paid on 90-day time deposits, T90, is used to represent the returns on alternative financial assets. Interest rates on such deposits were subject to ceilings until 1981, however, so they would not accurately reflect the returns available in the informal and non-regulated markets. Therefore, the yield on 91-day Treasury bills, TR91, is included as a second alternative financial return. 2/ For interest-bearing bank deposits, the own rate of return is represented by T90 and the return on substitute financial assets by TR91. Since such deposits represent the bulk of the M2 and M3 (averaging over 60 percent of M2 and an even higher proportion of M3 during 1973-85), the T90 interest rate can also be taken as representing the own rate of return for these broader aggregates. Strictly speaking however, these broader aggregates are a composite, for part of which T90 represents an own rate of return and, for another part, a return on substitute assets. This factor will tend to lower the impact of changes in T90 on the demand for these broader aggregates.

Expected inflation is measured by a lag function of past rates of inflation. The estimation results appear robust to changes in the

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1/ If, for example, the interest rate rises from 2 percent to 3 percent, the log of the rate rises from -3.91 to -3.51, which is a change of 0.40. But when the interest rate rises from 10 percent to 11 percent, the log of the rate rises from -2.30 to -2.21, which is only a change of 0.09. There is little reason to expect that a 1 percentage point rise in the interest rate would have four times the effect on the log of desired money holdings when the change is from a base of 2 percent than when it is from a base of 10 percent (see Fair (1983)).

2/ All rates of return included in the estimating equations are for assets with a maturity period of one quarter. This avoids any potential within-period capital gains or losses owing to changes in interest rates. Thus, apart from taxation and risk of default, the expected return on these assets should be equal to their yield.

particular form of the lag function. Both polynomial distributed lags over inflation rates during the preceding eight quarters,

$$\sum_{i=1}^{8} a_t \pi_{-t}$$

and the change in prices over a one-year period, $\pi 4$, were used to represent expected inflation and none of the qualitative results were substantially altered. 1/

Equation (2) may be interpreted as setting a "desired" value for money holdings. Portfolio adjustment costs would prevent a full, immediate adjustment of actual money holdings to the desired levels. Various forms of this stock-adjustment process have been used in the literature on modeling the demand for money. While there is no need to repeat here a detailed derivation of the different approaches, Chow (1966) assumes that real money balances adjust to their desired level by a constant fraction of the percentage discrepancy between the two in each period,

$$(3) \quad \log(\frac{M_t}{P_t}) - \log(\frac{M_{t-1}}{P_{t-1}}) = \delta \; [\log(\frac{M_t^d}{P_t}) - \log(\frac{M_{t-1}}{P_{t-1}})]$$

where δ is the coefficient of adjustment, $0 < \delta < 1$. Substituting equations (2) and (3), and solving for log (M_t^d/P_t) yields an estimating equation that allows for the possibility of lagged response of real money

1/ This may be because the estimated parameter for the lagged dependent variable in the estimating equation already reflects much of the information on the extent to which inflationary expectation are determined by past inflation rates.

balances to variations in income, rates of return, and expected inflation. 1/

$$(4) \quad \log\left(\frac{M_t^d}{P_t}\right) = \delta\beta_0 + \delta\beta_1 \log(y)_t + \delta\beta_2 \, rf_t$$

$$+ \delta\beta_3 \, rm_t + \delta\beta_4 \, \pi_t + (1 - \delta) \log\left(\frac{M_{t-1}}{P_{t-1}}\right)$$

1/ One objection to this specification is that it implicitly assumes that any change in the real value of nominal money balances due to changing prices leads to an immediate adjustment. An alternative specification, suggested by Goldfeld (1976), defines the adjustment process in terms of nominal money stocks: the right hand side of equation (3) becomes $\delta \, [\log(M_t^d) - \log(M_{t-1})]$ and so the lagged term in equation (4) becomes $(1-\delta) \log (M_{t-1}/P_t)$. A third alternative, used by Laidler (1982), stipulates that, for the economy as a whole, it is prices and not money balances that adjust to equate the desired and actual money stock. Thus,

$$(5) \quad \log(P_t) - \log(P_{t-1}) = \delta \, [\log(M_t) - \log\left(\frac{M_t^d}{P_t}\right) \, . \, P_{t-1}]$$

In this case, the lagged term in equation (4) would become $(1-\delta)\log (M_t/P_{t-1})$.

Although these alternative specifications of the stock adjustment process are derived from quite distinct theoretical hypotheses, it may prove difficult to distinguish between them in practice. One reason for this is that estimation of lags involving a price index can be blurred because the price of goods covered by the index are actually sampled on different dates during any reporting period and may also be based on list prices that lag behind actual prices. In the event, estimates of demand for money functions using the three different lagged terms showed little variation. Estimates using the form of equation (4) are reported in this paper, but none of the substantive conclusions would appear to be affected with one of the alternative functional forms.

With the addition of an error term, u_t, and seasonal dummy variables into the specification, the equation to be estimated becomes:

$$(6) \quad \log\left(\frac{M_t}{P_t}\right) = \delta\beta_0 + \delta\beta_1 \log(y_t) + \delta\beta_2\, rf_t + \delta\beta_3\, rm_t + \delta\beta_4\, \pi_t$$

$$+ (1-\delta) \log\left(\frac{M_{t-1}}{P_{t-1}}\right) + \delta\beta_5\, S_2 + \delta\beta_6\, S_3 + \delta\beta_7\, S_4 + u_t,$$

where S_2, S_3, and S_4 represent seasonal dummy variables for the second through fourth quarters, respectively. All of the estimated equations included seasonal dummy variables, but for ease of exposition, they will be dropped from the remaining discussion. For all of the monetary aggregates, we would expect $\beta_1 > 0$ and $\beta_2 < 0$. For currency and M1, we would expect $\beta_3 < 0$; for the broader aggregates, M2 and M3, however, we would expect $\beta_3 > 0$.

