WORKING PAPER 63

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ISTITUTE FOR SOCIAL AND ECONOMIC CHANGE
2000

ISBN 81-7791-019-1

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SOME ASPECTS OF MONETARY TARGETING IN INDIA

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Abstract

This study highlights the relevance of monetary targeting in India by looking at the stability of money demand function. Employing co-integration techniques the study concludes that despite financial liberalisation that has been taking place in India, the money demand function has been found to be stable.

I. Introduction

During the 50s and 60s, most developed countries experienced a low rate of inflation, a low level of unemployment and hence economic stability. But, in contrast, the 70s had experienced instability characterised by high and varying rates of inflation leading to a macro-economic disequilibrium with inflationary pressure. The efficacy of the monetary policy to fight inflation and unemployment, however, was greatly constrained by the system of fixed exchange rate. The external constraints kept the central banks from taking any measures to stabilise the domestic economy. In 1973, with the high pressure of inflation the central banks of those countries recommended for the suspension of the Bretton-Wood System of fixed exchange rate. Freed from external constraints and trying to bring the inflation rates under control in order to achieve greater stability in output growth, one country after another adopted quantitative targets for the growth rate of money supply as the nominal anchor for monetary policy. By mid 80s, however monetary targeting began to be modified and some countries even abandoned it altogether. In India, monetary targeting was adopted in the mid 80s following the recommendations of the Chakravarty Committee. The experience of India with monetary targeting shows that in most of the years, the actual growth rate of money supply has exceeded the announced targets. Furthermore, there has not been any significant improvement in respect of controlling the inflation rate, although the variability of inflation came down

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The authors thank an anonymous referee of the paper for helpful comments, and V N Venkatesha for assistance.

significantly. With increasing financial innovations, the RBI is now aiming at interest rate targeting on the ground that the money demand function might exhibit instabilities. Against this background, the present study attempts to analyse the relevance of monetary targeting in India by examining the money demand function during the period 1985:04 through 1998:03. We divide the study period into two parts: one spanning 1985:04 through 1991:06 and the second spanning 1991:07 through 1998:03 to assess the impact of different reforms taking place after liberalisation in the financial sector. The rest of the study is organised into four sections. Section II brings out the rationale for money supply targets. Section III analyses the experience of monetary targeting in India. Section IV comprises of the empirical analysis and section V concludes the study.

II. Rationale for Monetary Targeting

Monetary policy aims at attaining desired goals of output maximisation with price stability by manipulating the policy instruments which are under the direct control of the monetary authority. However, the successful implementation of the monetary policy necessitates the structure of the economy to be known to the policy makers and the effect of the policy on the goal variables to be observable immediately. But, in fact, the structure is unknown to the policy makers as there are many different characterisations of the structure of the economy and the goal variables are observable only after a considerable lag. Hence, the effect of the policy can only be observed after the policy has been pursued for some time. The union of these two problems leads to the need for the use of intermediate target variables such as interest rates, monetary aggregates, exchange rate in monetary policy, since these variables are viewed as closely related to the goal variables and readily affected by the policy instruments. Since the target variable is closely related to the goal variable, it is assumed that the effect of the policy on the target variable will be consistent with the effect on the goal variables. With the use of a target variable, the impact of exogenous changes may be corrected by simply manipulating the instrument operation to make the target variable reach its desired level. Hence the goal variables will not be affected by the exogenous changes. However, the prime problem has been the choice of target variable, that is, whether to use price variable such as the interest rates or quantity variables like monetary aggregates as intermediate targets. This problem was addressed under the targets and instruments literature initiated by Poole (1970) by using the IS-LM framework and under the 'rules versus discretion' literature initiated by Simons (1936).

