DEMAND FOR MONEY IN INDIA [1950-51 TO 2004-05] - AN ECONOMETRIC INVESTIGATION

Dr. Gaurang Rami

ABSTRACT

The demand for money is at the heart of how macroeconomic policies should be conducted effectively. In most of the developed and developing countries, policymakers have frequently questioned whether the money demand is stable over a period of time. According to Friedman the demand for money function is the most stable macroeconomic relation and also one of the most stable and important components in the analysis of economic behaviour. In this paper we have briefly surveyed various theories of demand for money. We have estimated demand for Narrow Money [M1] and Broad Money [M3] functions for Indian economy using annual data covering time period from 1950-51 to 2004-05. In order to determine the relationships between Narrow Money and Broad Money and other important macroeconomics variables such as GDP, Real income [YR], WPI, and Short term interest rate [Sir], we have estimated several estimations involving various combinations viz. linear, log linear, percentage change of these explanatory variables. When we used OLS method for estimation it is found that majority of estimated models are suffering from problem of autocorrelation. To get rid from this problem and for better estimates we have used Cochran-Orcutt a more sophisticated method to solve the problem of autocorrelation.

Keywords: OLS, Cochran-Orcutt, Money Demand, India.

I. INTRODUCTION

Money occupies an important place in the evolution of Economics as a science. There is hardly any activity in economy today which is not related to money. The world of economic transaction has expanded and Monetary Economics has developed as a full fledged branch of Economics.

According to Friedman (1956) 'in monetized economy; money as a medium of exchange provides facilities of separating sales and purchases of a person'. According to Keynes there are several motives to hold money and they are: (i) Transaction motive (ii) Precautionary motive (iii) Speculative motive. Another monetarist Jonson P D (1976) said that 'money is such a rare commodity that is not being demanded of itself but it is demanded because other goods can be purchased through it'.

The demand for money is at the heart of how policy should be conducted effectively. In most of the developed and developing countries, policymakers have frequently questioned whether the money demand is stable over a period of time. According to Friedman (1956), the demand for money function is the most stable macroeconomic relation and also one of the most stable and important components in the analysis of economic behaviour. The theory of money demand is one of the most enduring and debated issues in Economics.

II. REVIEW OF LITERATURE

Gujarati Damodar (1968) applied the partial adjustment model for Indian data covering the time period 1948-64, and found that demand for money was significantly influenced by real income with long run real income elasticity placed at 1.5. The long term interest rate (i.e. yield on government securities with maturity of 20 years or more), however, turned out to be insignificant.

Gupta K L (1970) as well as Singh Balbir (1970) worked for a somewhat extended period, 1949-66 and found real national income rather than wealth as the appropriate scale variable. The findings in respect of interest rate, however, were diametrically opposite, the former found short term interest rate to be significant while the latter found both short term as well as long term interest rate to be insignificant as explanatory variables.

Divatial and Venkatachalam (1972) found that, for the period 1952-68, income (defined as net household disposable income) as well as short term interest rate and long term interest rate taken together provide a satisfactory explanation of household money demand.

Bhattacharya (1974) using the two stage least square method, showed that personal disposable income performed better than national income as a scale variable in explaining narrow as well as broad money demand.

Gupta Suraj (1975) found that, during the period 1950-74, money demand in India was a proportional function of income but short term interest rates (proxied by 12 month time deposit rate and the bazaar bill rate) were statistically insignificant.

Laidler (1977) in his critical review of literature on Money demand theory had found that wealth is the most important explanatory variable as far as the U.S.A. economy is concerned. On the same line Meltzer in his study had regressed both income as well as non-human wealth together and separately on both the money

stock M1 and M2 for the period of 1900-1958 in U.S.A. He found that the demand for money function is more stable when wealth is considered as the independent variable. He was further in favour of using permanent income rather than current income. Burnner and Meltzer were in opinion of utilizing wealth variable than current and permanent income in explaining changes in demand for money (for both narrow and broad definitions).

Laidler (1977), Metlzer (1963), and Goldfeld (1973) have found that price level has not influenced demand for money. On the contrary S.B.Gupta (1979) found that the price level elasticity of demand for money is not unity in India. Pure economic theory does not provide any rationale as to the correct mathematical form of the money demand function. Generally three major functional forms dominated in the empirical literature: (1) Linear-additive (2) Log-linear (3) Linear-non additive [see Feige and Pearce (1997)]. However, the Log-linear version is the most appropriate functional form, as it gives the elasticities directly.

Sharma (1978) covering the period from 1950-51 to 1971-72, found that income elasticity of money demand in India exceeded unity, the money demand was interest elastic and that permanent or expected income performed better than the measured income as a scale variable.

Trivedi M S (1980) in his study on India for the period 1951-52 to 1974-75 on the role of inflationary expectations in the money demand function had found the appropriateness of the both the definitions of money viz. M1and M2 (that is for narrow and broad money). He had considered both the expected and permanent income as scale variables. He used adaptive expectation hypothesis to derive permanent income. The orthodox quantity theory gave quite satisfactory results. In another study Trivedi M S (1983) utilized a second order difference equation to regress demand for money on the permanent income and anticipated rate of interest to explain the behavioral pattern in per capita real stock of money. In terms of goodness of fit criterion, the orthodox quantity theory was found to be poorer for M1 than M2 .But when measured real income was utilized as a scale variable with expected inflation rate, results were better in case of M1 than M2. A very low R2 indicated that for Indian Economy the per capita real permanent income is more appropriate scale variable in money demand function.