The equations were estimated using Hatanaka's residual adjusted Aitken estimator. 1/ This approach has the advantage of providing estimates which are consistent and asymptotically efficient. It is well known that money demand equations tend to be subject to serial correlation and ordinary least squares estimates of equations subject to serial correlation are theoretically unbiased but inefficient. 2/ Furthermore, the use of a Cochrane-Orcutt regression procedure to estimate an equation in which there is a lagged dependent variable and a serially correlated error term would yield parameter estimates that are neither consistent nor efficient. For example, the coefficient of the lagged dependent variable

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1/ The demand for money using the estimation technique developed by Hatanaka has been examined for the United States by Laumas and Spencer (1980) and Allen and Hafer (1983).

2/ Although econometric theory indicates that the expected value of estimated coefficients is the true coefficient in well-specified equations that have serial correlation, the coefficient estimates could deviate substantially from their true values, and the standard errors, which are understated, will suggest much better fits than is, in fact, the case. Lieberman (1980) showed that many of the coefficient estimates of the money demand functions for the United States are affected radically when the equations are re-estimated adjusting for serial correlation.

would be biased upwards and the speed of adjustment would be biased downwards. 1/

The first step of the two-step Hatanaka estimation procedure is to obtain consistent estimates of the regression parameters and serial correlation coefficient in equation (6). These estimates are obtained by applying the instrumental variables method to the original regression equation to obtain consistent estimates of the regression coefficients: $\tilde{\beta}_0$, $\tilde{\beta}_1$, $\tilde{\beta}_2$, $\tilde{\beta}_3$, $\tilde{\beta}_4$, and $\tilde{\delta}$. The instruments consist of the current and the lagged exogenous variables in the system, plus any other valid instruments but not current or lagged endogenous variables. A consistent estimate of the serial correlation coefficient is obtained as

$$\tilde{\rho} = \sum_t \tilde{u}_t \tilde{u}_{t-1} / \sum_t \tilde{u}_{t-1}^2$$

where

$$\tilde{u}_t = \log(\frac{M_t}{P_t}) - \tilde{\delta}\tilde{\beta}_0 - \tilde{\delta}\tilde{\beta}_1 \log(y_t) - \tilde{\delta}\tilde{\beta}_2 \, rf_t - \tilde{\delta}\tilde{\beta}_3 rm_t - \tilde{\delta}\tilde{\beta}_4 \, \pi_t - (1-\tilde{\delta}) \log(\frac{M_{t-1}}{P_{t-1}}).$$

The second step is the ordinary least squares estimation of the following transformation of equation (6):

$$\log(\frac{M_t}{P_t}) - \tilde{\rho} \log(\frac{M_{t-1}}{P_{t-1}}) = \delta\beta_0 (1-\tilde{\rho}) + \delta\beta_1 (\ln y_t - \tilde{\rho} \ln y_{t-1})$$

$$+ \delta\beta_2 (rf_t - \tilde{\rho} rf_{t-1}) + \delta\beta_3 (rm_t - \tilde{\rho} rm_{t-1}) + \delta\beta_4 (\pi_t - \tilde{\rho}\pi_{t-1})$$

1/ In the approach based on the work of Hendry (see, for example, Hendry (1986), Hendry, Pagan, and Sargan (1984), and Hendry and Richard (1982)), the existence of serial correlation is typically taken to be evidence of model misspecification. Consequently, a more general class of autoregressive distributed-lag equations, in principle allowing for multiple lagged values of both the dependent and independent variables, is estimated. The resultant equation is sequentially simplified ("tested down") by dropping insignificant higher-order lags. Although general distributed lag models resolve many of the shortcomings of the simple partial adjustment models, such as incomplete dynamic specification and real balances are not constrained to adjust with the same geometric distributed lag to each independent variable, the partial adjustment mechanism has often served as the workhorse to capture the underlying dynamics in money demand equations (see Goldfeld and Sichel (1987)).

$$+ (1-\delta) \left[\log(\frac{M_{t-1}}{P_{t-1}}) - \tilde{\rho} \log(\frac{M_{t-2}}{P_{t-2}}) \right] + \psi \tilde{u}_{t-1} + e_t .$$

The resulting regression coefficients are consistent and efficient, whereas a consistent and efficient estimate of the serial correlation coefficient is obtained by $\rho = \tilde{\rho} + \psi$, where ψ is the coefficient of the lagged residual term in the second step regression. An estimate of the covariance matrix of the limiting distribution of the Hatanaka estimator is derived from the covariance matrix of the regression coefficients in the second step.

2. Estimation results

The estimation results for the period Q4 1973 to Q4 1988 are reported in Table 1. The reported equations include the one-year lagged rate of inflation, but results using the polynomial distributed lags on past inflation were similar. The results are broadly as would be expected on theoretical grounds. Demand for time and savings deposits is a positive function of T90, representing the own rate of return, and is a negative function of TR91, representing the return on substitute assets. In the equations for M1 and currency, T90 proved to be much more significant as an indicator of returns on substitute assets than TR91; the estimated coefficient of the latter was of the wrong sign and often statistically insignificant. The results indicate that increases in inflation have a strong negative impact on the demand for real money balances and that this impact tends to be stronger for the broader monetary aggregates. For instance, on the basis of the results reported in Table 1, a 1 percentage point increase in the rate of inflation leads to about a 0.6 percent decrease in the demand for real M2 and 0.3 percent for M3, but only a 0.06 percent decrease in the demand for real currency (Table 2). Like a number of earlier studies, the results also show low estimated income elasticities of demand for M2 and M3. This probably reflects, to a large extent, the strong growth in financial assets such as Treasury and Central Bank bills that are close alternatives to the interest-bearing liabilities included in these monetary aggregates; for instance the deposit substitutes included in M3 were larger than the entire M1 aggregate during the early 1980s, but by 1988 had declined to less than the equivalent of 5 percent of M1. Such shifts may also have affected the stability of the demand functions for these broader aggregates.