Poole (1970), developed a theoretical model using the IS-LM framework to analyse the targeting problem. According to Poole's analysis, the

choice of targets depends on the relative stability of the real (IS) and monetary sector (LM) of the economy. He showed that when the IS (LM) curve is more stable, then interest rate (monetary aggregate) would be the proper intermediate target. However, he argued for the use of a combination policy of interest rate and monetary targets, keeping in view the general instability in both the sectors. Holbrook and Shapiro (1970), again using the same model, considered the problem of selecting an appropriate target. They concluded that if the monetary sector (real sector) is sufficiently stable, the money supply (interest rate) should be preferred over other targets. Similarly, Waud (1973), using the IS-LM framework arrived at the same conclusions as of Poole. He also further analysed the choice of targets when the prices are not rigid, and found that in this case, real money and real interest rate should be used as targets. Cacy (1978) argued that money supply (interest rate) would be a better target if the demand for money function (demand for investment and saving function) is stable. He also analysed that instrument choice depends on the sensitivity of the demand for money and investment to changes in the interest rate. He concluded that money supply (interest rate) can be used as an intermediate target if the money demand is sensitive (insensitive) and investment is insensitive (sensitive) to changes in interest rate. He also favoured the use of a combination policy. Sellon and Teigen (1981), by using the aggregate supply and aggregate demand curves, examined the targeting problem taking into account the types of disturbances that occur in the economy. They concluded that for a spending disturbance, aggregate targets are superior to interest rate targets. In contrast, interest rate targets are preferred in case of portfolio disturbances. For money supply disturbances, either an interest rate or a monetary aggregate can be used as the intermediate target. In case of supply side shocks, if inflation (stabilising real income) is the goal variable, then monetary aggregates (interest rates) are better targets.

Thus, although the instruments and targets literature does not provide a strong case for use of monetary targets as targets from the above studies, the stability of the LM curve, i.e., stability of the money demand function emerges as the prerequisites for the use of monetary aggregates as intermediate targets. The stable money demand function would help in predicting the changes in income, price and interest rates due to change in money supply, thus making it a better target. This has become the basis for the widely accepted proposition for the use of monetary targets.

Another line of literature based on monetary rules suggests that money supply should be controlled. The idea of monetary rules stipulates that authorities are not allowed to carry out whatever policies they deem to be best suited at the time. By pursuing a monetary rule, discretionary actions of monetary authorities, which may be inappropriate, can be prevented. This line

of thinking was initiated by Simons (1936), whose main emphasis was on nullifying inappropriate political pressure on the monetary authorities. Friedman (1960) also argued for a monetary rule because the discretionary policy could be destabilising in the wake of the lags in implementation and operation of the monetary policy. He further argued that monetary authority should target those variables that it can control. Thus he indirectly showed that the interest rate cannot be used as a target and proposed a constant growth rate of money supply.

Several studies, based on the rational expectation model, argued in favour of monetary targeting when a rule-based monetary policy is followed. Wicksell (1901), argued for the use of monetary targeting and showed that an interest rate rule would make the price level indeterminate. He analysed that under an interest rate rule the public expects that the authorities would supply whatever nominal money stock is required to maintain the interest rate. So any exogenous shock to the price level will be matched by the money stock to make the price level stable. But, since there is no way to forecast the expected price level, under an interest rate rule, the price level would be indeterminate. Sargent and Wallace (1975) also reached the same conclusion by analysing the target problem in the rational expectation literature. They argued that the current behaviour and price level depend on the expected price level. But with an interest rate rule, the expected price level cannot be determined, making the entire time path of the price level indeterminate.

There are also economists who provided some explanation for the use of money supply targets. For instance, Volcker (1978) argued for the use of money supply targets to curb inflation. He analysed that in a period of inflation the nominal interest rate gives ambiguous signals on the stance of the monetary policy and therefore it is very difficult to judge the impact of the central bank action on the real interest rate. Again, monetary policy is also affected by the expectations of the public about inflation. Hence, he concluded that monetary target can be used as a useful tool of communication to the public, as the relationship between money and inflation is readily understood. The announcement of targets has an impact on stabilising the expectation of the public and thus helps in the successful implementation of the monetary policy. Also, he argued that it would act as a discipline on the monetary authorities. Freeman (1981) held the view that setting monetary growth target implies that it puts the main emphasis on what the central bank can and should do, if the aim is to bring price stability. Foot (1981) argued that the stable money demand function would provide the necessary ground for the use of money supply targets and also the announcement of targets has a psychological effect on both the financial and the real markets. Corden (1981) explained that with positive inflationary expectations, the nominal interest rates could give

false signals on the happenings of the real sector. In this case, the real interest rate can be used as a target but the non-availability of data on the real interest rate would make money supply a better target. Mishkin (1999) argued that in case of monetary targeting, information on whether the central bank is achieving its targets is known almost immediately, thus sending immediate signals to both the public and the market to keep inflation under control.

