Journal of Philippine Development
Number Twenty, Volume XI, No. 2, 1984

# CONTROLLABILITY OF VARIOUS MONETARY AGGREGATES

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## I. INTRODUCTION

The Central Bank of the Philippines currently uses monetary aggregates as intermediate targets of monetary policy. The success of this strategy depends on two conditions. One, the aggregates bear a close and predictable relationship to the ultimate target variable, say GNP, which policymakers seek to influence. In this case, the monetary aggregates can indicate what will happen to the ultimate target variable as a result of policy actions taken by the Central Bank. The second condition is that the monetary authority can control movements of the aggregates by simply adjusting the instruments of monetary policy as it would be meaningless to target a variable over which the Central Bank has no control. The monetary aggregates that satisfy both conditions can then serve as indicators of policy actions as well as movements of economic activity. In short, they can serve as intermediate targets of monetary policy.

In Lamberte (1983), the relationship between the various monetary aggregates and economic activity, proxied by GNP, was examined. The evidence indicates that broader monetary aggregates, specifically M3, M3A and M4A, predict future economic activity better than narrowly defined monetary aggregates.[1] Further, M3A and M4A are found to have better forecasting capability than M3. This merely underscores the importance of much broader aggregates that include financial assets produced by nondeposit financial institutions in appropriately describing economic activity.

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1. For the definition of the various monetary aggregates, See Appendix I.

These findings, however, would be useless for policymakers unless the aggregates that move closely with economic activity are controllable by the Central Bank and are less subject to non-policy actions. Unfortunately, the defined monetary aggregate is not a part of the set of policy instruments of the Central Bank, and is, therefore, not directly controllable. But the Central Bank can indirectly influence movements of the aggregate through some policy actions reflected in changes of the monetary base.[2] This study attempts to determine the extent to which the various monetary aggregates can be controlled by the Central Bank.

## II. THEORETICAL FRAMEWORK AND METHODOLOGY

The link between the monetary aggregate and the monetary base is summarized in the following equation.

$$(1) \qquad M = m \cdot MB$$

whereby the monetary aggregate ($M$) is the product of the money multiplier ($m$) and the monetary base ($MB$). The equation can be rewritten in additive form,

$$(2) \qquad ln_M = ln_m + ln_{MB}$$

That is, changes in $M$ are related to changes in $m$ and $MB$. Equation (2) decomposes changes of the monetary aggregate into two: those which are caused by changes in the money multiplier and those which are due to changes in the monetary base.

The monetary base is assumed to be completely determined by Central Bank actions.[3] On the other hand, the money multiplier, which is the summary of the behavior of financial intermediaries and of the nonfinancial private sector, is to a large extent beyond the control of the Central Bank. Financial intermediaries and the

2. The role of bank reserves and of currency in circulation in money creation is not discussed here. An excellent discussion on this can be found in Balbach (1981).

3. This hypothesis may be subjected to a test. It is possible that the monetary base cannot be controlled, that is, if the Central Bank pursues a policy of supplying reserves whenever there is a demand, and/or if the balance sheet items which are not subject to Central Bank discretionary action dominate those which are subject to Central Bank discretionary action. A testing of the said hypothesis, however, is not here and should be pursued in future studies.

nonfinancial private sector decide on the form of financial assets they will hold. For example, financial intermediaries may hold excess reserves or may lend the extra reserves to the public. The nonfinancial private sector may choose to hold deposits or cash, or a combination of both. Each of these decisions determines a particular value of a multiplier which, in turn, helps determine the magnitude of a particular aggregate. Thus, given a particular change in the monetary base, varying decisions of financial intermediaries and of the nonfinancial private sector on the form of financial assets they will hold will result in different growth patterns for the monetary aggregate. This, indeed, poses a problem for the Central Bank, for if the money multiplier is highly volatile and unpredictable, then movements of the monetary aggregate cannot be wholly influenced by the Central Bank despite its tight control over the monetary base. In contrast, if the rate of change of the money multiplier remains constant over time, then the Central Bank can control movements of the monetary aggregate through the monetary base.

To assess the degree by which the various monetary aggregates are controllable by the Central Bank, the rate of change of the money multiplier is assumed to be constant over time. The movement of the monetary aggregate can then be directly related to changes in the monetary base. Closer relationship between the aggregate and the base is interpreted here as greater controllability of the said aggregate. This is summarized in the following simple linear model.[4]

$$(3) \qquad ln\, M^*_t = \beta^*_0 + \beta^*_1\ ln\, MB_t$$

where $M^*_t$ is the equilibrium level of a monetary aggregate. It is possible that changes in $MB$ will not immediately result in the equilibrium level for $M$. Thus, the following adjustment process can, therefore, be incorporated:

$$(4) \qquad ln\, M_t - ln\, M_{t-1} = \lambda (ln\, M^*_t - ln\, M_{t-1})$$

Equation (4) specifies that the change in $M$ will respond only partially to the difference between $M^*_t$ and the past value of $M$, the rate of response being a function of the coefficient $\lambda$. Combining equations

4. See Tatom (1979) and Hafer (1981) for details of this model.

(3) and (4), rearranging terms, and expressing the result in terms of first difference, the final equation to be estimated is thus:

$$(5) \qquad \Delta \ ln\, M_t = \beta_0 + \beta_1 \ \Delta \ ln\, MB_t + \beta_2 \ \Delta \ ln\, M_{t-1}$$

From the estimated parameters of equation (5), the following parameters can be derived:

$$(6) \qquad \lambda = 1 - \beta_2$$

$$\beta^*_0 = \frac{\beta_0}{1 - \beta_2}$$

$$\beta^*_1 = \frac{\beta_1}{1 - \beta_2}$$

Estimating equation (5) requires data on *M* and *MB*. Since data on the various monetary aggregates are available, what is needed is information on *MB*. The monetary base can be derived from the balance sheet of the monetary authorities. A simplified balance sheet of the monetary authorities is presented in Table 1. The balance sheet may be rewritten as

$$(7) \qquad MB = (FA - FL) + (COG - GD) + (COB - CBCI)$$

A change in any of the items on the right-hand side of equation (7) would lead to a change in the monetary base. It should be pointed out that the tighter Central Bank control over the items on the right-hand side of the equation means greater control over the monetary base.

The magnitude of the monetary base, which is also called reserve money (*RM*), is reported in the *Philippine Financial Statistics* published quarterly by the Central Bank. The Central Bank's method of arriving at the figures for the monetary base or reserve money deserves some comments. Banks are required to hold reserves for their deposit liabilities and these are kept either at the Central Bank or in their own vaults. Statistics reveal that total reserves (required reserves + excess reserves) are almost equal to required reserves. What is important to point out is that some government securities earning not more than 4 percent annually are eligible as reserves.

**TABLE 1**
**SIMPLIFIED BALANCE SHEET OF THE MONETARY AUTHORITIES**

| *Assets* | *Liabilities* |
|---|---|
| 1. Foreign assets (FA) | 5. Monetary base (MB) |
| 2. Claims on government (COG) | 5.1 Currency held by the public |
| 2.1 National government Less: Treasury IMF account | 5.2 Currency held in banks' vaults |
| 2.2 Local government | 5.3 Deposits of Deposit money banks |
| 2.3 Semigovernment entities | 6. Government deposit (GD) |
| 3. Claims on banks (COB) | 7. CBCI issues (CBCI) |
| 4. Other assets (OA) | 8. Foreign liabilities (FL) |
| | 9. Other liabilities (OL) |

Because of their relative attractiveness, eligible government securities oftentimes constitute about 5 percent of the total required reserves of banks. Despite their magnitude, eligible government securities which form part of total reserves are not included in the current definition of monetary base. In addition, the reserves allotted for deposit substitutes are not reflected in the current definition of monetary base. Thus, the figures for the monetary base reported in the *Philippine Financial Statistics* seriously underestimate the actual figures, and as such, they are not useful for the purpose of this study.