In an extension to his previous study and using the same methodology of estimation of model with second order difference equation, Trivedi M S (1984)

assessed the role of variability of inflation rate in the demand for money function with both the definition of money i.e. M1 and M2. There was hardly any difference in the results of both the equations based on M1 and M2 except slightly higher R2 for M2. He had used per capita real income which is the value of NNP at constant prices deflated by total population as one of the scale variables. In another attempt, to analyse the demand for money function in the light of literature, Trivedi M S (1992) tried to analyse the empirical significance of (1) Measured real income (2) Private real final consumption expenditure and (3) Permanent real income as the scale variables in money demand function. He concluded that unlike M1 equation the anticipated rate of change in nominal income turns out to be comparatively a better explanatory variable vis-à-vis anticipated rate variable.

Paul Thomas (1981-82) on Indian data for the year 1951-52 to 1977-78 found significant relation of demand for money in India with permanent income, inflationary expectation and variability of inflation(Independent variables). The Linear form of regression was used with both the definitions of money along with income in variety of combinations. He found that the both M1 and M2 provide similar results, so there is nothing to choose between them. Inflation when introduced as explanatory variable reduces the autocorrelation problem, thus an important variable (variability) was left out. Permanent income was found to be better scale variable than current real income. In almost all the equations the correlation between inflation, expectations and the variability of inflation was found to be very small.

Bhole (1985) estimated money demand functions separately for M1 and M3 using annual data for 1950-51 to 1979-80 with income, interest rate (proxied by one year term deposit rate), expected inflation rate (measured by three year moving average of actual inflation rate) and the lagged money stock as the explanatory variables. He used linear, rather than the conventional log-linear model with nominal and real money stock as separate dependent variables and obtained generally satisfactory results.

Mishra G D (1985) by taking model M = a y found that in nominal terms, Random Coefficient Method (RCM) gives an improvement over ordinary least square method in the sense of the income elasticity of demand for money. Values under both the methods were significant with almost the same explanatory power (R2=0.99). The values of (income elasticity) by the RCM method was 1.0528 as compared to 1.0176 (OLS method).

If the value of R2 is given any justification, for the choice of variable as specification of model under RCM, the model in nominal terms may be chosen for interpretation. On such ground, he had generated the income velocity series for India from 1950-51 to 1981-82 which is quite consistent and is in conformity with the original behaviour.

The results obtained with deflator model i.e. model in real terms estimated by OLS method gives almost the same result as given by the model in nominal terms. B is highly significant with its value 1.0578, R2 being 0.939.

Gupta Suraj (1986) using alternative specifications of the demand function for money for India for the period 1950-51 to 1975-76 (annual data) has arrived at the following conclusions:

1) Demand functions in logarithmic form (except for interest rate variables) are seen to give better results than the one in simple linear form.
2) The short term interest rate (12 months time deposit rate of bank) gives better results when entered in the original form in regression equation with log M / P as the dependent variable than in log form.
3) In all the equations coefficient of P (WPI) has a negative sign indicating that a rise in the level of P lowers the real demand for money. This goes against the usual 'maintained hypothesis' by which it is assumed that the real demand for money is homogeneous of degree zero in P.

Rangarajan C (1988) estimated the demand function for broad money in the inverted form with the general price level being dependent on nominal money stock and real income. Based on annual data covering the period 1961-62 to 1986-87, this study found the real income elasticity of demand for broad money was of the order of 1.9.

Ramchandra Prasad U (1989) in his study on Indian economy for 1970-71 to 1987-88 had attempted several money demand models using log-linear form of equations. He experimented with both the money definitions with various explanatory variables like NNP at factor cost and current price, long term and short term interest rates, both the price indices WPI and CPI and inflation rates based on WPI and CPI. He further used call money rates of major commercial banks as well as expected inflation rates based on lagged values of the previous year. The main conclusions were -major determinants of demand for money in Indian context are nominal and real national income, long term interest rate, current inflation rate and inflation rate with one year of lag.

In the light of the above review of earlier studies on the subject, it was decided to try out various specifications of econometric models and various combinations of the explanatory variables influencing the demand for money in India.

III. METHODOLOGY

The basic methodology adopted in this study is the single / multiple equation models estimated with the Method of Least Squares (MLS) / Ordinary Least Square (OLS). Alternative specifications of various equations like liner and log linear are examined. The variables are also alternatively examined in terms of actual values and percentage change. The specifications of various relations are based on the earlier studies on the subject as well as economic and econometric characteristics.

IV. DATA SOURCES

1. The data on Gross Domestic Product at factor cost [GDP] were collected from various issues of Economic Survey, Government of India
2. The Data on Wholesale Price Index [WPI], Broad Money [M3], Narrow Money [M1], Short term interest rates [In our analysis from 1950-51 to 1960-70 Short term interest rate [Sir] defined as 12-month time-deposit rate of major scheduled commercial banks (other than the State Bank of India), average of the rates at Bombay, Calcutta and Madras and from 1970-71 to 2004-05 Sir defined as Commercial Bank Deposit Rates for 1 to 3 years.] were obtained from Handbook of Monetary Statistics of India, Reserve Bank of India (2006).

Our basic data refer to the time period 1950-51 to 2004-05.

V. DEMAND FOR MONEY FUNCTION FOR INDIA: ANALYSIS AND INTERPRETATION

In order to determine the relationship between Money supply (M1 and M3) and other important macro economic variables like GDP, real income [YR], WPI and Short term interest rate [Sir], we have fitted several equations involving various combinations of these explanatory variables.

(I) In the first set of equations, M1 (M3), Log M1 (Log M3) and percentage change in M1 (M3) were taken as the dependent variable separately. These dependent variables were regressed on (i) GDP (ii) Log GDP and (iii) Percentage change in GDP respectively.