The emergence of monetary targeting was mainly due to the breakdown of the Bretton-Wood system. But the presence of stable money demand function in the seventies and the difficulties in targeting interest rate during high inflation provided the necessary background for the adoption of monetary targets. Germany became the first advanced economy to adopt monetary targeting in 1974. It was followed by the USA, Switzerland and Canada in 1975. In 1976, the UK, France and Australia followed suit. But, by mid- eighties most of the developed countries moved away from monetary targeting approach and adopted the interest rate and exchange rate mechanism. In more recent years, the developed countries have opted for inflation targeting approach. The experience of the developed countries shows that there has been a substantial decline in the inflation rate and also in its variability during the targeting period. But in terms of the authorities ability to attain the target level, the experience has been poor. Monetary targeting has been less successful in some of these countries (USA, Canada, and UK) because it was not pursued seriously. But more importantly, the money demand function became more unstable owing to the high level of financial innovations that took place in developed countries. Additionally, with the opening of the economy, the large capital flows made the control of monetary aggregate more difficult. The monetary targeting approach was only successful in Germany and Switzerland but the approach was very much different from the Friedman type of monetary rule.

III. Monetary Targeting in India

In the 1980s, the opening up of the Indian economy called for a review of the functioning of the monetary system in India. Accordingly, in 1982, the Chakravarty Committee was set up to review the structure and operation of the monetary system in India. The committee found that the money demand function was stable in India and the overriding objective of the monetary policy was to control inflation. Also, the committee found evidence for the proposition that the rate of inflation is directly related to the long-run growth of money supply. Accordingly, it was concluded that to control inflation, money supply should be regulated. Also, it recommended that to control inflation the RBI should adopt the intermediate targeting path with broad money aggregate as the target.

Following the recommendations of the Chakravarty Committee, monetary targeting was adopted in India since the mid 1980s in much contrast to the general abandonment of monetary targeting in most of the developed countries. But the monetary targeting approach recommended by the committee differs from the monetary targeting pursued by the developed countries in that it was not based on the Friedman-type monetary rule; rather it was a flexible one which was to be fixed in ranges. Also the committee recommended monetary targeting with feedback and the same to be emanated from the real sector. To justify the recommendations for monetary targeting in India, Chakravarty (1986), pointed out that, "unlike the case of rigid monetarist approach to targeting in which the other sectors of the economy expected to bear the burden of adjustment, monetary targeting with feedback as recommended by committee is aimed at facilitating the smooth functioning of the other sectors of the economy."

Rangarajan (1997) also argued in favour of using monetary targeting as he found that the money demand function in India was a stable function of select variables such as income and interest rate and it could be used to reasonably predict inflation. The extent and pace of financial innovation in India are not such as to affect the stability of money demand behaviour. Also, he argued that the money supply target is well understood by the public and provides unambiguously the stance of monetary policy. He concluded that the interest rate targeting becomes a possible course of action only when the inflation rate remains in a narrow range.

The experience of India with monetary targeting for the past 13 years shows that in most of the years the growth rate of money supply exceeded the targeted growth rate. Also, in case of inflation management there was no significant improvement as it remained at 8.1% during the targeting period in contrast to 8.8% during the decade preceding the targeting period. Nevertheless, there was a significant decline in the variability of inflation rate. The persistence of excess liquidity and the inability to control the targeted level of money supply raises doubts about the stability of money demand function and the controllability of monetary aggregates. With the ongoing financial liberalisation and emergence of financial instruments with innovative features, the general expectation is that the money demand function would be more unstable as happened in the case of developed countries. Also, with increasing capital flows due to the opening up of the economy, controllability of monetary aggregates becomes more difficult. In this context, the study of Ramachandran (1996) assumes enough significance. He concluded that the simple sum narrow monetary aggregate (M1) has a relatively stable demand function with better forecasting ability compared to divisia and other simple sum aggregates. Hence, M1 should be used as the intermediate target. In contrast, Vasudevan (1998) argued that