Another method of estimating the monetary base that would include reserves in the form of eligible government securities and reserves for deposit substitutes is, therefore, proposed. This is outlined in the following equation:

$$MB = CC + RR_{DM} + ER_{DM} \quad (8)$$

where: $CC$ = currency in circulation;
$RR_{DM}$ = required reserves for demand deposits, savings deposits, time deposits and deposit substitutes of deposit money banks; and
$ER_{DM}$ = excess reserves of deposit money banks.

Data on *CC* are available from the *Statistical Bulletin.* With regard to *RR*, only the required reserves for demand deposits, savings deposits and time deposits of deposit money banks are reported. To obtain the required reserves for deposit substitutes, the following formula may be used:

$$RR_{ds} = r_{ds} \cdot DS \tag{9}$$

where: $RR_{ds}$ = required reserves for deposit substititutes;
$r_{ds}$ = reserve requirement ratio against deposit substitutes; and
$DS$ = level of deposit substitutes.

The reserve requirement ratio $(r_{ds})$ has been changing, starting from 1 percent in 1973 to 2 percent in 1980. In the computation for $RR_{ds}$, this changing reserve requirement ratio is considered.

Since we have introduced monetary aggregates which encompass deposit liabilities of both deposit money banks and nondeposit money banks, it is also necessary to come up with an adjusted monetary base which would include reserves of both types of financial institutions. The adjusted monetary base is defined as:

$$MBA = MB + RR_{OB} + ER_{OB} \tag{10}$$

where: $MBA$ = adjusted monetary base;
$RR_{OB}$ = required reserves for demand deposits, savings deposits, time deposits and deposit substitutes of other banks;
$ER_{OB}$ = excess reserves of other banks; and
$MB$ = as defined in equation (8).

Data on $RR_{OB}$ are not available; thus, an alternative would be to estimate them using the formula:

$$RR_{OB} = \sum_i \sum_j rr_{ij} \cdot D_{ij} \tag{11}$$

where: $D_{ij}$ = the level of the $i$th type of deposit of the $j$th type of bank;
$r_{ij}$ = the reserves requirement ratio of the $i$th type of deposit of the $j$th type of bank.

It is to be noted that the reserve requirement ratio *(rr)* varies according to type of deposits. For the same type of deposit, say savings deposits, the *rr* also varies according to type of financial

institutions. As shown in equation (11), these factors are taken into consideration in computing for the $RR_{OB}$. There is no way of determining excess reserves of other banks. $(ER_{OB})$. However, it is likely that these are very minimal, and it may be safe to assume the $ER_{OB}$ is zero.

Equation (5) is estimated using quarterly data for the period 1969:2 through 1980:4. The data base is presented in Appendix II. Seven regression equations are estimated, one for each monetary aggregate. For the exising aggregates, M1, M2 and M3, the monetary base (MB) defined in equation (8) is the independent variable, while for the additional monetary aggregates, M1A, M2A, M3A and M4A, the adjusted monetary base (MBA) given in equation (10) is the independent variable. The OLS method is utilized to estimate all equations. Ordinarily, the value of $\lambda$ should be constrained between zero and one before estimation. No such *a priori* restriction, however, is made in this study.

## III. EMPIRICAL RESULTS

The estimated parameters and summary statistics are presented in Table 2. All equations do not show a statistically significant first-order autocorrelation. The computed F-statistic is significant for all equations, indicating the plausibility of the model.

A number of interesting results can be gathered from Table 2. The equations of the three existing aggregates alone show that the monetary base moves with M1 more closely than with M2 and M3. The variation of the base accounts for about 72 percent of the variation of M1. The explanatory power of the base drops modestly to 64 percent for M2, and to 62 percent for M3.

The implied point elasticities indicate how responsive are the aggregates to changes of the monetary base. Results show that, contrary to common expectations, M3 appears to be more sensitive than M1 and M2 to changes in the monetary base. A 1.0 percentage point increase in the growth rate of the base would lead to a .76 percentage point increase in the growth rate M3. The estimated elasticity of M1 is slightly lower than M3, while that of M2 is considerably lower than M3.

The estimated $\lambda$ for M1, M2 and M3 indicates that, the broader the aggregate, the longer is the lagged adjustment process. The equi-

TABLE 2
REGRESSION RESULTS: MONETARY AGGREGATES AND MONETARY BASE
1969:2 – 1980:4

| | *M1* | *M2* | *M3* | *M1A* | *M2A* | *M3A* | *M4A* |
|---|---|---|---|---|---|---|---|
| $\beta_0$ | 0.0061 | 0.0143 | 0.0077 | 0.0074 | 0.0381 | 0.0338 | 0.0298 |
| | (1.05) | (2.52)** | (1.27)** | (1.06)** | (4.86)* | (3.77)* | (3.38)* |
| $\beta_1$ | 0.6361 | 0.4028 | 0.3766 | 0.8334 | 0.3536 | 0.2906 | 0.2984 |
| | (10.50)* | (8.73)* | (7.34)* | (10.49)* | (5.98)* | (4.32)* | (4.39)* |
| $\beta_2$ | 0.1316 | 0.2641 | 0.5070 | –0.1656 | –0.0444 | 0.1580 | 0.2082 |
| | (1.55) | (2.68)* | (5.35)* | (–2.08)** | (–0.38) | (1.23) | (1.64) |
| $\lambda$ | 0.8684 | 0.7359 | 0.4930 | 1.1656 | 1.0444 | 0.7094 | 0.7918 |
| | (86.84)* | (27.81)* | (10.28)* | (82.42)* | (60.30)* | (35.47)* | (29.93)* |
| $\beta_1^*$ | 0.7325 | 0.5474 | 0.7639 | 0.7150 | 0.3386 | 0.4096 | 0.3769 |
| | (7.02)* | (5.08)* | (4.00)* | (7.11)* | (4.34)* | (3.96)* | (3.31)* |
| $\rho$ | –0.1572 | –0.0816 | –0.0689 | –0.1103 | –0.1413 | –0.0174 | –0.0668 |
| $d$ | 2.2853 | 2.1529 | 2.1374 | 2.1650 | 2.2366 | 2.0235 | 2.1180 |
| $h$ | –1.2023 | –0.7105 | –0.6200 | –0.6741 | –1.3502 | –0.1683 | –0.8122 |
| SEE | 0.0269 | 0.0201 | 0.0229 | 0.0321 | 0.0235 | 0.0275 | 0.0279 |
| $R^2$ | 0.7150 | 0.6348 | 0.6246 | 0.7514 | 0.4798 | 0.3001 | 0.3113 |
| $F$ | 55.18* | 38.23* | 36.60* | 66.50* | 20.29* | 9.43* | 9.94* |

Notes: $t$-values in parentheses. $d$ is the Durbin-Watson statistic. $h$ is the Durbin $h$-statistic.
* – significant at 1% level; ** – significant at 5% level.
The $t$-values for $\lambda$ and $\beta_2^*$ are derived using the procedure outlined in Kmenta (1971).

librium adjustment process for a change in the monetary base is only .49 for M3 as compared to .87 and .74 for M1 and M2, respectively. This may be due to some factors, like lack of knowledge and/or technical constraint, which would account for the slower adjustment process of M3. It is to be noted that, up until this time, the Central Bank has not included required reserves for deposit substitutes which are fairly significant components of M3 in arriving at the monetary base.