Thus we obtained 6 sets of estimated equations – 3 for M1 and 3 for M3. The objective of this exercise was to see which transformation of the dependent variable - absolute, log or percentage change – gives the best results and also to see whether the problem of autocorrelation remain present in various equations or not. [Equations 1 to 6 in Table 1.1]

(A) The relevant estimated equations are presented in Table 1.1. It is found that

1) Out of the 3 versions (absolute value, log and percentage change) in two versions viz. absolute and log form, the value of R2 is very high for both M1 and M3 indicating a good fit. However, the model incorporating the percentage change of variables had quite low R2 – around 0.25. This shows that perhaps the percentage change in GDP is not an important determinant of percentage change in money supply (both M1 and M3). Our results also support the conclusions of Trivedi M S (1980), who used 'adaptive expectation hypothesis' to derive 'permanent income' which he used as the independent variable that the orthodox quantity theory gave quite satisfactory results.
2) Also, in the case of percentage change version, autocorrelation was found to be absent in the case of M1, but not in the case of M3, even when the values of Durbin Watson (DW) statistic had improved substantially.
3) The elasticity of Broad Money (M3) with respect to GDP is higher (1.22) than that of Narrow Money (M1) with respect to GDP (1.01), as obtained in the log version. These values also indicate almost equiproportional change in the dependent and the independent variables. It is noteworthy here that Mishra G D (1985) who used the Random Coefficient Method (RCM) for estimating the equation also found that the values of income elasticity was 1.0528 as against 1.0176 for OLS. Thus our results are also in conformity with the values obtained earlier by him.

(B) Now replacing GDP by Real Income (YR) which is GDP / WPI, the same sets of models were estimated as mentioned above in (A). It was found that [Equations 7 to 12 in Table 1.1]

1) As in (A), the value of R2 was quite high (around 0.98) in the case of the actual values and the log values of the variables. However, like (A), here also R2 is quite low in the case when percent changes in the variables are considered. This shows that percentage changes in the dependent variables are not well explained by the percentage variations in the independent variables.

2) In the case of actual and log values, the independent variables are found to be statistically highly significant, but for percentage changes, the coefficient are not statistically significant.
3) The elasticities of money supply (M1 or M3) with respect to Real Income (YR) turn out to be between 2.6 and 3.2 and these values are slightly more than double the elasticities obtained in the case of actual GDP. These values are also in conformity with the values obtained by Gujarati Damodar (1968) and Rangrajan C (1988).
4) In the case of real M1 and real M3, the coefficient of WPI was negative and statistically significant when GDP is another independent variable indicating that a rise in the level of WPI lowers the real demand for money. This goes against the usual 'maintained hypothesis' that the real demand for money us homogeneous of degree zero (0) in price, as concluded by Gupta Suraj (1986) also.
5) Autocorrelation was found to be present in all the cases. Thus it may be said that in all these models transformation of variables have not affected presence of autocorrelation.

(C) The model outlined in (A) and (B) were again re-estimated using the real values of the relevant variables, [Equation 13 to 24 in Table 1.2]

1) In this case also the results are similar to the once obtained in (A) and (B). The only difference is that autocorrelation was found to be absent when variables were measured in terms of percentage change, with the exception of the case in which the percentage change in GDP is the only independent variable.
2) The values of elasticity of real M1 (and real M3) with respect to GDP is found to be almost half of the corresponding values in the case of actual M1 (and actual M3) and elasticity of real M1 (and real M3) with respect to real income also reduces to almost half of the corresponding values in the case of actual M1 (and actual M3).
3) All the coefficients in all the equations were found to be statistically significant at 5 percent level.

The second set of estimated models involves a different set of macroeconomic variables as the independent variables; viz. WPI, Short Term Interest Rate (SIR) and their lagged values. The results using different combinations of these variables are depicted in Table 1.3. [Equation 25 to 32] and Table 1.4 [Equation 41 to 48]

Here, instead of using the crude method of transforming the independent variables to get rid of autocorrelation problem as was done in the previous section, we have used a more sophisticated method viz. Cochrane-Orcutt (C-O method) method to solve the problem of autocorrelation. Table 1.3 A [Equation 33 to 40] and Table 1.4 A [Equation 49 to 56]

The following broad conclusions are derived:

1) In all the estimated models, the problems of autocorrelation remain.
2) All the R2 values are above 0.9; indicating extremely good fit.
3) In the case of both real M1 and real M3, the coefficients of WPI were found to be statistical insignificant when real income replaced GDP as an independent variable. This may have happened due to the fact that real income had captured the influence of price factor to some extent.
4) In the case of real M1 and real M3 the coefficients of the lagged values of WPI are insignificant, when real income is one the independent variables along with SIR. But when the real income variable is replaced by its lagged values in the case of real M1; all the coefficient are significant but in the case of real M3 lagged WPI is statistically insignificant.

5) Short term interest rate (Sir) is found to be statistically significant in all the equations for real M1 but it is found to be statistically insignificant in 4 out of 6 cases for real M3. Thus, one may conclude that short term interest rate is an important variable explaining variation in money supply, more so in the case of narrow money. It can be noted here that earlier studies have obtained contradictory results regarding the impact of Sir on M1 and M3. Shastri (1962), Gupta (1969), Sharma (1987), Ramchandra U (1989) have concluded that demand for money in India is interest elastic, whereas Balbir Singh (1970), Gupat Suraj (1975), Sampat and Hussain (1981) and Ghatak (1981) have found that demand for money in interest inelastic.

6) When the re-estimation of the change models was done using the Cochrane-Orcutt method, only 1 out of 8 cases, the problem of autocorrelation persisted in the case of real M1. However, in the case of real M3, in all the cases the problem of autocorrelation persisted. Thus, the problem of autocorrelation seems to be more serious in the case of real broad money.

7) Use of the Cochrane-Orcutt method lead to insignificance of Short term interest rate variable in as many as 3 out of 6 cases, in the case of real M1, but this happened in only 1 case for real M3.

8) For WPI, the results were more or less similar in the cases of real M1 and real M3, when Cochrane-Orcutt method was used for re-estimation.