III. Tests of the Stability of the Money Demand Functions

Any instability in the estimated demand for money functions could manifest itself in several different ways. There could be a sudden shift in the underlying parameters for a particular subperiod; or a more gradual shift in the parameters over time; or the short-term adjustment path of the money stock could vary according to the nature of the initial shock, even though the final equilibrium position was as indicated by the

Table 1. Estimates of Money Demand Functions

Regression Equation	Dependent Variable	log(GNP)	INFL (π4)	TR91	T90	Lagged Dependent Variable	R^2 rho	D.W. H	SSR SEE	Cusums (b) Cusums (f)	Cusums Squared (b) Cusums Squared (f)
1.	log (M3/P)	0.30**	-0.002*	-0.002	-0.0009	0.46**	0.66	1.25	0.068	0.694	0.175
		(4.15)	(2.45)	(1.03)	(0.25)	(6.25)	0.75	3.57	0.037	0.655	0.185
2.	log (M3/P)	0.33**	-0.002*	-0.002		0.41**	0.64	1.20	0.078	0.653	0.205
		(4.41)	(2.27)	(1.36)		(5.60)	(0.76)	3.81	0.039	0.725	0.174
3.	log (M2/P)	0.40**	-0.003**	-0.00006	0.0003	0.52**	0.68	1.50	0.086	0.673	0.310**
		(4.46)	(3.09)	(0.02)	(0.07)	(6.51)	0.78	2.49	0.041	1.109*	0.115
4.	log (M2/P)	0.40**	-0.003**		0.001	0.52**	0.68	1.50	0.087	0.610	0.312**
		(4.55)	(3.22)		(0.04)	(6.56)	0.78	2.47	0.041	1.165**	0.126
5.	log (M2/P)	0.41**	-0.003**	0.0001		0.51**	0.68	1.49	0.088	0.652	0.312**
		(4.72)	(3.08)	(0.05)		(6.48)	0.78	2.50	0.041	1.070*	0.097
6.	log (M1/P)	0.34**	-0.0006	0.002	-0.01*	0.58**	0.64	1.69	0.202	0.867	0.265**
		(3.26)	(0.53)	(0.50)	(2.34)	(5.11)	0.56	2.70	0.063	0.653	0.324**
7.	log (M1/P)	0.33**	-0.0005		-0.01**	0.56**	0.63	1.69	0.204	0.749	0.276**
		(3.21)	(0.46)		(2.80)	(5.18)	0.56	2.23	0.063	0.582	0.331**
8.	log (CUR/P)	0.53**	-0.0002	0.008*	-0.018**	0.40**	0.79	1.76	0.141	0.989*	0.185
		(5.19)	(0.15)	(2.20)	(3.57)	(3.50)	0.64	2.09	0.053	0.465	0.302**
9.	log (CUR/P)	0.49**	-0.0003		-0.008*	0.48**	0.77	1.81	0.153	1.188*	0.134
		(4.55)	(0.27)		(2.48)	(3.90)	0.62	2.75	0.054	0.588	0.323**
10.	log (TSD/P)	0.46**	-0.003*	-0.002	0.006	0.65**	0.77	1.80	0.198	0.908	0.330**
		(3.33)	(2.29)	(0.59)	(1.02)	(8.66)	0.73	0.96	0.062	0.879	0.143
11.	log (DPSUB/P)	0.03	0.002	0.002	-0.02	0.98**	0.84	1.76	2.125	1.064*	0.277**
		(0.07)	(0.56)	(0.15)	(0.97)	(14.68)	0.51	1.03	0.204	1.191**	0.596**

Note: The numbers in parentheses below the estimated coefficients indicate absolute t-values; R^2 = coefficient of determination; D.W. = Durbin-Watson statistic; rho = estimated first-order autocorrelation coefficient after Hatanaka estimation; H = Durbin's h-statistic; SSR = sum of squared residuals; SEE = standard error of estimate; b and f refer to backward and forward recursive residuals, respectively; * = significant at the 0.05 level and ** = significant at the 0.01 level. Coefficients for seasonal dummy variables are not reported. Other symbols are defined in the text.

Table 2. Philippines: Short-Run and Long-Run Elasticities or Semi-Elasticities of the Demand for Money, Q4 1973-Q4 1988 1/

Monetary Aggregate and Variable	Short-Run Elasticity	Long-Run Elasticity	Adjustment Parameter
Currency			0.52
GNP	0.49	0.94	
INFL (π4) 2/	-0.0003	-0.0006	
T90 2/	-0.008	-0.015	
M1			0.44
GNP	0.33	0.75	
INFL (π4) 2/	-0.0005	-0.001	
T90 2/	-0.01	-0.023	
M2			0.49
GNP	0.41	0.84	
INFL (π4) 2/	-0.003	-0.0061	
TR91 2/	0.0001	0.0002	
M3			0.59
GNP	0.33	0.56	
INFL (π4) 2/	-0.002	-0.003	
TR91 2/	-0.002	-0.003	

1/ Derived from estimates reported in Table 1.

2/ Semi-elasticities. If the semi-elasticity of a variable is b, then a 1 percentage point change in that variable leads to approximately 100 b percent change in the demand for money. Thus, for M2, a 1 percentage point increase in the rate of inflation leads, in the long-run, to a 0.6 percent decline in the demand for real M2.

basic model. In this section, we report a number of tests of whether parameters of the money demand functions are invariant over time.

