USPSE
SCHOOL OF ECONOMICS
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WORKING PAPER

Estimating Demand for Money in Philippines

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No. 2008/11 **June 2008**

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Abstract

The purpose of this paper is to estimate the demand for narrow money for the Philippines, test for the effects of structural variables and to determine stability of money demand as they have implications on options of monetary policy targets. This paper estimates the demand for money (M1) for Philippines applying three alternative time series methods which generally gave similar results. The outcome estimates of income elasticity for Philippines is high at an average of the three alternative techniques employed at 1.245 while the average interest rate elasticity is -0.280 which are statistically significant with correct signs. The stability test shows that demand for money function for Philippines is temporally stable and therefore targeting money supply as opposed to the rate of interest is an appropriate measure to consider by respective monetary authorities in Philippines. Estimated results are consistent with both prior studies and across the three methods engaged. However, they may differ in their precision but only marginally.
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Keywords: Demand for Money, Cointegration, Income Elasticity, Interest Rate Elasticity, Stability Test, General to Specific Approach, Fully Modified Ordinary Least Squares and Engle-Granger Ordinary Least Squares.

JEL: C22, E41, E52;

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* I would like to thank Professor Bill Bhaskara Rao and Rup Singh for their guidance and useful comments on this paper. However, errors in this paper are of the author's responsibility.

1.0 INTRODUCTION

The Philippines is a newly industrialized country with predominantly agricultural base, light industry, and service sector. GDP stands at around US$116,931 million in 2006 with GDP per capita of US$1,176. The Philippine economy was affected tremendously by the Asian Financial Crisis of the late 1990s which weakened the Philippine peso significantly. Nevertheless, the Philippine economy recovered afterwards and experience improvements in growth. However, with the recognition of the possible impacts of rapid financial innovations introduced in the economy, the Bangko Sentral ng Pilipinas (BSP) which is the independent central monetary authority of the Philippines carefully assessed its position and modified its approach to monetary policy in 1995 putting greater emphasis on price stability over rigidly observing targets set for monetary aggregates. With hybrid approach (combination of both monetary targeting and inflation targeting) to conducting monetary policy, the BSP closely monitored movements of a wide range of key variables including interest rates, exchange rates, domestic credit and equity prices and a set of demand and supply and external economic indicators. In January 2000, the BSP approved the principle of inflation targeting and officially adopted inflation targeting as its main monetary framework for conducting monetary policy aiming at achieving price stability as the ultimate objective.

A standard long-run money demand function relates money demand to the real economic activity and the opportunity cost of holding money. The existence of such a stable long-run aggregate money demand function is an important assumption of macroeconomic models. Furthermore, the quantitative estimates of money demand function have important policy implications for monetary policy. In this paper, we have used the three alternative techniques to estimate the short-run and long-run relationships between the demand for narrow money (M1) and its determinants for Philippines.

Poole (1970) has shown that money supply should be targeted if the LM curve is stable and the rate of interest should be targeted if IS curve is unstable. Since stability of LM depends on the stability of demand for money, it is important to test for temporal stability of money demand functions. Singh and Kumar (2006) present that central banks in many developing countries seem to have switched to interest rate targeting without adequately testing for temporal stability of their money demand functions whereby partly is due to the monetary authorities blindly following the trends in the advanced countries in targeting the rate of interest because the money demand functions in the advanced countries became unstable after financial innovations. However, the Philippines is generally classified as a medium sized country in terms of volume of transactions which is facing financial and general economic developments.

Our objectives are to estimate the income and interest rate elasticities, examine if they differ significantly across the three methods and evaluate the stability of the demand for money functions for Philippine. Singh and Kumar (2006) asserted that although there have been some financial reforms in the developing countries, there is no significant evidence on their impact and their money demand functions seem to be stable. They also added that it is hard to change quickly the nature of the day-to-day exchange patterns based on the use of cash in the developing countries. Therefore targeting the rate of interest, instead of money supply is likely to cause more instability.

The paper is organized as follows. The following *Section 2* provides a brief literature survey on previous empirical studies on demand for money in the Philippines and other related works. *Section 3* presents the data and specification, *Section 4* reports a brief overview of the financial sector, presents obtained results, analysis based on the three employed time series techniques and examines the temporal stability of the money demand function while the final *Section 5* states the conclusion and policy implications.

2.0 LITERATURE SURVEY

There are studies available in the literature which estimates money demand behavior, in particular, using various time series econometrics techniques. A common feature of these studies is that they have employed conventional money demand function relating quantity of money demanded to a scale variable, and a set of interest rate variables to represent opportunity costs. A standard long-run money demand function relates money demand to the real economic transactions and the opportunity cost of holding money balances.