Among the additional monetary aggregates, results show that the adjusted monetary base is strongly correlated with M1A than with M2A, M3A and M4A. The variation of the adjusted monetary

base explains about 75 percent of the total variation of M1A. But its explanatory power substantially drops to .48 with M2A, to to .30 with M3A, and to .31 with M4A.

The implied point elasticity between the changes in the growth rate of the adjusted monetary base and changes in the growth of M1A is comparable to the implied elasticities between changes in the growth rate of the monetary base and changes in the growth rates of existing aggregates. A 1.0 percentage point change in the growth rate of the adjusted monetary base would result in a .72 change in the M1A growth rate. In contrast, the implied elasticities of M2A, M3A and M4A are fairly small, indicating that these aggregates are less sensitive to changes in the adjusted monetary base.

The estimated $\lambda$ for the additional monetary aggregates suggest that the equilibrium adjustment process for a change in the adjusted monetary base will be completed in less than a quarter for M1A, about a quarter for M2A, and more than a quarter for M3A and M4A. Again, this shows that the broader aggregate has the longer lagged adjustment process.

The results so far point out that the controllability of M1, M1A, and M3 is greater than that of the other aggregates, as judged by the value of $R$ and the degree of responsiveness of the aggregates with respect to the base. However, this conclusion is arrived at using in-sample observations. A more important test of controllability of the aggregates pertains to the out-of-sample forecasting capability of the equations reported in Table 2. The equations are then used to forecast growth rates of the various aggregates for the four quarters of 1981 and 1982. The results are summarized in Table 3.

Note that the RMSE's of M2, M3 and M1A are lower than the standard error of their respective regression equations (*SEE*), while that of M1 is about the same as its *SEE*. This indicates that M1, M2, M3 and M1A equations yield more accurate forecasting results. Thus, the simulation results indicate adequate control of these aggregates through the monetary base. In contrast, the RMSE is considerably higher than the SEE for the M2A, M3A and M4A equations. In addition, the RMSE's of M2A, M3A and M4A equations are substantially higher than those of the other aggregates. These results imply poor control of these aggregates through the monetary base. Thus, much broader aggregates that include financial assets produced by nondeposit money banks will seriously undermine the effectiveness of monetary control.

**TABLE 3**
**SIMULATION RESULTS: MONETARY AGGREGATES AND MONETARY BASE**

| Period | *M1* | | *M2* | | *M3* | | *M1A* | | *M2A* | | *M3A* | | *M4A* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $M_t^s$ | $M_t^a$ | $M_t^s$ | $M_t^a$ | $M_t^s$ | $M_t^a$ | $M_t^s$ | $M^a{}_t$ | $M_t^s$ | $M_t^a$ | $M_t^s$ | $M_t^a$ | $M_t^s$ | $M_t^a$ |
| 1981:1 | −.02390 | −.01622 | .00319 | .01144 | .00770 | .02861 | −.06021 | −.02600 | .01164 | .00094 | .02135 | .00146 | .01882 | .00182 |
| 2 | .02465 | .00765 | .03042 | .01278 | .03445 | .01450 | .03683 | .01014 | .04872 | .01338 | .04279 | .01338 | .03918 | .01344 |
| 3 | −.00259 | −.03330 | .01154 | −.00081 | .00931 | .00502 | −.00614 | −.03655 | .03262 | −.10131 | .03178 | −.08217 | .02835 | −.08060 |
| 4 | .04146 | .06046 | .03925 | .04999 | .03378 | .03492 | .06162 | .06584 | .04982 | .03730 | −.08217 | .03039 | .03027 | .02929 |
| 1982:1 | .02025 | −.02262 | .03142 | .00967 | .02907 | .01764 | .00421 | .00934 | .03972 | .10029 | .04129 | .09029 | .03866 | .08847 |
| 2 | .00980 | .00273 | .02108 | .01860 | .02060 | .01055 | .01512 | .00245 | .03758 | .01950 | .05130 | .01702 | .05154 | .01653 |
| 3 | .00033 | −.03017 | .01533 | .00933 | .00942 | .01000 | .00086 | −.02663 | .03463 | .00565 | .03435 | .00540 | .03104 | .00429 |
| 4 | .04705 | .05006 | .04521 | .04138 | .03937 | .02660 | .06607 | .05308 | .06087 | 04482 | .05357 | .02799 | .05012 | .02717 |
| RMSE | .02745 | | .01220 | | .0125 | | .02219 | | .05568 | | .04919 | | .04714 | |

Notes: $M_t^a$ — actual quarterly change of the relevant monetary aggregate; $M_t^s$ — simulated quarterly change of the relevant monetary aggregate. All variables are expressed in logarithms.
RMSE — root mean square error.

The discussions above focused on the relative controllability of the various monetary aggregates. Given certain criteria, the aggregates over which the Central Bank has adequate control were singled out. Complete controllability of these aggregates, however, is impossible. As pointed out earlier, a monetary aggregate is determined at any given time not only by the behavior of the Central Bank, as reflected in the movements of the monetary base, but also by the behavior of the financial intermediaries and the nonfinancial private sector, as summarized by the money multiplier.

In ascertaining the relationship between the base and the aggregates, it has been assumed that the rate of change of money multiplier remains constant over time. Although this may be the case over longer periods of time, it may not be true over shorter periods of time, like a quarter. Thus, short-run changes in the time path of the money multiplier can cause substantial deviation of the growth rate of the aggregate from a given base growth rate. This may show up in the estimated elasticity between changes in the aggregate and changes in the base, for if the rate of change of the money multiplier is indeed constant over time, the estimated elasticity would approach unity. Results, however, show that the estimated elasticities for all aggregates are markedly lower than one. The elasticity that is closest to unity is that of M3 which is .76. This suggests that the money multipliers for all aggregates have been volatile during the period of analysis. This could be an important source of control error.

Further changes in the growth rate of the aggregate are apportioned between those originating from changes in the growth rate of the base and those resulting from changes in the growth of the money multiplier. The results for the various monetary aggregates are shown in Charts 1 to 7. The actual changes in the growth rate of the relevant monetary aggregate are represented by the broken line curves. The solid line curves are the changes in the growth rate of the aggregate attributable to changes in the growth rate of base with the growth rate of the multiplier remaining constant. The dotted line curves represent changes in the growth rate of the aggregate originating from changes in the growth of the multiplier without a change in growth rate of the base. It is clear from these charts that, whenever the money multiplier alters its time path, the growth rate of the aggregate deviates from that of the base. Among the various aggregates, the money multipliers of M1, M3 and M1A appear to be less volatile compared to those of the other aggregates.