The term stability is defined here in the statistical sense of the null hypothesis, H_0, that: $B_1 = B_2 = \ldots B_T$ and $S_1^2 = S_2^2 = \ldots S_T^2$, where B denotes the vector of parameters (β_0, β_1, β_2, β_3, β_4, δ) and S_t^2 the variance of u_t at time t. It is useful to conduct a number of different stability tests, because they differ in terms of their power and alternative hypotheses. For example, the alternative hypothesis in the Quandt likelihood ratio test and the Chow test, discussed below, supposes coefficients are constant within a subperiod but change by discrete amounts over subperiods. If this is not the case, then it would be appropriate to re-estimate coefficients with a methodology that allows continuous but gradual time variation in the coefficients.

A fairly general approach aimed at investigating the stability of the regression coefficients consists of estimating a series of "recursive" regressions, starting with the first k+1 observations and adding a new observation with each regression until the final iteration contains all T observations in the sample. The predictive performance of the model can then be simulated, each observation in the sample being predicted with the parameter estimates based on the preceding observations. Brown, Durbin, and Evans (1975) suggest that the sequence of standardized one-step ahead prediction errors or "recursive residuals" be computed, and the cumulated sum of the residuals (or squared residuals) is then evaluated against a test statistic to determine whether the residuals are accumulating at a reasonably steady rate as the sample lengthens. If not, then the hypothesis that the parameter estimates are stable throughout the sample period is rejected at the specified confidence level. 1/

There is a complication in the application of recursive residuals technique in the present context in that the errors of the money demand equations are serially correlated. If the estimated coefficient of serial correlation, $\hat{\rho}$, is sufficiently close to the true ρ, one may expect the corresponding recursive residuals to have under the null hypothesis properties quite close to those of residuals based on the true value of ρ. However, there is no general guarantee that various test statistics computed from both sets of recursive residuals (based on ρ and $\hat{\rho}$ respectively) will have the same asymptotic distributions. Dufour (1982) suggested considering a grid of values of ρ inside some neighborhood of $\hat{\rho}$ and checking the robustness of the main conclusions. If the main conclusions on stability/instability are the same independently of ρ, these can be viewed as reliable. Hence, the cusums and cusums squared tests were all repeated for a range of values from ρ = -0.9 to 0.9 by intervals of 0.1.

The evidence regarding stability from the two recursive-regression tests is mixed; some of the test statistics favor the rejection of the stability hypothesis, while some do not. With a few exceptions, the

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1/ The recursive residual based on forward forecast errors is defined as

$$uf_t = e_t /(1 + x_t (X_{t-1}' X_{t-1})^{-1} x_t')^{1/2},$$

where e_t is the prediction error for period t, $X_T = (x_1, x_2, \ldots, x_T)'$ is a (T x K) matrix of observations on the K explanatory variables, and X_{t-1} contains only the first t-1 rows of X_T. For a set of time series observations, there will be a (T-K) vector of these recursive residuals, $uf = (uf_{K+1}, uf_{K+2}, \ldots uf_T)$. By running the same procedure backwards, another vector of recursive residuals, $ub = (ub_{T-K-1}, ub_{T-K-2}, \ldots ub)$, is generated. The forward versions of the cumulative sum series (cuf) and the cumulative sum of squares (cusqf) are defined as:

$$cuf(t) = (1/\hat{\sigma}) \sum^{t} uf_i ,$$

where $\hat{\sigma} = (\sum^{T}(uf_i - \overline{uf})^2/(T-K-1))^{1/2}$ and

$$cusqf(t) = \sum^{t} uf_i^2/\sum^{T} uf_i^2.$$

Confidence limits can be placed around a line representing constant increments in the recursive residuals, and a movement of the actual sum of the residuals outside these limits leads to rejection of the null hypothesis of stability.

estimated equations appear to be stable when judged by the cusums test. However, most of the equations show some temporal instability when judged by the cusums-of-squares test. 1/ Two points need to be made in this context. First, the two tests are designed to uncover different types of instability. The cusums test will only indicate systematic shifts in one direction that cause the errors to accumulate, whereas the cusums of squares test will also pick up haphazard instability that causes the sum of squared errors to deviate from the hypothesized path. It therefore appears from these tests that the equations are subject to haphazard instability, but with some important exceptions, probably not to systematic shifts. This would be consistent with the earlier description of a financial system that has been subject to frequent shocks. Second, high values of cusum of squares test together with low values of cusum tests can be interpreted as suggesting that instability is due to a shift in the residual variances rather than to shifts in the values of regression coefficients.

Whereas the cusums and cusums squared tests serve as guides to patterns in regression relationships, these tests fail to capture exact points of discontinuity because time must pass for forecast errors to accumulate. A movement of the sum of the residuals outside the confidence limits does not necessarily imply that a structural shift occurred precisely at that point in time; leads and lags may occur between a disruptive event and the period in which the instability becomes significant. Consequently, further tests are required to identify accurately points of discontinuity. The most important of these are the Quandt likelihood ratio test and the Chow test.