We have also attempted to estimate the models when log transformations of the real M3 and M1 are used as the dependent variables and log real income and short term interest rate are taken as the independent variables. Here we have also introduced the lagged dependent variables as the independent variable in some cases. Our conclusions are as follows: [Table 1.5 Equations 57 to 60]

1) Introduction of lagged dependent variable in the model not only improves R2 but also gets rid of the autocorrelation problem. This happens in the case of both M1 and M3.
2) Short term interest rate [Sir] is found to be statistically significant in the case of M1 but not in the case of M3. This confirms our earlier conclusion also.

Bhole (1985) has also estimated money demand function separately for M1 and M3 using the liner form and taking income, interest rate, expected inflation rate and lagged money stock as the independent variables, and had concluded that generally all these explanatory variables were important variables determining nominal and real income stock.

VI. CONCLUSION

In order to determine the relationship between Money supply (M1 and M3) and other important macro-economic variables like GDP, real income [YR], WPI and Short term interest rate [Sir], we have fitted several equations involving various combinations of these explanatory variables. In the first set of equations, M1 (M3), Log M1 (Log M3) and percentage change in M1 (M3) were taken as the dependent variable separately. These dependent variables were regressed on (i) GDP (ii) Log GDP and (iii) Percentage change in GDP respectively.

Out of the 3 versions (absolute value, log and percentage change) in two versions viz. absolute and log form, the value of R2 is very high for both M1 and M3 indicating a good fit. However, the model incorporating the percentage change of variables had quite low R2 – around 0.25. This shows that perhaps the percentage change in GDP is not an important determinant of percentage change in money supply (both M1 and M3). Our results also support the conclusions of Trivedi M S (1980), who used 'adaptive expectation hypothesis' to derive 'permanent income' which he used as the independent variable that the orthodox quantity theory gave quite satisfactory results. The elasticity of

Broad Money (M3) with respect to GDP is higher (1.22) than that of Narrow Money (M1) with respect to GDP (1.01), as obtained in the log version. These values also indicate almost equiproportional change in the dependent and the independent variables. It is noteworthy here that Mishra G D (1985) who used the Random Coefficient Method (RCM) for estimating the equation also found that the values of income elasticity was 1.0528 as against 1.0176 for OLS. Thus our results are also in conformity with the values obtained earlier by him.

We have estimated same set of equations replacing GDP by Real Income (YR). It was found that the value of R2 was quite high (around 0.98) in the case of the actual values and the log values of the variables. However, here also R2 is quite low in the case when percent changes in the variables are considered. This shows that percentage changes in the dependent variables are not well explained by the percentage variations in the independent variables. The elasticities of money supply (M1 or M3) with respect to Real Income (YR) turn out to be between 2.6 and 3.2 and these values are slightly more than double the elasticities obtained in the case of actual GDP. These values are also in conformity with the values obtained by Gujarati Damodar (1968) and Rangrajan C (1988).

In the case of real M1 and real M3, the coefficient of WPI was negative and statistically significant when GDP is another independent variable indicating that a rise in the level of WPI lowers the real demand for money. This goes against the usual 'maintained hypothesis' that the real demand for money us homogeneous of degree zero (0) in price, as concluded by Gupta Suraj (1986). Autocorrelation was found to be present in all the cases. Thus it may be said that in all these models transformation of variables have not affected presence of autocorrelation.

The second set of estimated models involves a different set of macroeconomic variables as the independent variables; viz. WPI, Short term interest rate (Sir) and their lagged values. Here, instead of using the crude method of transforming the independent variables to get rid of autocorrelation problem as was done in the first set of equations, we have used a more sophisticated method viz. Cochrane-Orcutt (C-O method) method to solve the problem of autocorrelation. The following broad conclusions are derived:

In all the estimated models, the problems of autocorrelation remain. All the R2 values are above 0.9; indicating extremely good fit. In the case of both real M1 and real M3, the coefficients of WPI were found to be statistical insignificant

when real income replaced GDP as an independent variable. This may have happened due to the fact that real income had captured the influence of price factor to some extent.

In the case of real M1 and real M3 the coefficients of the lagged values of WPI are insignificant, when real income is one the independent variables along with SIR. But when the real income variable is replaced by its lagged values in the case of real M1; all the coefficient are significant but in the case of real M3 lagged WPI is statistically insignificant.

Short term interest rate (Sir) is found to be statistically significant in all the equations for real M1 but it is found to be statistically insignificant in 4 out of 6 cases for real M3. Thus, one may conclude that short term interest rate is an important variable explaining variation in money supply, more so in the case of narrow money. It can be noted here that earlier studies have obtained contradictory results regarding the impact of Sir on M1 and M3. Shastri (1962), Gupta (1969), Sharma (1987), Ramchandra U (1989) have concluded that demand for money in India is interest elastic, whereas Balbir Singh (1970), Gupat Suraj (1975), Sampat and Hussain (1981) and Ghatak (1981) have found that demand for money in interest inelastic.

When the re-estimation of the change models was done using the Cochrane-Orcutt method, only 1 out of 8 cases, the problem of autocorrelation persisted in the case of real M1. However, in the case of real M3, in all the cases the problem of autocorrelation persisted. Thus, the problem of autocorrelation seems to be more serious in the case of real broad money.

We have also attempted to estimate the models when log transformations of the real M3 and M1 are used as the dependent variables and log real income and short term interest rate are taken as the independent variables. Here we have also introduced the lagged dependent variables as the independent variable in some cases. Introduction of lagged dependent variable in the model not only improves R2 but also gets rid of the autocorrelation problem. This happens in the case of both M1 and M3. Short term interest rate [Sir] is found to be statistically significant in the case of M1 but not in the case of M3. This confirms our earlier conclusion also. Bhole (1985) has also estimated money demand function separately for M1 and M3 using the liner form and taking income, interest rate, expected inflation rate and lagged money stock as the independent variables, and had concluded that generally all these explanatory variables were important variables determining nominal and real income stock.