though the demand for narrow money function might turn out to be fairly stable even in most of the developed economies, not much purpose would be served from the policy perspective as time liabilities form a major proportion of bank liabilities in India. A recent study by Mohanty and Mitra (1999) though found the demand for broad money (M3) to be fairly stable, argued that with the high level of capital flows in recent times, it may be difficult to control the monetary aggregate to the target level.

The above discussion reveals that it has been a matter of debate as to whether the monetary targeting should be continued or not in the wake of the ongoing reforms taking place in the financial sector. Also, very few studies have been undertaken in India to examine its relevance in the post liberalisation period. Since the stability of the money demand function forms the core of the monetary targeting strategy, the present study attempts to examine the stability of money demand function for both the narrow and broad money aggregates.

IV. Empirical Analysis

The present study uses the cointegration technique to examine the long-run relationship among the variables underlying the money demand function. The study is based on the period from 1985 through 1998 and two of its sub periods viz. 1985-91 and 1991-98. The choice of the second sub-period is guided by the liberalisation of the Indian economy in 1991. The data used are monthly and comprise of money supply- both narrow and broad aggregates, monthly weighted average call money rate, Index of Industrial Production (IIP), and Wholesale Price Index (WPI). Here, it may be noted that IIP is used as a proxy for GDP as the latter is not available on a monthly basis and the call money rate is used to represent the opportunity cost of holding money.

Following the standard specification, money demand function is given as:

$$RM_t = \beta_0 + \beta_1 \ln Yt + \beta_2 \ln Rt + \varepsilon_t$$

where, RM represents real money balances (M1 or M3), Y is the real income, which is represented by IIP, and R is the rate of interest for which the monthly weighted average call money rate is used. Here, all the variables are measured in their log levels.

A direct OLS estimation of the above equation for the full sample is made and the results thereof are reported in tables 1 and 2 for M1 and M3 respectively. For both the money demand specifications, the results show good statistical fit as evidenced by high-adjusted R^2. The income elasticity of real money demand is also provided by coefficients of LIIP which is 0.98 in case of

the narrow money and 1.05 in case of broad money. This seems to be a good estimate as the income elasticity is near unity. Though the call money rate has the expected value both for real narrow and broad money, it happens to be insignificant. Hence, for the full sample the call money rate is not to be concluded as the opportunity cost for holding money.

But for the sub sample periods, though high R^2 shows a good statistical fit for both real narrow and broad money, the income elasticity is found to be quite low; 0.65 on an average for M1 in both the periods and the same for M3 is 0.78. The coefficients for call money rate are found significant for both the money demand and in both the periods even at 1 per cent level. The reason for it may be due to the smaller sample size. The low DW statistic across the sample periods signals for a possible spurious relationship due to the probable presence of first order autocorrelation. This may be interpreted as evidencing the non-stationary nature of data and hence calls for unit root tests of the variables and application of cointegration techniques to establish a long-run equilibrium relationship. It has been noted by Miller (1991), that DW cannot be too low as it implies no cointegration; however, results provided in tables 1 and 2 show that the DW values exceed the critical value of 0.511 (at 1 per cent level) tabulated by Engle and Granger (1987) which may evidence the presence of a long-run equilibrium relationship among variables and hence cointegration must be applied.

The unit root tests namely, Dicky-Fuller (DF), Augmented Dicky-Fuller (ADF) and Phillips-Perron (PP) are conducted to check the stationary property of data as well as to check the order of integration. These results are provided in tables 3 through 5. From table 3, the results for the full sample period show that in the log levels of the series the null hypothesis of unit root cannot be rejected even at a 10 per cent level except in the case of call money rate which is found to be stationary. However, the null hypothesis of the unit root is rejected for all the variables in their first difference and hence concluded that RM1, RM3 and LIIP are integrated of order 1, that is, I(1).