The Quandt likelihood ratio test may be useful if the cusums and cusums squared tests tend to reject the hypothesis of stability and it is believed that any change over time may be concentrated at a single unknown

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1/ The impact of allowing ρ to vary over the range of -0.9 to 0.9, to study the sensitivity of the conclusions to different values of ρ, was minimal. The main conclusions of the recursive residuals analysis are the same independently of ρ. For almost all of the parameter values of ρ, the cusums test support the hypothesis of stability, whereas the cusums of squares test provide evidence of a structural break.

point, which it is desired to locate. 1/ A time series of the Quandt likelihood ratio was calculated for each equation on the basis of the recursive regressions. On the hypothesis that the equation undergoes a single shift at a specific point, this shift is likely to occur at the observation where the time series reaches its minimum. Even if the time series has a lower value elsewhere but the ratio jumps sharply from one observation to the next, that point may also indicate instability in the function. For the present exercise, both procedures were used judgmentally to determine the most likely date for the functional shift. The results suggest that the underlying parameters may have shifted in 1983 or 1984, which coincides with the period beginning with the financial crisis of late 1983. The lowest values for the time series of the Quandt likelihood ratios for the various monetary aggregates were as follows:

Monetary aggregate	Date
Currency	Q2 1983
M1	Q4 1981 and Q1 1983
M2	Q1 1985
M3	Q1 1984 and Q1 1985

For the narrower monetary aggregates, currency and M1, there were also sharp jumps in the likelihood ratio series in Q4 1983. Consequently, the Chow test was done for the hypothesis that the coefficients of the estimated equations are equal for the period Q4 1973-Q3 1983 and Q4 1983-Q4 1988. The results indicate that there was a significant shift

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1/ In the Quandt likelihood ratio test, the sample is divided into two segments (1...r) and (r+1...T). The null hypothesis, H_0, is that the regression coefficients and the variance of the error term are constant over the two segments, while the alternative hypothesis, H_1, is that they come from two separate models. For each observation, r, from r = T-k-1, the $\log_{10}$ maximum likelihood ratio is calculated:

$$\lambda_r = \log_{10}\left\{\frac{\text{maximum likelihood of the observations given } H_0}{\text{maximum likelihood of the observations given } H_1}\right\}$$

This statistic is computed, moving throughout the entire sample, and the point of discontinuity is diagnosed as the value of r at which λ_r attains its minimum. Because several regimes may exist, interest will also focus on local minima. The shortcoming of this approach is that since the distribution of λ_r under the null hypothesis is unknown, it does not lend itself to exact significance testing. However, once the relevant subperiods have been chosen, one may use the Chow test to obtain an F-statistic for whether the subsamples are drawn from different populations.

in the parameters for the currency, M1 and M3 equations, but not for the M2 equation. 1/

IV. Application of the Model of Exchange Market Pressure to the Philippines

As was mentioned in the introduction, the adoption of a floating exchange rate system in October 1984 resulted in a much closer linkage between exchange rate and domestic credit policies and led to a number of changes in the intermediate targets of monetary policy. This section applies the Girton-Roper model of exchange market pressure to the Philippine monetary experience. 2/ The basic hypothesis of the model, which builds upon the monetary approach to the balance of payments and exchange rate determination, is that an excess domestic supply of money will cause some combination of currency depreciation and an outflow of foreign reserves. Thus, exchange market pressure is defined as the sum of the rates of change in the exchange rate and international reserves, suitably defined. An imbalance between the rates of growth in the supply and demand for money creates pressure for the exchange rate to adjust, but by intervening in the foreign exchange market, the authorities can convert some or all of the exchange market pressure into reserve changes (i.e., balance of payments surpluses or deficits). The hypothesis that the magnitude of exchange market pressure is independent of whether the monetary authorities absorb the market pressure in the exchange rate or in foreign reserves is also tested.

The Philippines provide a good example for testing the model because the economy can be regarded as small and open, in that world monetary conditions and world prices for goods, services, and capital are exogenously determined, which simplifies the estimation of the model. In

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1/ Strictly speaking, the levels of significance of the F statistics used in the Chow test are only accurate if the variances of the error terms are equal for the two sub-periods. However, heteroscedasticity does not appear large and one of the sub-periods has a relatively large number of observations (40). Toyoda (1974) has shown that the Chow test is well-behaved under such conditions. There is an additional complication in the application of the Chow test since the equations are adjusted for serial correlation. However, if the serial correlation coefficients from the different regimes are reasonably close, the test results can be viewed as reliable. It should also be noted that one observation will be common to both subsamples because of the presence of the lagged dependent variable, which raises the question of the statistical independence of the sums of squares.

2/ The exchange market pressure model has been applied to several developing countries. The applications include Connolly and Da Silveira's (1979) study for Brazil, Modeste's (1981) study for Argentina, and Kim's (1985) study for Korea.

these circumstances, the model consists of the following equations: (1) a money demand function based on those estimated in the previous section; (2) the money supply process; (3) purchasing power parity; and (4) the equilibrium condition for the monetary sector.

$$\frac{M^d}{P} = F(Y,\ rf\ ,\ \pi) \tag{1}$$

$$M^s = m(R+D) \tag{2}$$

$$P = P^*/e \tag{3}$$

$$M^d = M^s \tag{4}$$

M^d is the demand for nominal money balances; M^s is the supply of nominal money balances; P is the price level; Y is the real GNP; rf is the average yield on 91-day Treasury bills; e is the exchange rate, expressed in terms of units of foreign currency per unit of domestic currency; P^* is the foreign price level; m is the money multiplier; R is the stock of international reserves; and D is the domestic credit component of base money. 1/ By replacing P with P^*/e in equation (1) and transforming equations (1) and (2) into terms of rates of growth gives:

$$\hat{M}^d + \hat{e} - \hat{P}^* = \alpha_1 \hat{Y} + \alpha_2 \hat{rf} + \alpha_3 \hat{\pi} \tag{1a}$$

$$\hat{M}^s = \hat{m} + k\hat{R} + (1-k)\hat{D} \tag{2a}$$

1/ As was mentioned earlier, the principal aggregate used to measure the stance of monetary policy in the Philippines is base money, defined as reserve money plus bank holdings of reserve eligible securities plus reserve deficiencies. Two sets of estimation were done for the exchange market pressure model, using different measures for the exchange rate and foreign price level variable. One set used the U.S. dollar per Philippine peso rate and the U.S. consumer price index, whereas the other set used the nominal effective exchange rate and the industrial country consumer price index. Since the results did not differ in any significant way, only those using the U.S. dollar per Philippine peso and the U.S. consumer price index are reported.