According to Cole (1995) money markets in Asia generally went through four similar stages of development namely controlled system, initial liberalization, retrenchment following a crisis and a more aggressive development during the 1980s. In estimating money demand equations it is obvious that real GDP and nominal short-term interest rate on time deposits plays a vital role as explanatory variables. Although there are reasonable number of papers on the demand for money in other developing countries, only a few empirical works has been done using the experience of the Philippines. Baunto, *et al.* (2007) affirmed that the Philippine economy experienced three recessions, 1984 to 1985, 1991 and 1998, which hampered its chances of becoming one of East Asia's miracles. The 1980s was the most turbulent period of the economy, when annual output growth registered -7.4% in 1984 and -7.2% in 1985, the sharpest contraction ever experienced by the economy since post war. Annual inflation rates recorded double-digit figures over the period 1982 to 1985 and in 1984 it reached an all-time high record of 49.3%.

Gochoco-Bautista (2006) stated that the excessive money creation in Philippine was a result of central bank's pursuit of multiple objectives including monetary aggregate targeting in conjunction with exchange rate targeting and output-growth targeting. In response to the economic crisis, government authorities contracted money supply and imposed fiscal austerity that resulted in jacking up the domestic interest rates. Lim (2006) added that in the case of Philippine, restraining liquidity is not entirely a new policy strategy during economic slowdown and, in fact, meeting tight quarterly monetary targets in the 1980s became a common practice every time the economy faced deterioration of balance of payments and high inflation.

Past studies such as Hafer and Hein (1982) and Arrau, *et al.* (1991) attempt to measure financial innovation in a variety of ways. Our approach is to employ a (0,1) dummy variable to capture any shift in the money demand relation that may have arisen because of financial innovations. Similarly, Copelman (1996) adopts the dummy variable approach to analyze financial innovation's effects on money demand in Bolivia, Israel and Venezuela. In this paper the dummy variable is unity for observations beginning in 1994 and zero for

prior observations. This year is chosen since it is when most of the institutional changes and financial innovations discussed earlier began in earnest.

Yap (2000) presented the Philippine Institute for Development Studies (PIDS) Annual Macroeconometric Model 2000 for Philippines in his paper where he also estimated the demand for narrow money for the period 1970 to 1998. In his specification he used real Gross National Product (GNP) and Treasury Bill of 91-day as explanatory variables of demand for narrow money. However, he estimated the long-run income elasticity as 0.049 which is correctly signed and significant. He applied Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to check the stationarity of residuals. Stationarity of the residuals implies that the variables in the equation are cointegrated and hence the estimated equation is valid. In both cases the test was carried out with an intercept and time trend included. He added that without the intercept or time trend, the absolute value of the critical value decreases significantly.

Hafer and Kutan (2003) in their paper tests whether financial innovations in the Philippines distorted the long-run relation between real money balances, income and interest rates using data for the monetary base, M1 and M3 over the period 1980 to 1998. They used the Johansen (1988) procedure in their estimation. The estimated equation for narrow money used is a simple version of long-run money demand similar to our specification but they employed the CPI as the deflator, GNP as real income, and interest rate is measured using the interest rate on 91-day treasury bills. Their estimated long-run income and interest rate elasticities are 1.54 and -0.10 respectively. The estimated long-run income and interest rate elasticities are signed correctly and of magnitudes not inconsistent with money demand estimates for developing economies if the shift term (*dummy* variable) for innovation is included in the estimation process otherwise it gives no cointegration evidence. They employed a (0,1) *dummy* variable to capture any shift in the money demand relation that may have arisen because of financial innovations. However, the shift term that captures financial innovations on money demand was positively signed which stands at 0.02 and significant at 5% level, suggesting that financial innovations increases demand for money (M1) balances in the short-run. The most important result is finding that including a simple shift term to account for the impact of financial innovation yields a significant long-run equilibrium money demand function for M1.

Moreover, Bahmani-Oskooee and Rehman (2005) investigated the stability of money demand function for Asian developing countries. The countries included are India, Indonesia, Malaysia, Pakistan, the Philippines, Singapore, and Thailand. The data are quarterly observations covering the period from the first quarter of 1972 to the forth quarter of 2000. They flag out that the empirical results of *CUSUM* and *CUSUM Square* tests show that in some Asian countries even though the money demand (M1 or M2) balances are cointegrated with their determinants (real income, rate of inflation, and exchange rate), the estimated parameters are unstable. The study shows that in India, Indonesia and Singapore, the M1 variable is cointegrated with its determinants and the estimated elasticities are stable over time while in the remaining countries (Malaysia, Pakistan, the Philippines and Thailand), the M2 aggregate is cointegrated and stable.