VII. REFERENCES

BOOKS

1. Bhole L M (1985), 'Impacts of Monetary Policy', Himalaya Publishing House, Bombay
2. Cuthbertson and David Barlow (1991), 'Money Demand Analysis: An Outline' in Money and Financial Markets, Ed. By Mark P Taylor, Massachusetts: Basil Blackwell Inc., Cambridge
3. Fisher Irving (1911), 'The Purchasing Power of Money' Macmillan, New York
4. Friedman Milton (1956), 'The Quantity Theory of Money-A Restatement', in studies in the Quantity Theory of Money, Ed. By Milton Friedman, University of Chicago Press, Chicago
5. Friedman Milton (1969), 'The Optimum Quantity Theory of Money' in the Optimum Quantity Theory of Money and Other Essay, Ed. By Milton Friedman, Aldine Publishing Company, Chicago
6. Gujarati Damodar (1995), Basic Econometrics, 3rd Edition, McGraw Hill International Editions, New York
7. Gupta Suraj (1986), The Demand for Money in India', Monetary planning for India, Oxford University Press, Delhi, pp. 189-193
8. Hoover Kevin, The Methodology of Empirical Macroeconomics, Cambridge University Press, New York
9. Jadav Narendra (1994), Monetary Economics for India, McMillan India Limited, Delhi
10. Kulkarni Kishor G, Modern Monetary Theory, McMillan India Limited, New Delhi
11. McCallum Bennett and Marvin S Goodfriend (1987), 'Demand for Money: Theoretical Studies' in the New Palgrave: Money, Ed. By John Eatwell, Murray Milgate and Peter Newman, W.W.Norton & Company Inc.
12. Rami Gaurang and Dave M B (2011) 'Some Aspects of Macroeconomic Development in India: An econometric Application, Lambert Academic Publication, Deutschland, Germany
13. Saravane M, The Demand for Money in India: a sectoral approach, Vikas Publications, Delhi
14. Walras Leon (1900), 'Elements d'economie', 4th edition, Politique pure, F.Pichon, Paris

B. ARTICLES

1. Ahmed Shamim and Md. Ezazul Islam (2007), 'A Cointegration Analysis of the Demand for Money in Bangladesh', Working paper series: WP 0710, Research Department, Bangladesh Bank (An electronic version of this paper is available at http://www.bangladeshbank.org.bd)

2. Akerlof George and Ross Milbourne (1980 b) 'The Short Run Demand for Money', The Economic Journal, Vol. 90, No. 360, pp. 885-900

3. Akerlof George and Ross Milbourne (1983) 'Optimal Money Holding Under Uncertainty', International Economic Review, Vol. 24, No. 3, pp. 685-698

4. Akerlof George and Ross Milbourne (1987) 'Re-Examining the Buffer-Stock of Money', The Economic Journal, Vol. 97, pp. 130-142

5. Anderson L and Jordan J (1968), 'Monetary and Fiscal Actions: A Test of their Relative Importance in Economic Stabilization', Federal Reserve Bank of St.Louis, Review 50, November, pp. 11-24

6. Anderson Richard, Barry Jones and Travis Nesmith (1997 b), 'Monetary Aggregate Theory and Statistical Index Numbers: Review', Federal Reserve Bank of St. Louis, Vol. 79, No 1, pp. 31-51

7. Ando A and K Shell (1975), 'Demand for Money is a General Portfolio Model in the Presence of an Assert Market that Dominates Money in the Brookings Model: Perspectives and Recent Developments', Ed. By Gary Fromm and Lawrence R Klein, Amsterdam, North Holland

15. Barman R B and Nag A K, (2002), 'Inflation in India – A multi dimensional view through various prices', National Income Accounts and Data System, ed. By Minhas B S, Oxford University Press, New York

8. Barnett William (1980), 'Economic Monetary Aggregates: An Application of Index Number and Aggregation Theory', Journal of Econometrics, Vol. 14, No 1, pp. 11-48

9. Barro Robert and Stanley Fischer (1976), 'Recent Developments in Monetary Theory', Journal of Monetary Economics, Vol. 2, No 2, pp. 133-167

10. Barth J and Bannett (1974), 'The Role of Money in the Canadian Economy: An Empirical Test', Canadian Journal of Economics, May, pp. 306-311

11. Bathwar Hansa (1996), 'Demand for Money in India: An Econometric Study', Veer Narmad South Gujarat University, Surat (Unpublished M.Phil Dissertation)

12. Bhattacharya B B (1974), 'Demand and Supply of Money in a Developing Economy: A Structural Analysis for India', Review of Economics and Statistics, Vol. 56

13. Biswas Basudev and Peter J Saunders (1990), 'Money and Price level in India: An empirical Analysis', The Indian Economic Journal, Vol. 38, 1990.
14. Chowdhary A R (1986), 'A Note on the Relative Impact of Monetary and Fiscal Actions in India', Indian Economic Journal, Vol. 34, No 1, July-September, pp. 89-93
15. Clower and Howitt Peter (1978), 'The Transaction Theory of the Demand for Money: A Reconsideration', Journal of Political Economy, Vol. 86, No 3, pp. 449-466
16. Clower Robert (1967), 'A Reconsideration of Microfoundations of Monetary Theory', Western Economic Journal, Vol. 6., pp.1-9
17. Damodar Gujarati (1968), 'The Demand for Money in India', Journal of Development Studies, Vol. 1, No 1, October
18. Dasgupta Basab and Gupta Rangan (2005), 'The Macroeconomic Reform and the Demand for Money in India', Working paper: 2005-02, University of Pretoria, South Africa (An electronic version of this paper is available at (http://www.up.ac.az./up/web/en/academic/economics/index.html)
19. Divatia V V and Venkatachalam T R (1972), 'Household Demand for Money in India: Some Evidence from Time Series' R B I Bulletin, Mumbai, June
20. Fase M M G and C C A Winder (1994), 'Money Demand Within EMU": An Analysis with the Divisia Measure', Quarterly Bulletin, De Nederlandsche Bank, pp. 25-55
21. Feige Edgar and Douglas Pearce (1977), 'The Substitutability of Money and Near Monies: A Survey of the Time-Series Evidence', Journal of Economic Literature, Vol. 15, No 2, pp. 439-469
22. Ghatak Subrata and Deadman Derek (1981), 'On the stability of the demand for money in India', Indian Economic Journal, Vol.29, No-1, July-September, pp. 41-54
23. Gupta G S (1984), 'Monetary Target Setting', Mimeo, Indian Institute of Management, Ahmedabad, India
24. Gupta K L (1970), 'Demand for Money in India', Journal of Development Studies, Vol. 1, No 2, January
25. Gupta Suraj (1975), 'Planning Neutral Money in India', Indian Economic Journal, 23, No. 2, October-December
26. Hicks J R (1935), 'A suggestion for simplifying the Theory of Money', Economica, Vol. 2, pp. 1-19
27. Jariwala Vijay (2006), 'Demand for Money in India: An Econometric Analysis', Veer Narmad South Gujarat University, Surat (Unpublished M.Phil Dissertation)