CHART 1
QUARTERLY GROWTH RATES OF M1, MB AND $m_1$, 1969:2-1980:4

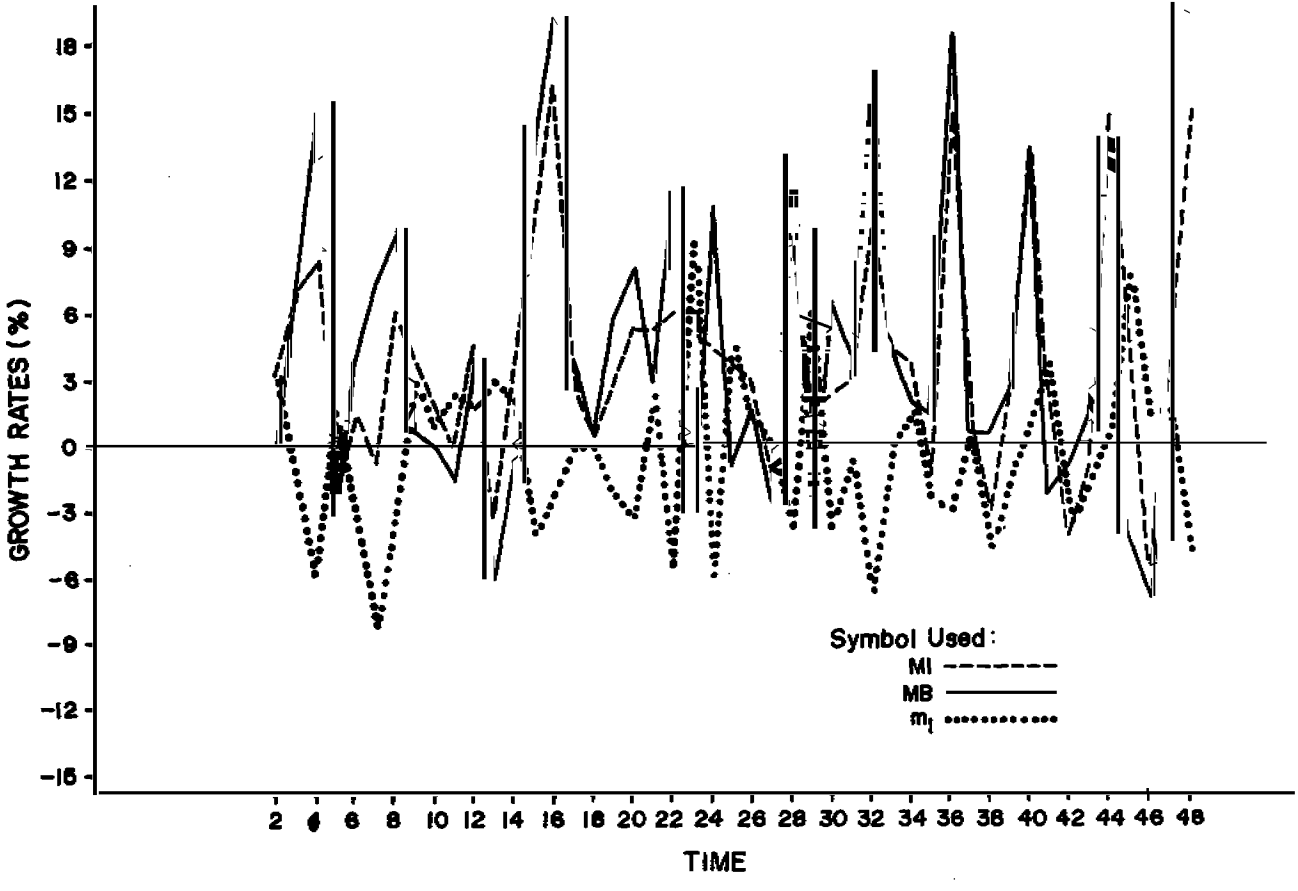


CHART 2
QUARTERLY GROWTH RATES OF M2, MB AND $m_2$, 1969:2-1980:4

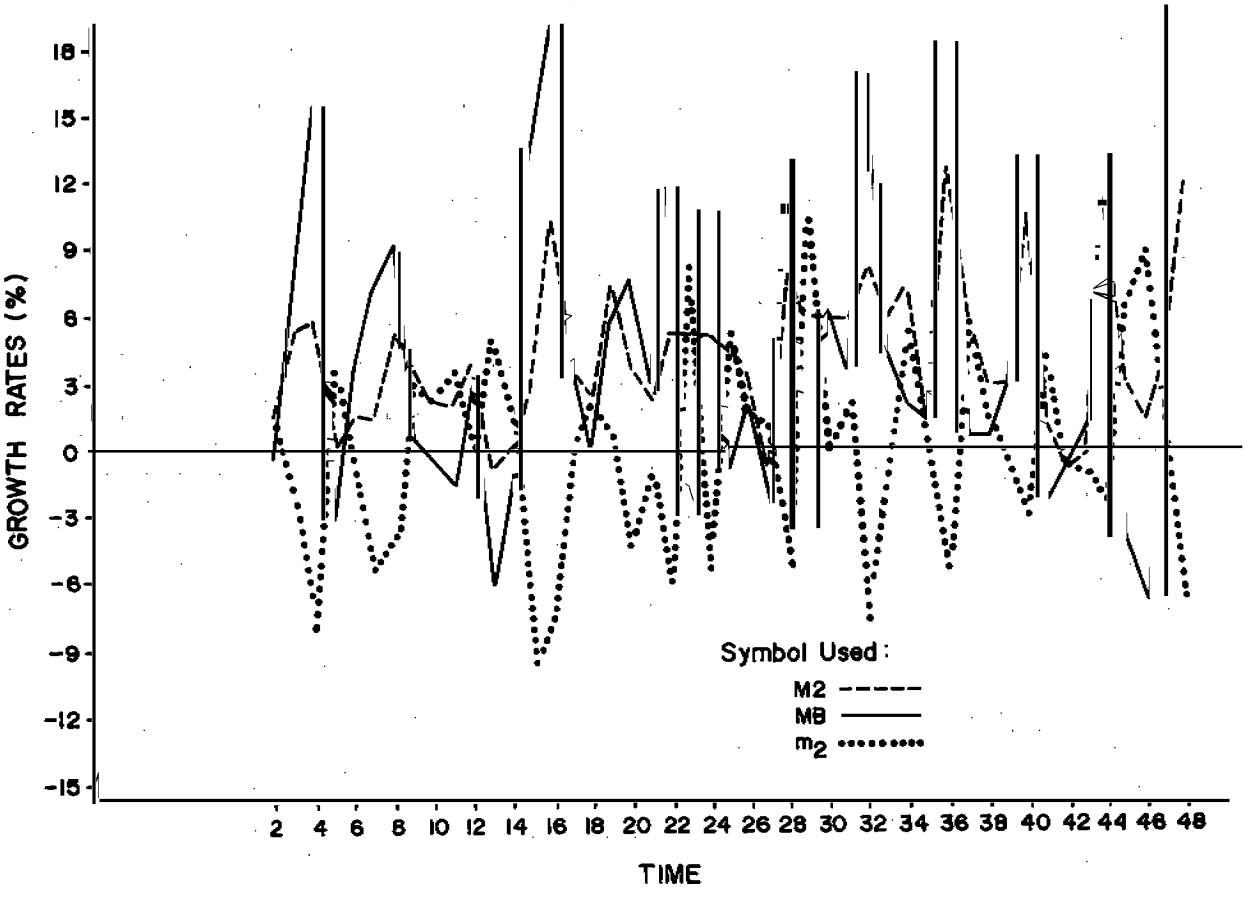