Singh and Kumar (2006) estimated the short and long-run relationships between the demand for narrow money and its determinants in 12 developing countries using the three alternative time series methods namely General to Specific Approach (GETS), Johansen

Maximum Likelihood (JML) and the Fully Modified Ordinary Least Squares (FMOLS) whereby different sample periods were used for some countries. In the case of Philippines, with the same specifications they used a sample period of 1981 to 2002. However, the implied long-run income and semi-interest rate elasticities for Philippines in Singh and Kumar's (2006) paper are similar for the alternative methods applied but only differ marginally. Their estimates of income elasticities for the analysed countries were close to unity in their sample, except for Philippines which was higher at around 1.25 and significant. On the other hand, the implied semi-interest rate elasticities in their work is around -0.05. They also conducted tests for stability of the money demand functions using *CUSUM* and *CUSUM Squares* tests whereby the results imply that the money demand function is temporally stable.

Similarly, Baunto *et al.* (2007) examines shocks in the Philippines monetary sector and their consequences on macroeconomic performance from the mid-eighties until 2006. The full-sample of his work consists of quarterly series from 1982 second-quarter to 2006 fourth-quarter where his data for narrow money, nominal and real GDP, and income velocity were adjusted for seasonality using multiplicative moving average. He employed the Threshold Generalised Autoregressive Conditional Heteroskedasticity (T-GARCH) square model to examine his data. Moreover, structural breaks of income velocity of narrow money were taken into account as these shifts imply non-stationary of the series. He reported that the income velocity of narrow money with drift but no time trend stands significantly at 1.237 while the interest rate differentials with drift but no trend result to 0.047.

Furthermore, Tang (2007) in his paper empirically investigate the money demand function for five Southeast Asian countries, viz. Malaysia, Thailand, Singapore, the Philippines, and Indonesia. The results reveal that real M2 aggregate, real expenditure components, exchange rate, and inflation rate are cointegrated for Malaysia, the Philippines, and Singapore but not Thailand. He employed the ARDL modeling approach because of its ability to incorporate both I(0) and I(1) regressors. The statistical significance of real income components suggests the bias of using single real income variable in money demand (M2 aggregate) specification of both short- and long-run. Besides conventional determinants of money demand such as exchange rate and interest rate variables, he considers the major components of final expenditure (GDP) such as final consumption expenditures (private and government sectors), expenditures on investment goods, and exports as scale variables. He did both the *CUSUM* and *CUSUM Square* tests which shows that the estimated parameters are stable for the five Southeast Asian economies, except for Indonesia which is based on short-run specification.

3.0 EMPIRICAL SPECIFICATION AND DATA

The widely applied Keynesian specification of the demand for money was adopted in which demand for real narrow money is a function of real income and the nominal rate of interest. The interest rate measures the opportunity cost of holding money. However, this paper will be using the specification outlined by Rao and Singh (2006). Our standard specification is illustrated below:

$$\ln(M/P)_t = \alpha_1 + \beta_1 \ln(Y/P)_t + \beta_2 R_t + \varepsilon_t \qquad (1)$$

where M is narrow money consisting of currency in circulation and demand deposit, P and Y are GDP deflator and nominal GDP at factor cost (or market price whichever is available) respectively, R is the nominal short-term interest rate on time deposits and ε is an *iid* error term. Descriptions of the variables and sources of data are in Appendix.

The three alternative estimation techniques employed in this paper are GETS, EGOLS[2] and the FMOLS approaches. *Table 1* reports the cointegrating coefficients obtained with alternative approaches. It shows the long-run estimates for GETS, EGOLS and FMOLS which are obtained after subjecting the variables to unit root tests. According to *Table 3* in *Appendix A2*, all tested variables in (1) for unit roots in the series were done using Augmented Dickey Fuller (ADF) test that were found to be I(1) in levels and I(0) in first difference. Unit roots tests were conducted on these time-series to investigate whether they are stationary or not. Our estimates implied that income and interest rate elasticities for Philippine are correctly signed and significant. In respect to the EGOLS method, an ADF type test called the CRADF test was used with the null hypothesis that the variables are not cointegrated, that is the residuals are I(1).[3] Based on Ericsson and MacKinnon (2002), the null of no cointegration was rejected at 1% in GETS and FMOLS.[4]

The statistical data used in this paper were obtained from the International Financial Statistics (IFS) published by the IMF. Other relevant data were obtained from the ADB Statistics, UN Database, PIDS Economic & Social Database and data from the Central Bank of the Philippines namely Bangko Sentral ng Pilipinas (BSP). Generally, the sample period for estimation is 1970 to 2005. The three estimation techniques were estimated within a consistent framework. Generally, the demand for money in our case is expected to respond positively to an increase in respective incomes whereby a raise in interest rate would reduce demand for money.