where $k = \frac{R_{-1}}{R_{-1} + D_{-1}}$; the percentage rate of change for each variable X is denoted by $\hat{X}$ and the parameters α_1, α_2, and α_3 are, respectively, the real income, interest rate, and inflation elasticities of real money balances. Substituting equations (1a) and (2a) in (4), the following equation, which measures exchange market pressure is obtained:

$$\hat{e} + \hat{r} = \hat{P}^* + \alpha_1 \hat{Y} + \alpha_2 \hat{rf} + \alpha_3 \hat{\pi} - \hat{d} - \hat{m} \qquad (5)$$

where $\hat{r}$ is the change in international reserves as a proportion of the monetary base and $\hat{d}$ is the change in domestic credit as a proportion of the monetary base. Since α_2, $\alpha_3 < 0$ and $\alpha_1 > 0$, equation (5) states that an increase in the rate of growth in domestic credit, the money multiplier, the yield on treasury bills, and the inflation rate will, ceteris paribus, result in a depreciation of the exchange rate and/or an outflow of international reserves; whereas an increase in real income and world prices will result in an appreciation of the exchange rate and/or an inflow of international reserves.

In contrast to the simpler monetary approach models that focus on the balance of payments of a small economy under a system of fixed exchange rates, the above model takes exchange market pressure rather than the balance of payments as the appropriate focal point for economies under managed floating. If there is an excess supply of money, domestic residents will attempt to restore equilibrium in their portfolios by increasing their expenditures on goods and services and nonmonetary assets. Part of the adjustment process involves residents exchanging their local money for foreign currency, which results in a depreciation of the exchange rate and a reduction in the supply of money. The depreciation of the exchange rate leads in turn to an increase in the domestic price level, which increases the demand for money. Therefore, equilibrium is restored by a reduction in the supply of money and/or an increase in the demand for money. By replacing the dependent variable ($\hat{r} + \hat{e}$) by ($\hat{r}$) or ($\hat{e}$) as the dependent variable, the empirical analysis tests whether the exchange market pressure model provides better results than the monetary model for the balance of payments or the monetary model for determining the exchange rate, used independently.

The model was estimated for quarterly data from the fourth quarter 1973 to the fourth quarter 1988 using ordinary least squares. The recursive residual approach and the Chow test were used to test for parameter stability. Estimates of the parameters of equation (5) are reported in Table 3. M1 was used for calculating the money multiplier variable in regressions (1) to (4), whereas M2 was used in regressions (5) to (8).

Table 3. Estimated Coefficients for the Model of Exchange Market Pressure

Regression Equation	Dependent Variable	$\hat{d}$	$\hat{P}^*$	$\hat{Y}$	$\hat{m}$	$\hat{r}f$	$\hat{\pi}$	Q	R^2 / D.W.	Cusums (b) / Cusums (f)	Cusums Squared (b) / Cusums Squared (f)	SSR / SEE
		Estimated Coeffient of the Independent Variable										
1.	$\hat{e}+\hat{r}$	-0.86**	1.29*	0.45**	-0.49**	-0.14*	-0.01		0.78	0.343	0.234*	0.27
		(13.6)	(2.6)	(3.6)	(3.0)	(2.2)	(0.5)		1.90	0.606	0.108	0.07
2.	$\hat{r}$	-0.80**	1.81	0.41**	-0.38*	-0.06	0.00		0.75	0.492	0.158	0.31
		(11.7)	(3.4)	(3.0)	(2.2)	(0.9)	(0.14)		2.01	0.337	0.195	0.08
3.	$\hat{e}$	-0.06	0.52	0.04	-0.10	-0.08*	-0.01		0.16	1.215**	0.357**	0.09
		(1.6)	(1.8)	(0.6)	(1.1)	(2.1)	(1.1)		1.19	1.066*	0.508**	0.04
4.	$\hat{e} + \hat{r}$	-0.86**	0.24	0.42**	-0.47**	-0.13*	-0.004	0.02	0.77	0.539	0.216*	0.26
		(13.6)	(0.26)	(3.3)	(3.0)	(2.1)	(0.4)	(1.3)	1.82	0.737	0.214*	0.07
5.	$\hat{e} + \hat{r}$	-0.95**	1.56**	0.28**	-0.94**	-0.14**	0.01		0.88	0.805	0.142	0.16
		(18.5)	(4.2)	(3.19)	(7.39)	(2.89)	(0.80)		1.73	0.463	0.133	0.05
6.	$\hat{r}$	-0.93**	1.99**	0.31**	-1.05**	-0.006	0.005		0.92	0.532	0.191	0.15
		(18.7)	(5.5)	(3.56)	(8.63)	(0.13)	(0.67)		1.79	0.476	0.151	0.05
7.	$\hat{e}$	-0.03	-0.43	-0.02	0.11	-0.14**	0.001		0.30	1.235**	0.377**	0.08
		(0.8)	(1.65)	(0.3)	(1.31)	(4.00)	(0.22)		1.33	0.986	0.499	0.04
8.	$\hat{e} + \hat{r}$	-0.94**	0.42	0.26**	-0.92**	-0.15**	0.008	0.02	0.87	0.880	0.117	0.15
		(18.6)	(0.59)	(2.88)	(7.36)	(3.13)	(1.03)	(1.87)	1.70	0.678	0.205*	0.05

Note: Regressions (1)-(4) use M1 for calculating the money multiplier variable and regressions (5)-(8) use M2. The numbers in parentheses below the estimated coefficients indicate absolute t-values; R^2 = coefficient of determination; D.W. = Durbin-Watson statistic; SSR = sum of squared residuals; SEE = standard error of estimate; b and f refer to backward and forward recursive residuals, respectively; * = significant at the 0.05 level and ** = significant at the 0.01 level. Other symbols are defined in the text.