However, the result differs in case of two sub-sample periods. In both the periods, all the four variables are found to be non-stationary in their log levels since the null hypothesis cannot be rejected at 10 per cent and all the difference series are stationary as the null hypothesis is rejected even at 1 per cent level. Thus, all the four series RM1, RM3, LIIP and LCALL are found to be integrated of order 1.

After ascertaining the order of integration of each variable, we proceed to the Engle-Granger two-step procedure to check for the presence of a long-run equilibrium relationship. It may be noted here that for the full sample, the LCALL variable must necessarily be dropped as it is found to be I(0) but the

same is included in both the sub-sample periods. Table 6 reports the Engle-Granger cointegration for both narrow and broad money demand relationships for both full-sample and sub-sample periods respectively. The comparison of the DF test statistic for the residuals of money demand function confirms that both M1 and M3 demand functions show the presence of long-run equilibrium relationships.

The results from the Johansen maximum likelihood cointegration tests for the real money, IIP and LCALL are given in tables 7 and 8. Table 7 shows the cointegration tests for real narrow money for three sample periods. The trace statistics show that the null hypothesis that the variables are not cointegrated (r=0) against the alternative of one or more cointegrating vectors (r>0) is rejected for all the sample periods. For the full sample period, the λ_{max} statistic shows the presence of a single cointegrating vector as the null hypothesis of r = 1 is not rejected. For the period 1985:04 to 1991:06 the trace test rejects the null hypothesis of r ≤1 against r >1 at 10 per cent level but λ_{max} statistics is not able to reject the null hypothesis of r = 1 at even 10 per cent level and thus there is a single cointegrating vector. For the period 1991:07 to 1998:03, trace statistic rejects the null hypothesis of r ≤ 1 against r > 1 as well as λ_{max} statistic rejects the null hypothesis of r = 1 against the alternative of r = 2 but the null hypothesis of r = 2 is not rejected which thus shows the presence of two cointegrating vectors.

In case of real broad money the same results are reported. The comparison of trace and λ_{max} values with respective critical values shows that there is a single cointegrating vector for the period 1985:04 to 1998:03 and 1985:04 to 1991:06, while two cointegrating vectors are reported for the sample period 1991:07 to 1998:03 at 5per cent level of significance. But the comparison of λ_{max} at 10per cent level shows that for this period the null hypothesis of r = 2 is rejected against the alternative of r = 3, thereby showing presence of three cointegrating vectors.

The presence of cointegrating vectors shows that there exists a long-run relationship between the variables concerned. The estimated cointegrating vectors of the respective money demand functions with regard to LIIP and LCALL gives the elasticity coefficients which are shown in table 9. The income elasticity is close to unity in the case of narrow money for the full-sample period and exceeds unity in the case of the sub-sample periods. The call money rate has the expected signs across aggregates and in both sample periods. The income elasticity is about 1.3 in the case of broad money across the sample periods. But since a cointegrating vector merely represents a long-run stable relationship among jointly endogenous variables, in general, they cannot be interpreted as structural equations. Consequently neither of the cointegrating

vectors necessarily represents either the long-run demand for money or long-run supply of money. However, a stable long-run demand for money implies that there is a stable long-run relationship between the real money, real income and interest rate. Consequently, these results are consistent with the proposition that the long-run demand for money is stable, although they may not be estimates of the long-run money demand function itself.

V. Concluding Remarks

This study brings out the relevance of monetary targeting in India by examining the stability of the money demand function. The results show that there exists a long-run relationship for both narrow and broad money aggregates even after liberalisation, thereby implying that monetary targeting could be continued. However, since the stability tests of the money demand functions are sensitive to the choice of the sample period as well as the variables, these findings may be considered tentative. Of late, the RBI is contemplating targeting interest rates on the ground that the money demand function would be unstable. But there are difficulties in adopting interest rate targeting. As Vasudevan (1998) argued, in a developing economy like India where financial markets are not fully integrated, it is difficult to exactly select a rate of interest that could be regarded as a benchmark for the market interest rates. In the presence of a high inflation rate, targeting the interest rate would send out wrong signals from the monetary sector. Hence, the practical course of action would be to continue with monetary targeting.