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[2] Engel-Granger Ordinary Least Squares

[3] The lag lengths were selected using AIC and SBC criteria. The CRADF statistic value at 5% significant level is -4.026 which is higher than the test statistic at -3.084 in absolute terms. Therefore, we accept the null hypothesis that the variables are not cointegrated. Details are available from author on request.

[4] The Ericsson & Mackinnon critical values that we computed for 1% and 5% significance are -3.323 and -4.062 respectively. Comparing them in absolute terms with our Lambda (GETS) or ECM of residuals at 1 lag period (FMOLS) t-ratios in *Table 2*, the t-ratios are higher which generally implies that they are eligibly significant at 1% level thus demonstrating that there is cointegration presence. Details are available upon request from author.

4.0 EMPIRICAL RESULTS AND ANALYSIS

Table 1 shows the cointegrating coefficients of the demand for narrow money for Philippines implying that the long-run income and the semi-interest rate elasticities are similar across all the three approaches. Singh and Kumar (2006) found out that out of the countries analysed only the Philippines has an income elasticity of around 1.25 while the others obtained close to unit income elasticities. However, this paper found out very similar results with previous studies.

Table 1: Cointegrating Coefficients of the Money Demand for Philippines

Variable	GETS	FMOLS	EGOLS
Constant	-8.766 (-4.11)*	-8.641 (-15.80)*	-8.381 (-20.11)*
$\ln(Y/P)_{t-1}$	1.246 (18.46)*	1.258 (17.09)*	1.231 (21.77)*
R_{t-1}	-0.028 (-7.74)*	-0.022 (-4.28)*	-0.028 (-6.63)*

Notes: The t-ratios are reported below the coefficients and significance at 5% and 10% are indicated by * and ** respectively. The variable $\ln(Y/P)_t$ represent log of real income. The sample period taken are 1970 to 2005.

Table 1 outlines that GETS, FMOLS and EGOLS have long-run income elasticities of 1.246, 1.258 and 1.231 respectively, with expected signs which are highly significant. The implied long-run interest rate elasticities are equivalent for GETS and EGOLS standing at -0.287 and -0.267 with FMOLS, which also possess the expected signs which are statistically significant. However, the Wald tests on the null that income elasticities and interest rate elasticities are the same respectively from the alternative methods were not rejected at 10%, indicating that income elasticities are very similar as well as interest rate elasticities.[5] These results are comparable to Sriram (1999) for developing countries, Oskooee and Rehman (2005) for Asian economies, and Hafer and Kutan (2003) for Philippines.

4.1 IDENTIFICATION AND EXOGENEITY TESTS

The identification tests indicate that all the implied long-run relations represent demand for money function, since only the one period lagged residuals normalized on money ($ECMM_{t-1}$) was significant with correct negative signs in $\Delta\ln(M/P)_t$ equations. Moreover, both the residuals normalized on income $ECMY_{t-1}$ and the rate of interest $ECMR_{t-1}$ was insignificant in their respective regressions. The computed ECM coefficients and their t-ratios in parenthesis are reported the diagonal of their respective (3×3) matrices in *Table 4* in *Appendix A2*.

Further, following Enders (2004) another set of three ECM equations were estimated with their respective $ECMM_{t-1}$ being included as one of the independent variables in each

[5] Details of Wald test are avoided to conserve space, but are available on request from the author.

of the implied equations. The $ECMM_{t-1}$ was only significant in equations where the dependent variables were $\Delta \ln(M/P)_t$ in all cases. The exogeneity test results are also illustrated in *Table 4*, see along the first row in the matrix. Since the dis-equilibrium in the respective money markets do not significantly contribute to the explanation of $\ln(Y/P)_t$ and R_t in all cases, we treated $\ln(Y/P)_t$ and R_t as being weakly exogenous in respective to the money demand equation. Using the one period lagged residuals from the above cointegrating relations, the dynamic money demand equations for EGOLS and FMOLS were estimated. GETS approach was used to search for the best lag structure. Unlike FMOLS and EGOLS, GETS estimates both the equilibrium relation and the dynamics in one step.

Some coefficients were restricted to obtain their preferred equations. *Dummy* represents the financial sector reforms which has positive impact. The *SERs* in all estimates are low and the ECM_{t-1} terms are strongly significant with correct negative signs implying negative feedback mechanisms in all dynamic equations. The fitness of the actual vs. predicted values of growth of real M1 gives fairly high $\overline{R}^2$ for all and *SEEs* are low. *Table 2* shows our estimates of the dynamics of the demand for money equations using the three estimation approaches. Note that none of the χ^2 summary statistics are significant at 5% level thus assuming that our estimations face no problems from serial correlation, functional form misspecification, non-normality and heteroscedasticity in residuals. However, other subsequent variables included in our preferred estimates are highly significant. Columns *A1*, *B1*, and *C1* shows the parsimonious equation without the trend and dummies in order to prevent from any distortions. Columns *A2*, *B2* and *C2* include the trend without dummy variables while columns *A3*, *B3* and *C3* shows both the trend and dummy variables.