28. Jonson P D (1976), 'Money and Economic Activity in the Open Economy: The United Kingdom, 1880-1970', Journal of Political Economy, Vol. 84, No 5, pp. 979-1012
29. Laidler David (1984), 'The Buffer Stock' Notion in Monetary Economics', The Economic Journal, Vol. 94, pp.17-34
30. Mehta B C and Kisero A O (1993), 'The Monerarist-Fiscalist Controversy: A Model Examined with Indian Data', Indian Economic Journal, Vol. 41, No 1, July-September, pp. 90-101
31. Mishra G D (1985), 'Demand for Money in India: An Empirical Evaluation', Indian Economic Journal, Vol. 33, July-September, pp. 77-84
32. Misra G D (1985), 'Demand for money in India: An empirical evaluation', Indian Economic Journal, Vol. 33, July-September, pp.77-84
33. Pigou A C (1917), 'The Value of Money', The Quarterly Journal of Economics, Vol. 37, pp. 38-65
34. Rangrajan C (1988), 'Issues in Monetary Management', Presidential Address, 71st Annual Conference of the Indian Economic Association
35. Roley Vance (1985), 'Money Demand Predictability', Journal of Money, Credit and Banking, Vol. 17, No 4, pp. 611-654
36. Sampath R K and Hussain Zakir (1981), 'Demand for money in India', Indian Economic Journal, Vol. 29, No-1, July-September, pp. 17-35
37. Sargent Thomas and Neil Wallace (1982), 'The Real-Bills Doctrine versus the Quantity Theory: A Reconsideration', Journal of Political Economy, Vol. 90, No 6, pp. 1212-1236
38. Sharma R L (1978), 'The Demand for Money in India: An Empirical Analysis', Indian Economic Review, Vol. 13, No. 1
39. Singh A P, Shetty S L and Venkatachalam T R (1982), 'Monetary Policy in India: Issues and Evidence', Supplement to the RBI Occasional Papers, 3.
40. Singh Balbir (1970), 'Price Stability and Money Supply During Forth Five Year Plan', Indian Economic Journal, Vol. XVII, Nos. 4-5, April-June
41. Sriram S S (1999), 'Survey of Literature on Demand for Money: Theoretical and Empirical Work with Special Reference to Error-Correction Models', IMF Working Paper WP/99/64
42. Sriram S S (1999), 'Demand for M2 in an Emerging-Market Economy: An Error Correction Model for Malaysia' IMF Working Paper WP/99/173
43. Sriram S S (2001), 'A Survey of Recent Empirical Money Demand Studies', I M F Staff Papers, Vol 47, No 3, pp. 334-365
44. Thacker Nita (1992), 'Is inflation a monetary phenomenon? The case for India', The Indian Economic Journal, Vol. 40, No-1, July-September, 1992, pp. 145-151

45. Thorton John (1989), 'The demand for money in India: A test of Mckinnon's complementarity hypothesis', India Economic Journal, Vol. 37, No-1, July-September, pp. 82-86
46. Upadhyaya K P (1991), 'The Efficacy of Monetary and Fiscal Policies in Developing Countries: An Application of the St.Louis Equation', The Indian Economic Journal, Vol. 39, No 1, July-September, pp. 35-42

C. REPORTS AND SOURCES OF DATA

1. Economic Survey of India (Various Issues), Government of India, Ministry of Finance, Economic Division, New Delhi
2. Handbook of Statistics on the Indian Economy (2006), Reserve Bank of India, Mumbai
3. National Income Accounts (Various Issues), Central Statistical Organization, Government of India, New Delhi
4. Price Indices 1990-98 (1999), Office of the Economics Advisor, Government of India, New Delhi
5. Second Working Group on Money Supply (1977), Reserve Bank of India, Mumbai

TABLES FROM NEXT PAGE…

TABLES

Table 1.1: Demand for Money in India OLS estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	gdp	loggdp	pergdp	YR	logYR	perYR	R^2	DW	Remark
1	M_1	-4755.71 [-2.7211] **	0.1964 [97.060] **						0.9943	0.2491	P
2	Log M_1	-0.8346 [-29.4825] **		1.014 [183.44] **					0.9983	0.455	P
3	Per M_1	4.8547 [3.2514] **			0.5853 [4.9397] **				0.3062	1.7162	A
4	M_3	-41851.9 [-3.5766] **	0.6872 [50.7520] **						0.9195	0.1119	P
5	Log M_3	-1.57183 [-40.7933] **		1.2199 [162.081] **					0.9979	0.3155	P
6	Per M_3	8.40919 [5.9230] **			0.4755 [4.2206] **				0.2408	0.8497	P
7	M_1	-97670.7 [-10.6673] **				36.373 [25.1553] **			0.9212	0.1035	P
8	Log M_1	-5.3472 [-33.2503] **					2.6783 [60.1721] **		0.9853	0.3134	P
9	Per M_1	12.0401 [9.9497] **						-0.1292 [-0.6574]	0.0082	0.8787	P
10	M_3	-35878.8 [-9.1854] **				125.65 [20.3697] **			0.8845	0.079	P
11	Log M_3	-6.9731 [-31.2761] **					3.2138 [52.0799] **		0.9804	0.1988	P
12	Per M_3	13.7289 [12.4305] **						0.00802 [0.0447]	0.00003	0.334	P