TABLE 1
Simple OLS Regression Results for RM1 as Dependent Variable

PERIOD	CONS-TANT	LIIP	LCALL	R^2	D-W Statis-tics
1985:04 -1998:03	0.94 (7.59)	0.98 (42.45)	-0.003 (-0.26)	0.92	1.19
1985:04 -1991:06	2.25 (11.09)	0.64 (14.39)	0.15 (5.90)	0.87	1.50
1991:07 -1998:03	2.18 (11.13)	0.66 (15.30)	0.16 (6.66)	0.88	1.51

Note: figures in parentheses represent respective t ratios.

TABLE 2
Simple OLS Regression Results for RM3 as Dependent Variable

PERIOD	CONS-TANT	LIIP	LCALL	R^2	D-W Statistics
1985:04 - 1998:03	1.61 (12.94)	1.05 (45.15)	-0.023 (-1.80)	0.92	1.26
1985:04 - 1991:06	2.69 (11.33)	0.78 (14.84)	0.12 (3.86)	0.85	1.39
1991:07 - 1998:03	2.64 (11.68)	0.79 (15.82)	0.12 (4.47)	0.86	1.41

Note: figures in parentheses represent respective t ratios.

TABLE 3: Unit Root Tests for Sample Period 1985:04 - 1998:03

	Levels			First Differences		
VARIABLES	DF	ADF	PP	DF	ADF	PP
RM1	-0.36	-0.53(4)	-0.35(4)	-9.75	-6.88(4)	-9.47(4)
RM3	-0.16	-0.22(4)	-0.14(4)	-10.72	-6.45(4)	-10.57(4)
LIIP	-2.02	-1.19(4)	-1.52(4)	-19.83	-7.75(4)	-20.67(4)
LCALL	-4.94	-3.18(2)	-4.70(4)	-15.67	-7.32(4)	-17.14(4)

TABLE 4: Unit Root Tests for Sample Period 1985:04 - 1991:06

	Levels			First Differences		
VARIABLES	DF	ADF	PP	DF	ADF	PP
RM1	-0.39	-0.72(4)	-0.39(4)	-7.06	-5.02(4)	-6.92(4)
RM3	-1.44	-1.70(4)	-1.49(4)	-8.06	-4.67(4)	-8.04(4)
LIIP	-2.69	-1.97(4)	-2.41(4)	-13.32	-4.58(8)	-14.24(4)
LCALL	-1.99	-1.60(4)	-1.35(4)	-9.17	-6.89(4)	-10.60(4)

TABLE 5: Unit Root Tests for Sample Period 1991:07 - 1998:03

VARIABLES	Levels			First Differences		
	DF	ADF	PP	DF	ADF	PP
RM1	-0.52	-1.02(4)	-0.51(4)	-6.81	-5.17(4)	-6.59(4)
RM3	-1.61	-2.11(4)	-1.64(4)	-7.66	-4.22(4)	-7.59(4)
LIIP	-2.56	-1.74(4)	-2.20(4)	-13.67	-5.00(4)	-14.73(4)
LCALL	-3.08	-0.98(4)	-2.70(4)	-8.53	-6.01(4)	-9.51(4)

Note : The critical values for unit root tests for full sample are -3.46, -2.88, and -2.57 at 1%, 5% and 10% respectively and for sub samples the values are -3.51, -2.89, and -2.58 respectively.