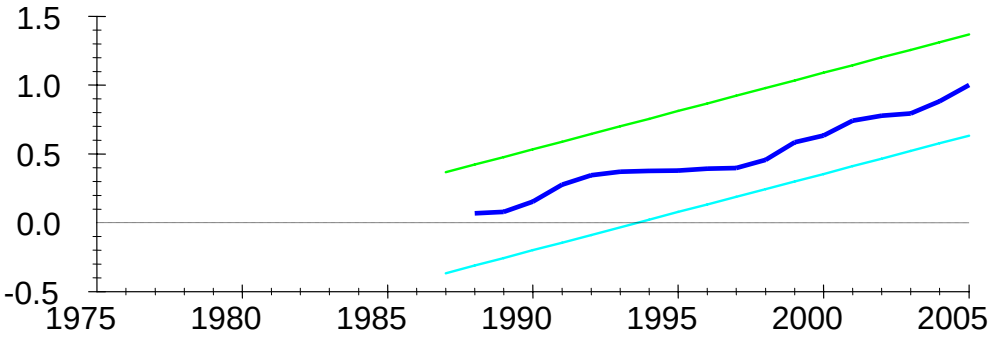
Table 2: Dynamic Demand for Money Equations

	GETS			FMOLS			EGOLS		
	A1	*A2*	*A3*	*B1*	*B2*	*B3*	*C1*	*C2*	*C3*
Constant	-8.766 (-4.11)*	-10.886 (-6.08)*	-7.105 (-3.33)*	-0.068 (-2.34)*	-0.065 (-2.32)*	-0.080 (-2.74)*	-0.071 (-2.49)*	-0.064 (-2.24)*	-0.078 (-2.85)*
Trend			0.022 (2.81)*						
$\ln(Y/P)_{t-1}$	1.246 (18.46)*	1.333 (28.02)*	0.815 (3.88)*						
R_{t-1}	-0.028 (-7.74)*	-0.018 (-4.46)*	-0.008 (-2.14)*						
λ	-1.023 (-4.95)*	-1.162 (-6.43)*	-1.170 (-5.62)*						
$\Delta\ln(M/P)_{t-1}$	0.383 (4.19)*	0.295 (2.71)*		0.477 (3.14)*	0.376 (3.24)*	0.456 (3.07)*	0.378 (3.19)*	0.381 (3.18)*	0.357 (3.24)*
$\Delta\ln(M/P)_{t-2}$			-0.333 (-2.14)*	0.332 (2.15)*	0.275 (1.95)**	0.359 (2.27)*	0.292 (2.05)*	0.287 (1.87)**	0.286 (2.14)*
$\Delta\ln(M/P)_{t-3}$	0.383 (c)			0.558 (4.88)*	0.497 (4.67)*	0.542 (4.66)*	0.509 (4.74)*	0.485 (4.21)*	0.498 (4.94)*
$\Delta\ln(Y/P)_{t}$		1.287 (2.33)*	1.820 (3.37)*		0.376 (c)		0.378 (c)	0.381 (c)	0.357 (c)
$\Delta\ln(Y/P)_{t-1}$			1.105 (2.40)*						
$\Delta\ln(Y/P)_{t-2}$	1.245 (2.73)*	1.333 (c)	1.879 (3.13)*						
$\Delta\ln(Y/P)_{t-3}$			1.105 (c)						
$\Delta\ln(Y/P)_{t-4}$	1.101 (2.36)*	1.380 (2.93)*	1.356 (2.92)*	1.413 (2.99)*	1.225 (2.76)*	1.453 (3.08)*	1.374 (2.99)*	1.139 (2.46)*	1.259 (3.01)*
ΔR_t	-0.038 (-7.67)*	-0.029 (-5.75)*	-0.017 (-3.65)*	-0.034 (-6.51)*	-0.031 (-6.74)*	-0.033 (-6.44)*	-0.029 (-6.36)*	-0.032 (-6.62)*	-0.031 (-6.92)*
ΔR_{t-2}	-0.018 (-4.21)*	-0.017 (-2.62)*	-0.017 (c)	-0.016 (-3.88)*	-0.015 (-3.53)*	-0.014 (-2.14)*	-0.015 (-3.42)*	-0.014 (-2.11)*	-0.014 (-3.53)*
ΔR_{t-4}	-0.018 (c)	-0.012 (-2.73)*		-0.016 (c)	-0.015 (c)	-0.016 (-3.62)*	-0.015 (c)	-0.016 (3.52)*	-0.014 (c)
Dummy		0.092 (2.60)*	0.102 (2.76)*			0.071 (1.82)**			0.073 (1.93)**
ECM_{t-1}				-1.103 (-5.53)*	-0.975 (-5.56)*	-1.248 (-5.89)*	-0.984 (-5.57)*	-0.954 (-5.36)*	-1.081 (-6.14)*
$\overline{R}^2$	0.742	0.791	0.779	0.728	0.733	0.743	0.733	0.721	0.760
SSE	0.063	0.056	0.057	0.064	0.063	0.062	0.063	0.065	0.059
$\chi^2(sc)$	0.013 (0.91)	2.046 (0.15)	0.732 (0.39)	1.096 (0.30)	0.973 (0.32)	1.926 (0.17)	1.431 (0.23)	1.311 (0.25)	2.122 (0.15)
$\chi^2(ff)$	1.810 (0.18)	0.453 (0.50)	0.354 (0.55)	3.083 (0.08)	2.236 (0.14)	2.315 (0.13)	2.407 (0.12)	2.219 (0.14)	1.663 (0.20)
$\chi^2(n)$	0.142 (0.93)	1.903 (0.39)	0.836 (0.66)	0.614 (0.75)	0.417 (0.81)	0.178 (0.92)	0.648 (0.72)	0.675 (0.71)	0.704 (0.70)
$\chi^2(hs)$	1.653 (0.20)	0.048 (0.83)	0.005 (0.94)	0.192 (0.66)	0.033 (0.86)	0.184 (0.67)	0.018 (0.89)	0.025 (0.87)	0.110 (0.74)