CHART 3
QUARTERLY GROWTH RATES OF M3, MB AND $m_3$, 1969:2-1980:4

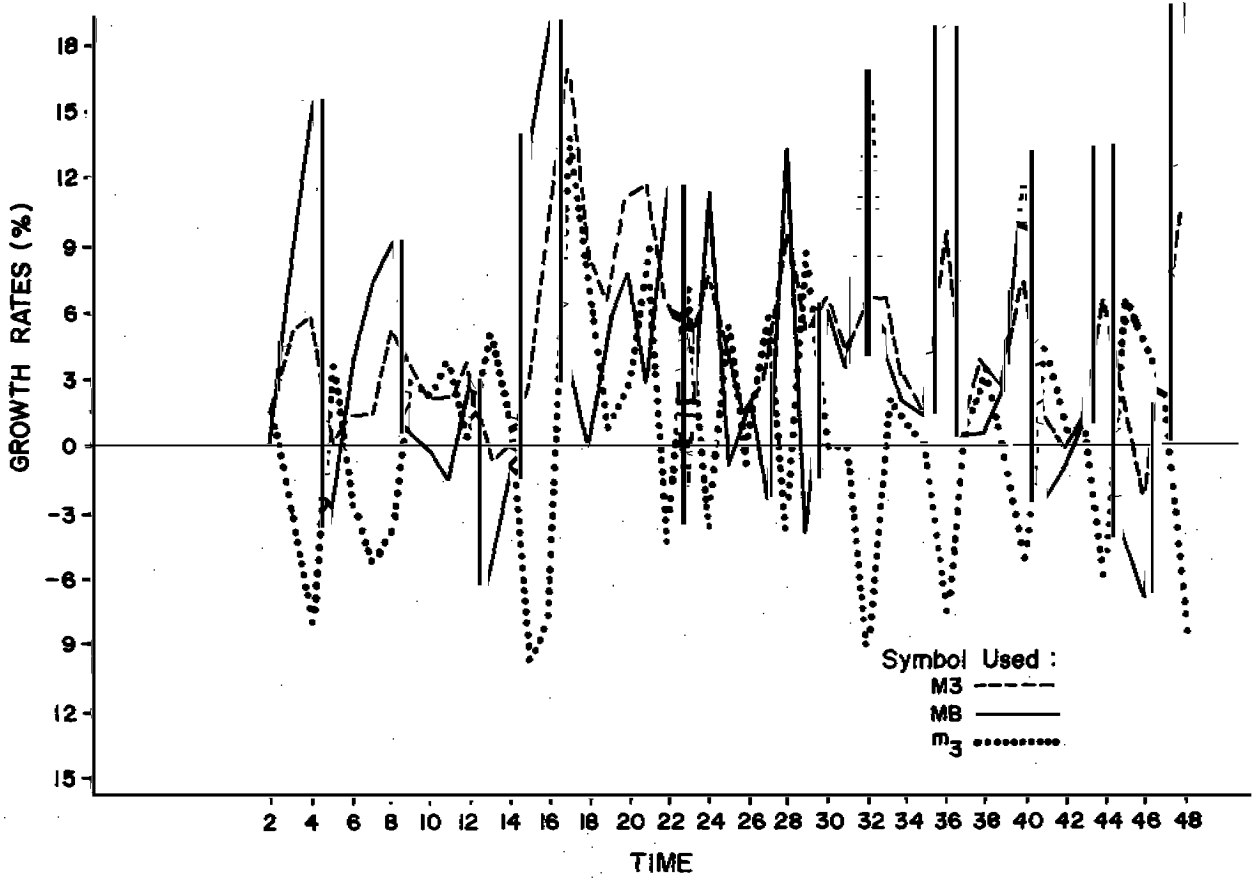
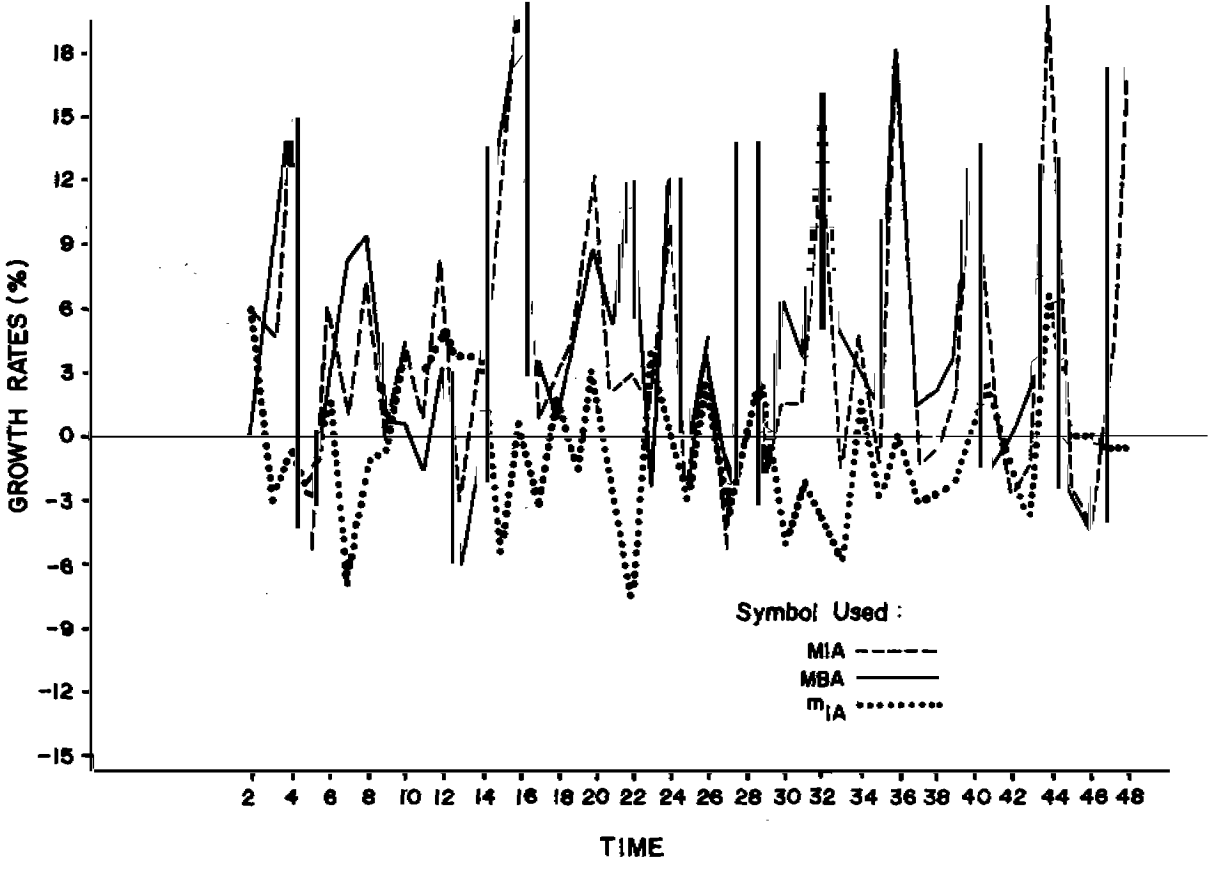
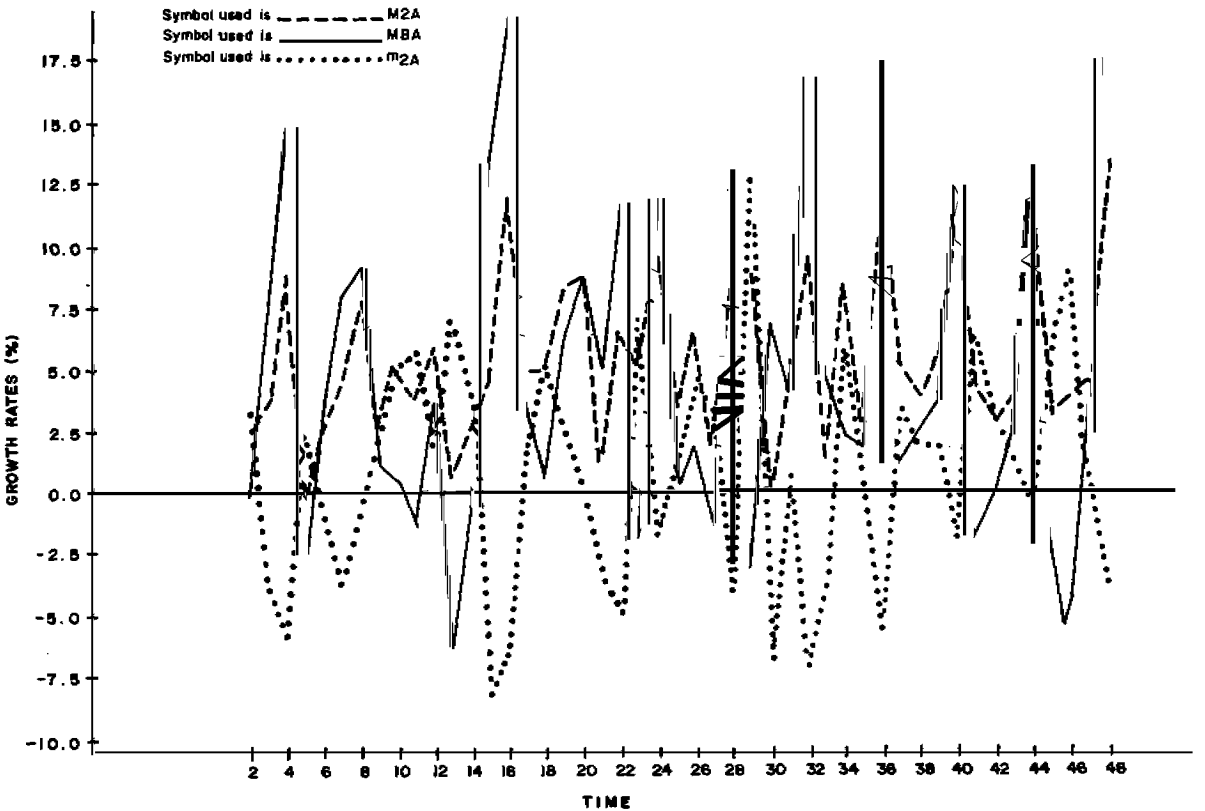