*Figures in parenthesis are t-values ** Statistically significant at 5 percent level P: Presence of autocorrelation*
A: Absence of autocorrelation

Table 1.2: Demand for Money in India OLS estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	gdp	loggdp	pergdp	YR	logYR	perYR	R^2	DW	Remark
13	real M_1	428.25 [23.9703] **	0.0001 [49.3472] **						0.9782	0.0931	P
14	Logreal M_1	0.87745 [17.8895] **		0.3872 [40.4317] **					0.968	0.2348	P
15	Perreal M_1	7.6443 [4.6665] **			-0.3872 [-1.9355] *				0.0493	1.2691	A
16	real M_3	665.009 [11.2809] **	0.00389 [57.0233] **						0.9836	0.143	P
17	Logreal M_3	0.1402 [2.9858] **		0.5926 [64.61] **					0.9872	0.3613	P
18	Perreal M_3	11.1921 [6.4160] **			-0.3686 [-2.6625] **				0.103	1.0775	P
19	real M_1	-96.5626 [-5.3496] **				0.1972 [69.2084] **			0.9884	0.2693	P
20	Logreal M_1	-0.9099 [-17.3396] **					1.0406 [71.6394] **		0.9895	0.4696	P
21	Perreak M_1	1.9628 [1.9472] *						0.6209 [3.7907] **	0.2014	1.9238	A
22	real M_3	-1296.72 [-12.2694] **				0.7444 [44.6052] **			0.9735	0.1174	P
23	Logreal M_3	-2.5359 [-29.72] **					1.5761 [66.7568] **		0.988	0.244	P
24	Perreal M_3	3.5172 [3.3119] **						0.769 [4.4563]	0.2624	1.6021	A

*Figures in parenthesis are t-values ** Statistically significant at 5 percent level P: Presence of autocorrelation A: Absence of autocorrelation*

Table 1.3: Demand for Money in India OLS estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	WPI	GDP	Sir	YR	WPI_{-1}	GDP_{-1}	YR_{-1}	R^2	DW	Remark
25	$realM_1$	306.225	6.5138	0.00055						0.9935	0.4017	P
		[20.9426]	[11.2071]	[12.8180]								
		**	**	**								
26	$realM_1$	255.391	3.0445	0.00077	19.1842					0.994	0.5181	P
		[9.7571]	[1.8943]	[7.3629]	[2.3020]							
		**	*	**	**							
27	$realM_1$	-145.82	-2.4765			0.0324				0.989	0.3273	P
		[-3.5256]	[-1.3216]			[8.6837]						
		**				**						
28	$realM_1$	73.4734	2.1576		-27.4368	0.1775				0.996	0.8183	P
		[2.2049]	[1.779]		[-9.7750]	[10.5032]						
		**	*		**	**						
29	$realM_1$	251.57		0.00079	21.3099		2.8612			0.9938	0.4846	P
		[8.6133]		[7.0790]	[2.5311]		[1.5967]					
		**		**	**							
30	$realM_1$	248.515			19.761		3.7987	0.00081		0.9933	0.4462	P
		[8.6133]			[2.2458]		[2.1246]	[6.5709]				
		**			**		**	**				
31	$realM_1$	44.5486			-26.0894	0.1938	1.0246			0.9958	0.8647	P
		[1.1959]			[-9.0931]	[9.9260]	[0.6998]					
					**	**						
32	$realM_1$	76.3188			-25.8087		3.1768		0.1751			
		[2.2384]			[-9.0435]		[2.5731]		[10.0400]	0.9959	0.7797	P
		**			**		**		**			

*Figures in parenthesis are t-values ** Statistically significant at 5 percent level P: Presence of autocorrelation A: Absence of autocorrelation*

Table 1.3.A : Demand for Money in India Cochrane-Orcutt estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	WPI	GDP	Sir	YR	WPI_{-1}	GDP_{-1}	YR_{-1}	R^2	DW	Remark
33	$realM_1$	1725.13	-4.2181	0.00103						0.9984	1.893	A
		[3.8234]	[-2.2028]	[11.1917]								
		**	**	**								
34	$realM_1$	1631.91	-2.8475	0.00095	-7.8286					0.9984	1.9348	A
		[3.9871]	[-1.3189]	[8.6489	[-1.2513]							
		**		**								
35	$realM_1$	-339.279	5.1245			0.1651				0.9976	1.5154	IC
		[-1.5085]	[3.2030]			[7.8463]						
			**			**						
36	$realM_1$	-43.6199	6.2745		-14.7815	0.1382				0.9976	1.6194	IC
		[-0.2558]	[3.6166]		[-1.8850]	[5.5810]						
					*	**						
37	$realM_1$	876.057		0.00082	-11.8501		0.7082			0.9983	1.9597	A
		[4.4187]		[8.5957]	[-2.0399]		[0.3719]					
		**		**	**							
38	$realM_1$	830.317			-8.8703		0.644	0.00093		0.9982	1.55	IC
		[4.1797]			[-1.4300]		0.3182	[8.0615]				
		**						**				
39	$realM_1$	-41.514			-10.5262	0.154	4.89103			0.9972	1.5282	IC
		[-0.2644]			[-1.2422]	[4.5660]	[1.9458]					
						**	*					
40	$realM_1$	94.7781			-21.39		7.9533		0.1205	0.9975	1.3199	p
		0.8566			[-3.0853]		[4.9872]		[5.4514]			
					**		**		**			