Notes: The t-ratios are reported below the coefficients and significance at 5% and 10% are indicated by * and ** respectively. The chi-square tests in order of presentation in the table are for serial correlation, functional form mis-specification, non-normality and heteroscedasticity in residuals for which corresponding p-values are in parenthesis. Constraint estimates are indicated with (c). Microfit 4.1 of Pesaran and Pesaran (1997) is used for estimation.

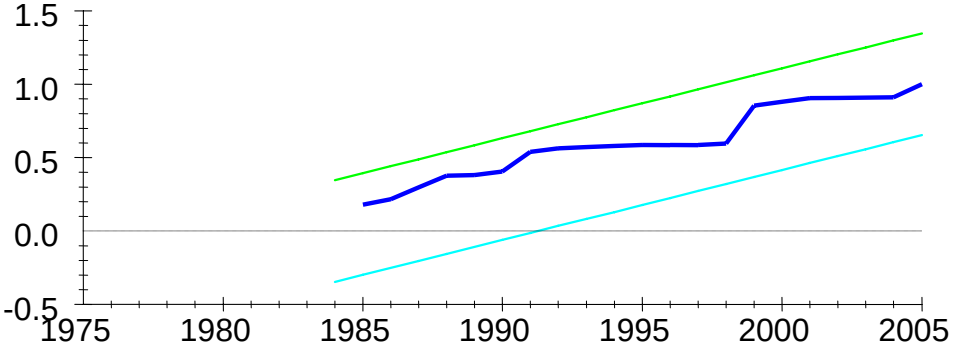
4.2 STABILITY TESTS

Figure 1: Plot of Cumulative Sum of Squares of Recursive Residuals for GETS



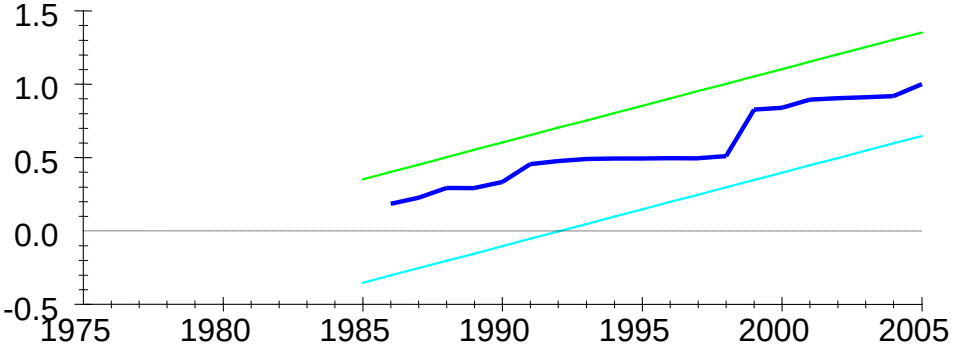
The straight lines represent critical bounds at 5% significance level