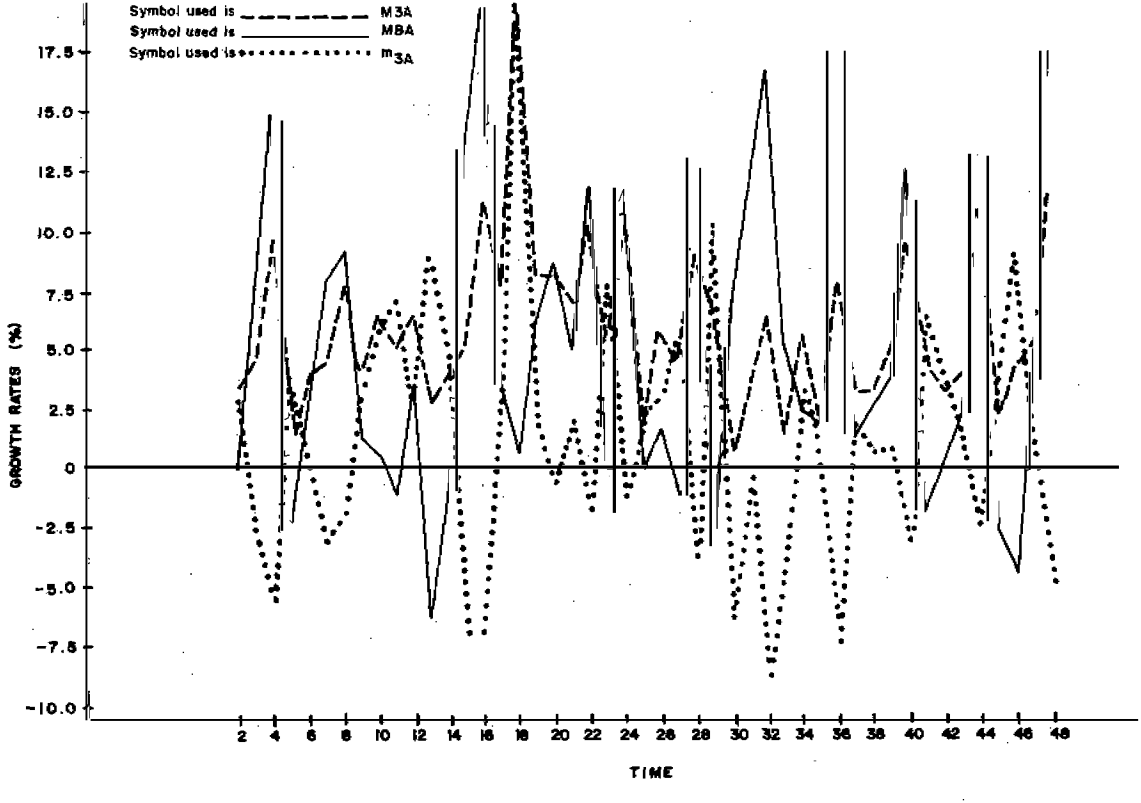
CHART 4
QUARTERLY GROWTH RATES OF M1A, MBA AND $m_{1A}$, 1969:2-1980:4



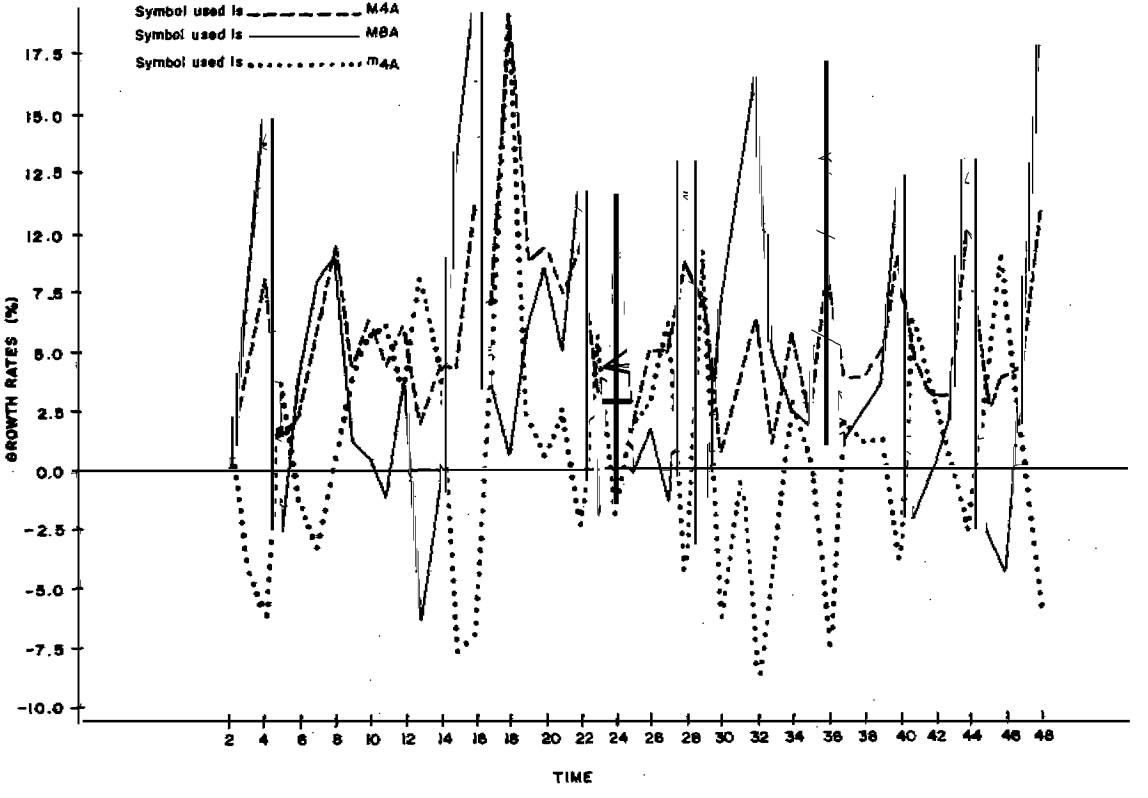
## CHART 5
## QUARTERLY GROWTH RATES OF M2A, MBA AND $m_{2A}$, 1969:2-1980:4



## CHART 6
## QUARTERLY GROWTH RATES OF M3A, MBA AND $m_{3A}$, 1969:2-1980:4



## CHART 7
## QUARTERLY GROWTH RATES OF M4A, MBA AND $m_{4A}$, 1969:2-1980:4



It is not surprising, then, that relatively higher elasticities are obtained for M1, M3 and M1A.

## IV. CONCLUDING REMARKS

The degree of controllability of the various aggregates has been examined. This exercise requires data on the monetary base, which is the variable that represents Central Bank actions. The Central Bank method of arriving at estimates of the monetary base, however, has been judged to be deficient. To remedy this deficiency, an alternative method was proposed. This was used to construct a monetary base series that includes only the reserves of deposit money banks and another series that includes the reserves of all financial institutions.

Using quarterly data for the period 1969:2 through 1980:4, results show that control over M1, M2, M3, and M1A is fairly adequate. In contrast, much broader aggregates, such as M2A, M3A and M4A, that include a sizable proportion of deposit liabilities of nondeposit money banks seriously undermine the effectiveness of monetary control. This finding is hardly appealing to policymakers, especially since the least controllable aggregates – M3A and M4A – are those that appear to be strongly correlated with economic activity. However, policymakers are not completely without any alternative. M3 also bears a close and predictable relationship with economic activity, although this relationship is not as strong as that of M3A and M4A, and is found to be controllable to a large extent.

Elsewhere, it was shown that only the actual growth rates of M3 followed very closely its targeted growth rates, while those of M1 and M2 had substantially diverged from their targeted growth rates. This could hardly be a coincidence considering that, among the existing aggregates, only M3 has sufficient capability to forecast future values of GNP quite reliably. That the Central Bank shows less concern about the deviation of the growth rates of M1 and M2 from their targeted growth rates can be defended by the results of this study. Perhaps, what is needed is a more explicit statement about which aggregate to use as an intermediate target of monetary policy so that market participants can be guided accordingly on the degree of monetary restraint being exercised by monetary authorities.

Although M3 is shown to be a promising intermediate target, the Central Bank should not, however, lose sight of the movements of M3A and M4A in view of the growing importance of nondeposit money banks and of the policy to encourage merger among financial institutions. Perhaps, future changes in the measures for effective control of monetary aggregates should also address the issue of exercising greater control over broader aggregates.

Greater control over the aggregates must be given adequate attention. As revealed in this study, money multipliers have been quite volatile even for M3. This has somewhat weakened the direct relationship between the aggregates and the base. There are at least two ways of dealing with this problem. One is for the Central Bank to exert some efforts to stabilize the money multiplier. This requires applying some measures, such as imposing a uniform reserve requirement ratio for all types of deposits, regardless of the financial institution issuing them. Another, which is currently being done by the Central Bank, is the imposition of a ceiling on foreign exchange holdings of commercial banks. If the money multiplier can be successfully stabilized, then perhaps the growth rate of the base can be set equal to the desired growth rage of the selected aggregate.