Regressions (1) and (5) provide strong evidence in support of the exchange market pressure model. All the estimated coefficients have the correct sign and significantly differ from zero; the exception is the inflation variable in equation (1), which is statistically insignificant. Recursive regressions were run, both forward and backward, over the sample period, and except for the cusums squared test for the backward recursion, the null hypothesis of parameter stability cannot be rejected. Since the floating exchange rate system was adopted in October 1984, the Chow test was done for the hypothesis that the coefficients of the estimated equations are equal for the period Q4 1973-Q3 1984 and Q4 1984-Q4 1988. The results support the hypothesis that the parameters of the estimated model are constant for the two sub-periods.

As a further test of the model, regression equations using either $\hat{r}$ or $\hat{e}$ as the sole dependent variable rather than the composite variable $\hat{r} + \hat{e}$ were estimated. Regression equations (2) and (6) report the results for $\hat{r}$ as the sole dependent variable, and they are similar to those obtained for the composite variable. However, when $\hat{e}$ is used as the dependent variable (equations (3) and (7)), the results are markedly poorer, with some parameter estimates having the wrong signs and the cusums and cusums squared tests indicating parameter instability.

As a final test, the hypothesis that the measure of exchange market pressure is not sensitive to its distribution between exchange rate and foreign reserves changes was tested. To do this, the variable, $Q = (\hat{e} - 1)/(\hat{r} - 1)$, was added to the regression equations (1) and (5). 1/ The results, reported in equations (4) and (8), are basically unchanged, and the Q variable is statistically insignificant. Thus, the measure of exchange market pressure is not sensitive to its composition.

Having demonstrated that the exchange market pressure model fits well for Philippine data, it is interesting to examine how at different periods the authorities' have allowed excess domestic money supply pressures to be reflected primarily in movements in the exchange rate or in net foreign assets. Chart 3 illustrates that, even after the formal adoption of a floating exchange rate system in October 1984, changes in net foreign assets continued to bear a large part of the impact of excess domestic money supplies. Indeed, there was, in practice, remarkably little change in the degree of the authorities' reliance on exchange rate movements compared with reserve management as a result of the announced change in exchange rate regime; for instance, the standard deviations in $\hat{r}$ and $\hat{e}$

1/ The simpler ratio $\hat{e}/\hat{r}$ was not used because it is discontinuous for values of $\hat{r} = 0$.

were almost identical before and after the announced change in regime. 1/ To some extent, this reflected the substantial discrete devaluations that occurred in 1983-84, just prior to the adoption of the floating rate (Chart 4).

V. Concluding Remarks

This paper has examined some of the key issues in the conduct of Philippine monetary policy since 1984, including the factors underlying the monetary authorities' choice of intermediate policy targets and instruments used to achieve those targets. It was noted that the setting of target paths for monetary aggregates is predicated on the existence of reasonably stable relationships between the demand for money and the level of prices and real output. Accordingly, the paper reported on the estimation of demand functions for various categories of monetary aggregates, and discussed various tests of stability of these demand functions in light of the various shocks to the economy and the financial system.

The results suggest that the demand for money functions (especially for M2) have been more stable than might have been expected given that the financial system has encountered many shocks and has been significantly transformed over time. However, the results support the conclusions that (1) even if the demand for money and its components is reasonably stable in the longer term, there can be periods of temporary instability (especially for currency demand) when the variances around any predicted values may be large. This would argue for some caution in rigidly adhering to precise base money targets in the very short term, especially during periods of financial shocks; and (2) there has been a significant, long-term shift in most money demand functions following the 1983-84 period.

The analysis in this paper has emphasized that the choice of monetary targets and the conduct of exchange rate policy are closely connected. A monetary model of exchange market pressure was applied to the Philippine experience. The basic proposition of the model is that any excess domestic supply of money will be dissipated through some combination of adjustments in the balance of payments and exchange rates. The regression analysis shows that there is strong evidence of a negative relationship between the rate of domestic credit creation and the rates of change in exchange market pressure. The results also show that the measure of exchange market pressure does not depend on its composition between foreign exchange and foreign reserves. Finally, even after the adoption

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1/ The standard deviation of $\hat{r}$ for the period Q1 1973-Q3 1984 was 0.140 and for the period Q4 1984 - Q4 1988 it was 0.138; and the standard deviation of $\hat{e}$ for the two subperiods was 0.039 and 0.042, respectively.