Figure 2: Plot of Cumulative Sum of Squares of Recursive Residuals for FMOLS



The straight lines represent critical bounds at 5% significance level

Figure 3: Plot of Cumulative Sum of Squares of Recursive Residuals for EGOLS



The straight lines represent critical bounds at 5% significance level

It is crucial to test for stability of the money demand after obtaining our equilibrium estimates and dynamic equations. The *CUSUM Squares* tests does not show evidence of instability in our money demand equation for the three alternative methods as relayed by *Figure 1*, *Figure 2* and *Figure 3* for GETS, FMOLS and EGOLS respectively, thus indicating that our sound estimates are temporally stable hence showing the existence of stable relationship between money demand, interest rate and income. The *CUSUM* tests also indicate the same results.[6] This implies the vitality of focusing on money supply as a monetary policy instrument for the Central Bank of Philippines. Bahmani-Oskooee and Rehman (2005), Singh and Kumar (2006) and Tang (2007) share the same view that the money demand functions for the Philippines is stable based on *CUSUM* and *CUSUM Square* stability tests which they conducted. However, Singh and Kumar (2006) reports that if these monetary authorities blindly follow the advanced countries in targeting the rate of interest, they would cause more instability in income levels. This evidence supports the BSP's choice of a monetary aggregate as its policy instrument to achieve its policy objectives as presented by Hafer and Kutan (2003).

4.3 ACTUAL vs FITTED VALUES

Figure 4: Plot of Actual and Fitted Values

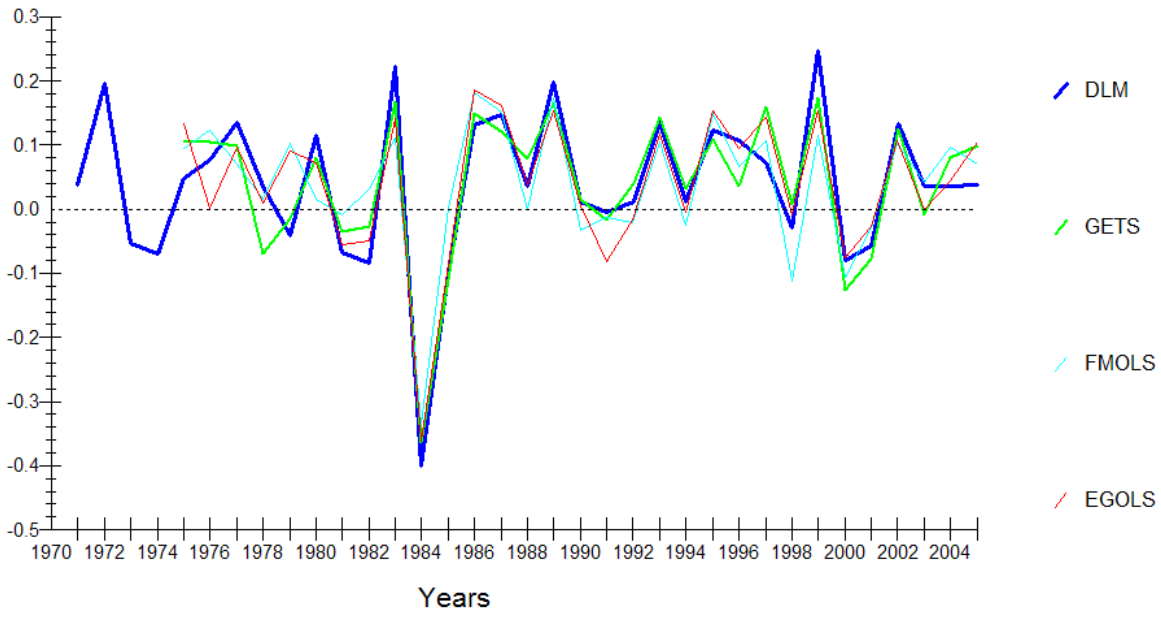


Figure 2 above show the plot of actual and predicted values of our preferred estimates indicating that they predict changes in demand for money reasonably well. It is generally evident and justifiable that the three alternative time series techniques applied give similar results. It is also obvious that our results across the three methods were consistent with previous studies and our expectations. Singh and Kumar (2006) indicate that adequate

[6] *CUSUM* test results were not included in this paper to conserve space but are available upon request from author.

attention should be paid to the purpose of research and interpretation of results rather than on the estimation methods because they hardly give conflicting summaries. However, they may differ in their precision but only marginally.