TABLE 6: Engle-Granger Cointegration Test (DF test stastic for the residuals of money demand function)

MONEY DEMAND	1985:04 – 1998:03	1985:04 - 1991:06	1991:07 - 1998:03
RM1	-8.15	-6.62	-6.90
RM3	-8.40	-6.28	-6.61

TABLE 7: Cointegration Test of Johansen Maximum Likelihood Approach for RM1

NULL HYPOTHESIS	ALTERNATIVE HYPOTHESIS	1985:04-1998:03	1985:04-1991:06	1991:07-1998:03	CRITICAL VALUES	
Trace Test	Trace Test	Trace Values	Trace Values	Trace Values	5%	10%
r = 0	r > 0	65.67	65.31	64.59	29.68	26.79
r ≤ 1	r > 1	0.07	15.26	18.41	15.14	13.33
r ≤ 2	r ≥ 2	-	3.88	3.06	3.76	2.69
λ_{MAX} Test	λ_{MAX} Test	λ_{MAX} Values	λ_{MAX} Values	λ_{MAX} Values	5%	10%
r = 0	r = 1	44.27	38.74	40.28	20.97	18.60
r = 1	r = 2	0.07	11.38	15.34	14.07	12.07
r = 2	r = 3	-	3.88	3.06	3.76	2.69

TABLE 8: Cointegration Test of Johansen Maximum Likelihood Approach for RM3

NULL HYPOTHESIS	ALTERNATIVE HYPOTHESIS	1985:04-1998:03	1985:04-1991:06	1991:07-1998:03	CRITICAL VALUES	
Trace Test	Trace Test	Trace Values	Trace Values	Trace Values	5%	10%
r = 0	r > 0	44.67	54.00	58.69	29.68	26.79
r ≤ 1	r > 1	0.07	15.26	18.41	15.14	13.33
r ≤ 2	r ≥ 2	-	3.88	3.06	3.76	2.69
λ_{MAX} Test	λ_{MAX} Test	λ_{MAX} Values	λ_{MAX} Values	λ_{MAX} Values	5%	10%
r = 0	r = 1	44.27	38.74	40.28	20.97	18.60
r = 1	r = 2	0.07	11.38	15.34	14.07	12.07
r = 2	r = 3	-	3.88	3.06	3.76	2.69

Note: r refers to number of cointegrating vectors.

TABLE 9: Money Demand Relationship Based on Johansen Test

	RM1			RM3		
PERIOD	LCALL	LIIP	ECM	LCALL	LIIP	ECM
1985:04-1998:03	-	0.978	-0.166	-	1.136	-0.055
1985:04 - 1991:06	-0.050	1.013	-0.155	-0.195	1.267	-0.032
1991:07 - 1998:03	-0.072	1.078	-0.134	-0.236	1.345	-0.035

REFERENCES

Cacy, J A(1978), 'The Choice of Monetary Policy Instrument', *Federal Reserve Bank of Kansas City Economic Review*, May, 17-35.

Carlstrom, C T and T S Fuerst (1995), 'Interest Rate Rules verses Money Growth Rules: A Welfare Comparison in a Cash-in-Advance Economy', *Journal of Monetary Economics*, 36, 247-67.

Chakravarty, S (1986), 'Report of the Committee to Review the Working of the Monetary System: A Reexamination', *Sir Purshotamdas Thakurdas Memorial Lecture, Bombay.*

Chakravarty, S (1987), 'Economic Growth and Monetary Policy', *Commerce*, January 10-16, 5-13.

Cobham, D, 'Monetary Targeting' , *The New Palgrave Dictionary of Money and Finance.*

Dickey, D A and W A Fuller (19790), 'Distribution of the Estimations for Autoregressive Time Series with a Unit Root', *Journal of the American Statistical Association*, 74, 427-31.

Engle R F and C W J Granger (1987), 'Cointegration and Error Correction: Representation, Estimation and Testing', *Econometrica*, 55, 251-76.

Foot, M D K W (1981), 'Monetary Target: Their Nature and Record in the Major Economies', *Monetary Targets, Griffits and Wood (ed.), The Macmillan Press Ltd., Hong Kong*, 13-46.

Friedman, M (1968), 'The Role of Monetary Policy', *American Economic Review*, LVIII, 1, 1-17.

Friedman, B (1990), 'Targets and Instruments of Monetary Policy', *Handbook of Monetary Economics, Friedman B M and F H Hahn (ed.), Elsevier Science Publishers B V*, II, 1185-1230.

Friedman, B (1975), 'Targets, Instruments and Indicators of Monetary Policy', *Journal of Monetary Economics*, 1, 443-73.