The other approach proposed here does not require changes in regulatory environment. That is, the Central Bank may attempt to predict variations of the money multiplier so that it can initiate offsetting actions through the monetary base to achieve the desired growth rate of the aggregate. This is clearly illustrated in the following:

$$M = m \cdot MB$$

where $M$ is the selected monetary aggregate, $m$ is the money multiplier, and $MB$ is the monetary base. If $M^*_t$ is the desired level of the aggregate, and $\hat{m}_t$ is the predicted money multiplier, then the monetary base, $MB^*_t$, needed to achieve $M^*_t$ is

$$MB^*_t = \frac{M^*_t}{\hat{m}}$$

This approach, however, assumes that the monetary multiplier can be correctly predicted. Thus, it would be worthwhile to examine this possibility. Studies done in advanced economies about the possibility of predicting the money multiplier through some methods

showed some encouraging results.[5] Since the monetary base is supposed to reflect Central Bank actions, it is worthwhile to determine whether management of the base is governed by considerations other than achieving monetary control. This is important in the light of certain government policies that might have undermined monetary control through the base. Fore example, the Central Bank is bound to provide adequate funds to priority areas determined by government. Another is the sales (and purchases) of foreign exchange by the Central Bank which may be used mainly to stabilize the exchange rate, not control money. In addition, it is important to examine whether balance sheet items which are not subject to Central Bank discretionary actions dominate those which are subject to Central Bank discretionary actions.

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5. See Buttler et al. (1979), Bomboff (1977), Hafer and Hein (1982), and Balbach (1981).

## APPENDIX I
## RELATIVE IMPORTANCE OF DIFFERENT COMPONENTS OF MONETARY AGGREGATES, PHILIPPINES, 1980
(In Percent)

| *Components* | *Current* | | | *Additional monetary aggregates* | | | |
|---|---|---|---|---|---|---|---|
| | *M1* | *M2* | *M3* | *M1A* | *M2A* | *M3A* | *M4A* |
| A. Monetary authorities | | | | | | | |
| Currency in circulation | 45.20 | 18.40 | 15.00 | 44.00 | 10.30 | 8.30 | 8.10 |
| B. Deposit money banks* | | | | | | | |
| Demand deposits | 54.80 | 22.30 | 18.20 | | | | |
| Savings and time deposits | | 59.30 | 48.50 | | | | |
| Deposit substitutes | | | 18.20 | | | | |
| C. Commercial banks | | | | | | | |
| Demand deposits | | | | 55.30 | 13.00 | 10.50 | 10.20 |
| Savings and time deposits | | | | | 60.80 | 49.00 | 47.80 |
| Deposit substitutes | | | | | | 10.10 | 9.90 |
| Marginal deposits | | | | | | | 2.50 |
| D. Rural banks | | | | | | | |
| Demand deposits | | | | .06 | .01 | .01 | .01 |
| Savings and time deposits | | | | | 2.10 | 1.70 | 1.63 |
| E. Thrift banks | | | | | | | |
| Demand deposits | | | | .70 | .10 | .10 | .10 |
| Savings and time deposits | | | | | 13.60 | 11.00 | 10.70 |
| F. Nonbank financial intermediaries | | | | | | | |
| Deposit substitutes | | | | | | 9.30 | 9.00 |

*These consist of all commercial banks and rural banks accepting demand deposits.
Sources: Unpublished statistics of the Department of Economic Research, Central Bank, and various issues of the CB Statistical Bulletin.