5.0 CONCLUSION AND POLICY IMPLICATIONS

In this paper we empirically revealed that money demand relation is well determined by the two crucial long-run elasticities of income and the rate of interest. Our empirical results based on the three employed methods with the proper specifications indicate that the long-run income elasticities for the Philippines do not give conflicting summaries of the same dataset but analogous results. Long-run income elasticities for Philippines using GETS, FMOLS and EGOLS vary closely standing at 1.246, 1.258 and 1.231 respectively. The long-run elasticities for interest rate from using GETS, FMOLS and EGOLS are -0.287, -0.267 and -0.287 respectively. The two crucial long-run elasticities are statistically significant with expected signs. Nevertheless, the *CUSUM* and *CUSUM Squares* tests for the three alternative methods show that the demand for money is temporally stable. A *dummy* variable representing the financial sector reforms starting from 1994 onwards since it was when most of the institutional changes and financial innovations earnestly commenced. Financial reforms imply a positive impact that was significant at 5% level standing at an average of 0.081 between the alternative methods.

Furthermore, the coefficients for Error Correction Models (ECM) for the three methods are statistically significant and negative as expected thus supporting the validity of the equilibrium relationship between the variables in the long-run equations. The speed of adjustment is close to unity for the three methods with significant statistics. One limitation present in this paper is the ignorance of possible structural breaks and their implications on unit root tests as reported by Perron (1989). However, the *CUSUM* and *CUSUM Squares* stability tests show the existence of a stable relationship between money demand, interest rate and income. This implies the importance for the Bangko Sentral ng Pilipinas to focus on money supply as a monetary policy instrument instead of interest rate as suggested by Poole (1970), and Singh and Kumar (2006). The findings of this paper may be useful for policy makers in formulating monetary policy.

The important issue is to have the right specifications for estimations in order to base our fiscal and monetary policies on good predictions. Estimations of this sort helps in addressing policy questions and that, for these, predictive accuracy is paramount. It is imperative that our specifications and results are consistent with economic theory. The existing estimated elasticities are of crucial vitality which enables us to translate assumptions about future expectations into actual projections that could anticipate the implications for economic performance and design alternative policy responses. Further researches are necessary for better empirical estimation that may allow these results to be further refined in future work, hence better determination of monetary policies.

Data Appendix A1

P = GDP deflator (2000=100). Data derived are from International Financial Statistics (IFS-2005) and UN Database.

Y = Nominal GDP at factor cost or market prices, whichever is available. Data are from IFS-2005 and UN Database.

R = The average short-term (maximum of 3 years) savings deposit rate. Data derived from the IFS-2003/2005, BSP data, PIDS Economic & Social Database and ADB database (2005).

M1 = Currency in circulation, including demand deposit and bills payable. Seasonally adjusted data obtained from IFS-2005 and UN Database.

Note:
All variables, except the rate of interest, are deflated with the GDP deflator and are converted to natural logs. Data are available for replication on request.

Appendix A2

Table 3: Augmented Dickey-Fuller (ADF) Unit Root Test for variables entering the Money Demand Equation

	$\ln \overline{M}_t$	$\Delta \ln \overline{M}_t$	$\ln \overline{Y}_t$	$\Delta \ln \overline{Y}_t$	R_t	ΔR_t
Lags	[0,0]	[0,0]	[1,1]	[1,1]	[4,4]	[1,3]
Test Statistic	-2.035	-6.340*	-3.235	-3.573*	-1.253	-4.214*

Notes: The ADF is the augmented Dickey-Fuller test. Significance at 5% level is indicated by *. The 5% critical value for ADF is -3.567. The lag lengths are selected using AIC and SBC criteria, for example [0,1] indicates that lag 0 and 1 are significant in the respective tests. If the ADF statistic is higher than the Test statistic in absolute terms then it relays that there is unit root presence. The variables $\ln \overline{M}_t$ and $\ln \overline{Y}_t$ represent log of real money and real income, respectively. The sample period taken are 1970 to 2005.

Table 4: Identification and Exogeneity Tests

	$\Delta \ln \overline{M}_t$	$\Delta \ln \overline{Y}_t$	ΔR_t
$ECMM_{t-1}$	-0.440 (-2.39)*	-0.046 (-0.81)	-1.017 (-0.21)
$ECMY_{t-1}$		0.042 (0.56)	
$ECMR_{t-1}$			-0.256 (-1.45)

Notes: The t-ratios are reported below the coefficients and significance at 5% and 10% are indicated by * and ** respectively. The variables $\ln \overline{M}_t$ and $\ln \overline{Y}_t$ represent log of real money and real income, respectively. $ECMM_{t-1}$, $ECMY_{t-1}$ and $ECMR_{t-1}$ are the lagged residuals of the CVs normalized on money, income, and rate of interest, respectively. The sample period taken are 1970 to 2005.

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