Figures in parenthesis are t-values ** *Statistically significant at 5 percent level*

P: Presence of autocorrelation A: Absence of autocorrelation IC: inconclusive

Table 1.4: Demand for Money in India OLS estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	WPI	GDP	Sir	YR	WPI_{-1}	GDP_{-1}	YR_{-1}	R^2	DW	Remark
41	$realM_3$	388.345 [5.3366] **	14.7687 [5.1057] **	0.00283 [13.1796] **						0.9889	0.2367	P
42	$realM_3$	413.053 [3.0193] **	16.455 [1.9588] *	0.002725 [4.9398] **	-9.3245 [-0.2141]					0.9886	0.2291	P
43	$realM_3$	-1753.94 [-7.4334] **	-22.9836 [-2.1501] **			1.0709 [7.0132] **				0.9752	0.1885	P
44	$realM_3$	-423.584 [-2.5649] **	5.1287 [0.8533]		-166.44 [-11.965] **	0.7379 [8.8078] **				0.9933	0.4947	P
45	$realM_3$	419.406 [2.9885] **		0.00266 [4.5696] **	-9.9079 [-0.2275] **		18.1945 [1.9623] *			0.9885	0.1987	P
46	$realM_3$	357.944 [2.5792] **			7.00562 [0.1655]		16.4612 [1.9141] *	0.003 [5.1316] **		0.9894	0.1981	P
47	$realM_3$	-510.812 [-2.8190] **			-162.973 [11.677] **	0.7889 [8.3055] **	1.507 [0.2116]			0.9932	0.5354	P
48	$realM_3$	-444.107 [-2.8982] **			-160.249 [-12.494] **		7.6585 [1.3802]		0.7499 [9.5659] **	0.9942	0.4984	P

*Figures in parenthesis are t-values ** Statistically significant at 5 percent level P: Presence of autocorrelation A: Absence of autocorrelation*

Table 1.4.A : Demand for Money in India Cochrane-Orcutt estimation 1950-51 to 2004-05

Eq.	Dependent	Constant	WPI	GDP	Sir	YR	WPI_{-1}	GDP_{-1}	YR_{-1}	R^2	DW	Remark
49	$realM_3$	8273.09 [3.4635] **	-24.3416 [-3.1657] **	0.00426 [11.5810] **						0.9983	0.9522	P
50	$realM_3$	7308.6 [4.2860] **	-8.0134 [-1.0723]	0.003326 [8.7258] **	-94.7897 [-4.4143]					0.9987	1.1797	P
51	$realM_3$	-2410.72 [-2.7367] **	15.2365 [2.3849] **			0.689 [8.1928] **				0.9974	0.8067	P
52	$realM_3$	-475.641 [0.7612]	26.304 [4.2968] **		-119.793 [-4.3265] **	0.4771 [5.4559] **				0.998	1.1398	P
53	$realM_3$	4818.76 [3.6057] **		0.002782 [8.4495] **	-108.801 [-5.5089] **		5.279 [0.7755]			0.9987	1.2481	P
54	$realM_3$	4827.59 [3.9782] **			-91.9813 [-5.0888] **		0.1471 [0.0237]	0.00347 [10.1368] **		0.9989	1.2904	P
55	$realM_3$	-488.645 [-0.7283]			-103.875 [-3.4486] **	0.4936 [4.1522] **	25.3545 [2.8751] **			0.9977	1.1492	P
56	$realM_3$	-383.104 [-0.6423]			-127.426 [-5.6403] **		31.6016 [6.0904] **		0.4597 [6.4813] **	0.9984	1.0641	p

*Figures in parenthesis are t-values ** Statistically significant at 5 percent level P: Presence of autocorrelation A: Absence of autocorrelation*

Table 1.5: OLS estimates: Demand for Money in India: 1950-51 to 2004-05

Eq. No	Dependent	Constant	Logyr	Sir	Lag dependent	R^2	DW	Reference
57	**Logrealm1**	-1.08215 [-19.9107] **	1.1053 [64.0367] **	-0.0091 [-5.1836] **		0.993	0.812	**P**
58	**Logrealm1**	-0.50361 [-5.1686] **	0.4709 [4.8452] **	-0.0035 [-2.4270] **	0.5921 [6.6009] **	0.996	1.696	**A**
59	**Logrealm3**	-2.528 [-23.2398] **	1.5731 [45.5336] **	0.00041 [0.1183]		0.987	0.243	**P**
60	**Logrealm3**	-0.4134 [-2.6843] **	0.2385 [2.5603] **	0.00016 [0.1062]	0.8655 [14.5436] **	0.997	1.479	**IC**

Figures in parenthesis are t-values

DW = Durbin-Watson statistics

* Significant at 5 % level ** Significant at 1% level

P = Presence of autocorrelation

A = Absence of autocorrelation

IC = Inconclusive

Note: Real M_1 and M_3 measure as $\mathbf{M_1 / WPI}$ and $\mathbf{M_3 / WPI}$ respectively

ABOUT AUTHOR

Dr. Rami is working as Associate Professor at Veer Narmad South Gujarat University, Surat (Gujarat-India) and Visiting Professor at Cebu Normal University, Cebu City, Philippiens. He has about 11 years of teaching and research experience. Dr. Rami holds Doctorate degree in Economics, Masters in Economics with specialization in Econometrics and Masters in Sociology with specialization in Industrial Sociology, and he has done Post Graduate Diploma in Research Methodology [PGDRM]. Dr. Rami was awarded with entire university Gold Medal for securing highest percentage at Post Graduate level in Economics. He has published four books, two working papers, one monograph, and about 20 research papers in national and international referred journals. Dr. Rami has worked as a team member for the preparation of various District Human Development Reports, funded by Government of Gujarat and United Nation Development Programme [UNDP] where he has engaged in chapter writing on health and educational status of the respective districts.