CHART 3
PHILIPPINES
TRENDS IN EXCHANGE MARKET PRESSURE AND THE COMPOSITION OF THE AUTHORITIES' RESPONSE

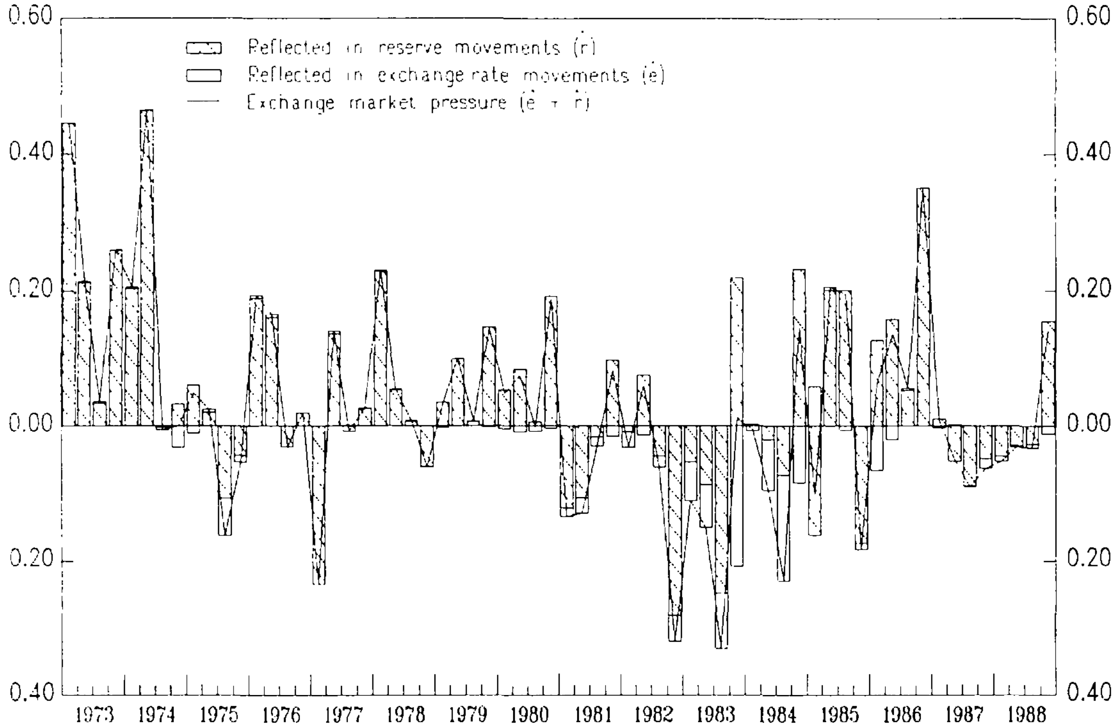
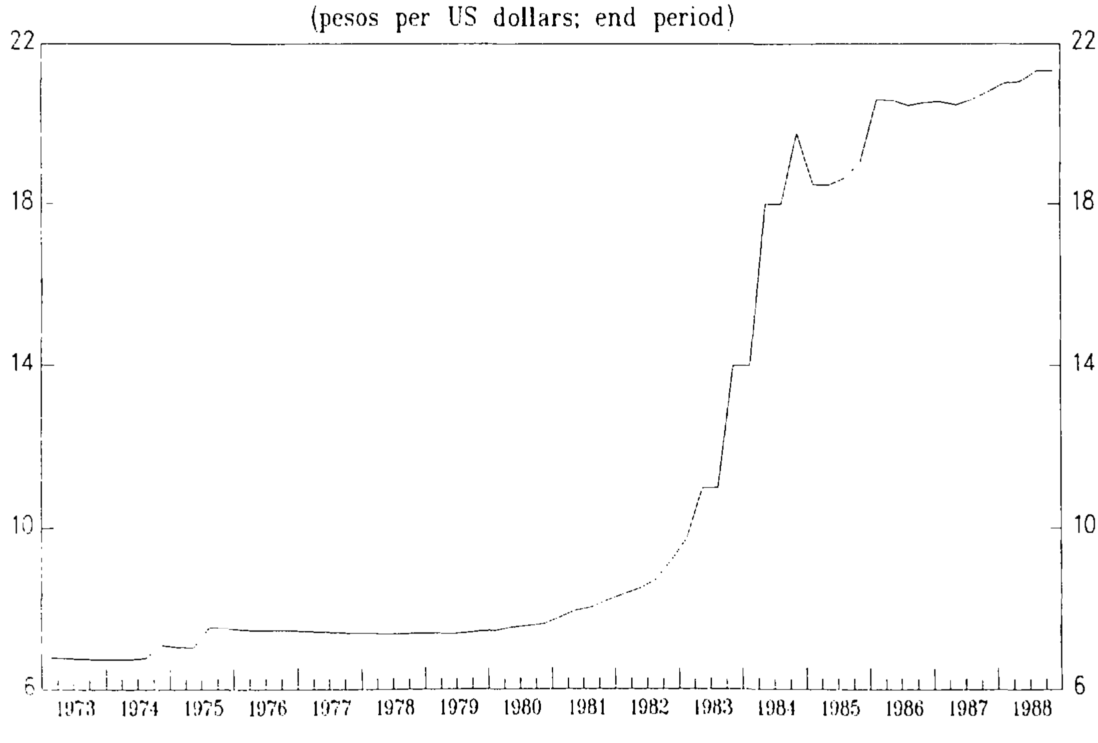


CHART 4
TRENDS IN EXCHANGE RATE
(pesos per US dollars; end period)



of a floating exchange rate system in October 1984, the authorities allowed changes in foreign reserves to continue to absorb most of the exchange market pressure.

Sources and Definitions of Variables Used in Regressions

(All values are in billions of pesos; all constant price variables are in terms of 1980 prices; and all indices take 1980 = 1.0.)

GNP	Real GNP of the Philippines. Quarterly data for 1981Q1 onwards are taken from International Financial Statistics (IFS) (line 99 a.p.). GNP data for the period 1973-80 is only available in semi-annual form, so a quarterly series for this period was created by benchmarking the semi-annual series on a quarterly index of electricity production.
P	Consumer price index (line 64 of IFS). Period average.
INFL ($\pi 4$)	12-month percentage change in the consumer price index.
CUR	Currency outside banks (line 14a of IFS). Average of monthly data.
M1	Currency + demand deposits (Line 24). Average of monthly data.
M2	Currency + demand deposits + time and saving deposits.
M3	M2 + deposit substitutes. Average of monthly data.
TSD	Time and savings deposits (line 25 of IFS).
DPSUB	Commercial bank deposit substitutes (line 26ab of IFS).
T90	Average rate paid on 90-day time deposits.
TR91	Annualized average yield on 91-day Treasury bills, from Philippine Financial Statistics, various issues.
e	Exchange rate in pesos per U.S. dollar, end of period (line ae of IFS).
R	Net foreign assets of monetary authorities (line 11 of IFS).
D	Net domestic assets of monetary authorities (monetary base minus net foreign assets).

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