## APPENDIX II
## DATA BASE: MONETARY AGGREGATES AND MONETARY BASE: QUARTERLY
## (1969:2 – 1980:4)

| *Period* | *M1* | *M2* | *M3* | *M1A* | *M2A* | *M3A* | *M4A* | *MB* | *MBA* |
|---|---|---|---|---|---|---|---|---|---|
| 69:2 | 3,870 | 7,705 | 7,705 | 3,771 | 8,685 | 9,181 | 9,801 | 2,743 | 2,795 |
| 3 | 4,136 | 8,114 | 8,114 | 3,930 | 9,020 | 9,588 | 1,0164 | 2,959 | 3,014 |
| 4 | 4,492 | 8,619 | 8,619 | 4,497 | 9,822 | 10,462 | 11,014 | 3,414 | 3,474 |
| 70:1 | 4,412 | 8,635 | 8,635 | 4,246 | 9,766 | 10,566 | 11,154 | 3,304 | 3,386 |
| 2 | 4,283 | 8,779 | 8,779 | 4,493 | 9,991 | 10,950 | 11,441 | 3,435 | 3,518 |
| 3 | 4,439 | 8,932 | 8,932 | 4,526 | 10,430 | 11,449 | 11,990 | 3,698 | 3,808 |
| 4 | 4,897 | 9,388 | 9,388 | 4,877 | 11,239 | 12,318 | 13,107 | 4,049 | 4,168 |
| 71:1 | 4,880 | 9,718 | 9,718 | 4,873 | 11,550 | 12,800 | 13,701 | 4,078 | 4,209 |
| 2 | 4,936 | 9,944 | 9,944 | 5,098 | 12,162 | 13,582 | 14,530 | 4,092 | 4,230 |
| 3 | 4,944 | 10,146 | 10,146 | 5,153 | 12,639 | 14,258 | 15,181 | 4,021 | 4,164 |
| 4 | 5,179 | 10,494 | 10,494 | 5,575 | 13,351 | 15,169 | 16,175 | 4,159 | 4,310 |
| 72:1 | 5,010 | 10,382 | 10,382 | 5,424 | 13,458 | 15,533 | 16,440 | 3,898 | 4,054 |
| 2 | 5,076 | 10,391 | 10,391 | 5,569 | 13,823 | 16,155 | 17,155 | 3,855 | 4,017 |
| 3 | 5,543 | 10,712 | 10,712 | 5,979 | 14,420 | 16,981 | 17,940 | 4,389 | 4,547 |
| 4 | 6,470 | 11,871 | 11,871 | 7,179 | 16,096 | 18,886 | 19,931 | 5,247 | 5,419 |
| 73:1 | 6,704 | 12,309 | 13,945 | 7,231 | 16,946 | 20,288 | 21,340 | 5,430 | 5,610 |
| 2 | 6,712 | 12,612 | 15,179 | 7,438 | 17,818 | 24,280 | 25,515 | 5,439 | 5,632 |
| 3 | 6,524 | 13,529 | 16,204 | 7,783 | 19,287 | 26,232 | 27,733 | 5,754 | 5,986 |
| 4 | 7,267 | 14,022 | 18,063 | 8,742 | 20,976 | 28,405 | 30,336 | 6,245 | 6,517 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 74:1 | 7,639 | 14,347 | 20,206 | 8,932 | 21,181 | 30,375 | 32,586 | 6,419 | 6,842 |
| 2 | 8,110 | 15,099 | 21,602 | 9,217 | 22,563 | 33,318 | 35,553 | 7,188 | 7,660 |
| 3 | 8,601 | 15,918 | 22,553 | 9,356 | 23,652 | 34,961 | 36,767 | 6,988 | 7,496 |
| 4 | 9,008 | 16,772 | 24,242 | 10,390 | 25,952 | 38,474 | 40,255 | 7,791 | 8,378 |
| 75:1 | 9,348 | 17,506 | 25,278 | 10,088 | 26,780 | 39,274 | 40,951 | 7,741 | 8,372 |
| 2 | 9,607 | 18,132 | 25,590 | 10,562 | 28,508 | 41,421 | 43,068 | 7,916 | 8,540 |
| 3 | 9,395 | 17,812 | 26,381 | 10,044 | 29,043 | 43,283 | 45,100 | 7,720 | 8,430 |
| 4 | 10,315 | 19,254 | 28,886 | 11,435 | 31,529 | 47,112 | 48,972 | 8,779 | 9,560 |
| 76:1 | 10,500 | 20,477 | 30,332 | 11,313 | 34,322 | 50,108 | 51,972 | 8,458 | 9,257 |
| 2 | 10,715 | 21,780 | 32,311 | 11,503 | 34,123 | 50,273 | 52,175 | 8,998 | 9,904 |
| 3 | 11,022 | 23,074 | 33,573 | 11,695 | 35,744 | 52,040 | 53,981 | 9,316 | 10,301 |
| 4 | 12,075 | 25,025 | 35,897 | 13,184 | 38,988 | 55,431 | 57,443 | 10,915 | 12,034 |
| 77:1 | 12,634 | 26,484 | 38,453 | 13,028 | 39,436 | 56,076 | 58,081 | 11,443 | 12,634 |
| 2 | 13,145 | 28,393 | 39,591 | 13,577 | 42,682 | 59,403 | 61,461 | 11,691 | 12,978 |
| 3 | 12,970 | 28,917 | 40,051 | 13,412 | 43,704 | 60,657 | 62,752 | 11,824 | 13,191 |
| 4 | 14,938 | 32,532 | 43,931 | 15,792 | 48,518 | 65,702 | 67,924 | 14,010 | 15,485 |
| 78:1 | 15,164 | 34,468 | 45,064 | 15,524 | 50,919 | 67,914 | 70,292 | 14,133 | 15,717 |
| 2 | 14,656 | 35,409 | 46,705 | 15,420 | 52,971 | 70,141 | 72,839 | 14,270 | 16,083 |
| 3 | 14,940 | 36,559 | 48,103 | 15,675 | 55,928 | 73,522 | 76,408 | 14,717 | 16,712 |
| 4 | 16,946 | 40,343 | 51,837 | 17,756 | 62,021 | 80,246 | 83,083 | 16,688 | 18,852 |

Appendix II (Continued)

| Period | M1 | M2 | M3 | M1A | M2A | M3A | M4A | MB | MBA |
|---|---|---|---|---|---|---|---|---|---|
| 79:1 | 17,183 | 40,987 | 52,763 | 17,907 | 64,809 | 83,563 | 86,861 | 16,262 | 18,521 |
| 2 | 16,502 | 40,643 | 52,800 | 17,396 | 66,839 | 86,305 | 89,833 | 16,197 | 18,572 |
| 3 | 16,403 | 40,756 | 53,672 | 17,148 | 69,311 | 89,438 | 92,649 | 16,392 | 18,981 |
| 4 | 18,844 | 45,409 | 57,360 | 20,638 | 77,958 | 98,817 | 101,961 | 18,651 | 21,458 |
| 80:1 | 19,685 | 46,796 | 59,141 | 20,140 | 80,263 | 100,838 | 104,352 | 17,985 | 20,930 |
| 2 | 18,587 | 47,496 | 57,944 | 19,290 | 83,454 | 104,737 | 108,291 | 16,726 | 19,996 |
| 3 | 19,606 | 49,521 | 61,224 | 19,885 | 86,871 | 109,736 | 112,951 | 17,388 | 20,830 |
| 4 | 22,538 | 55,432 | 67,803 | 23,145 | 98,392 | 122,091 | 125,217 | 20,906 | 24,436 |

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