Friedman, M (1984), 'Lessons from the 1979-82 Monetary Policy Experiment: A Comment', *American Economic Review*, 74, 397-400.

Griffits and Wood (1981), 'Monetary Targets', *The Macmillan Press Ltd, Hong Kong.*

Hagen, J V (1999), 'Money Growth Targeting by the Bundesbank', *Journal of Monetary Economics*, 43, 681-701.

Holbrook, R and H Shapiro (1970), 'The Choice of Optimal Intermediate Economic Targets', *American Economic Review*, LX, 40-46.

Johansen, S (1988), 'Statistical Analysis of Cointegrating Vectors', *Journal of Economic Dynamic and Control*, 12, 231-54.

Johansen, S and K Juselius (1990), 'Maximum Likelihood Estimation and Inference on Cointegration with Application to Demand for Money', *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Lane, T D (1985), 'The Rationale for Money Supply Targets: A Survey', *The Manchester School*, June, 179-207.

Majumdar, N A (1989), 'Monetary Targeting: Objectives and Appropriate Indicators', *Economic and Political Weekly*, 24, 34, 1959-62.

Miller, S M (1991), 'Monetary Dynamics: An Application of Cointegration and Error Correction Modeling', *Journal of Money Credit and Banking*, 23, 2, 139-54.

Mishkin, F S (1999), 'International Experience with Different Monetary Policy Regimes', *Journal of Monetary Economics*, 43, 579-605.

Mohanty, D and A K Mitra (1999), 'Experience with Monetary Targeting in India', *Economic and Political Weekly*, January 16-23, 123-32.

Phillips, P C B and P Perron (1988), 'Testing for Unit Root in Time Series Regression', *Biometrica*, 75, 335-46.

Poole, W (1970), 'Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model', *Quarterly Journal of Economics*, LXXXIV, 197-216.

Ramachandran, M (1996), 'The Optimal Level of Monetary Aggregation and Monetary Targeting for India', *32nd Annual Indian Econometric Society Conference (March 21-23), ISI, Bangalore*, 3, 65-83.

Rangarajan, C (1989), 'Issues in Monetary Management', *Indian Economic Journal*, 36, 3-4, 1-13.

Rangarajan, C (1997), 'Role of Monetary Policy', *Economic and Political Weekly*, December 2, 3325-28.

Saving, T R (1967), 'Monetary Policy Targets and Indicators', *Journal of Political Economy*, 75, 4, 446-56.

Sargent, T J and N Wallace (1975), 'Rational Expectations, the Optimal Monetary Instruments and the Optimal Money Supply Rule', *Journal of Political Economy*, 83, 241-54.

Sellon, G H Jr. and R L Teigen (1981), 'The Choice of Short Run Targets for Monetary Policy: A Theoretical Analysis', *Federal Reserve Bank of Kansas City Economic Review*, April 3-16.

Sellon, G H Jr. and R L Teigen (1981), 'The Choice of Short Run Targets for Monetary Policy: A Historical Analysis', *Federal Reserve Bank of Kansas City Economic Review*, May 3-12.

Simons, H C (1936), 'Rules versus Authorities in Monetary Economics', *Journal of Political Economy,* 44, 1, 1-30.

Tobin, J (1983), 'Monetary Policy: Rules, Targets and Shocks', *Journal of Money Credit and Banking,* 15, 4, 506-18.

Vasudevan, A (1998), 'Analytical Issues in Monetary Policy in Transition', *Reserve Bank of India Bulletin,* January, 45-52.

Vasudevan, A (1999), 'Some Practical Issues in Monetary Policy Making', *Reserve Bank of India Bulletin,* January, 121-28.

Volcker, P A (1978), 'The Role of Monetary Targets in an Age of Inflation', *Journal of Monetary Economics, 4, 2, 329-39.*

Waud, R N (1973), 'Proximate Targets and Monetary Policy', *Economic Journal,* 63, 1-20.

Wicksell, K (1901), 'Lectures on Political Economy' (Trans. By E Klassen), L Robbins (ed.) 1934-1935, Macmillan, NewYork.

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