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A RE-EXAMINATION OF THE LONG-RUN RELATIONSHIP BETWEEN MONEY SUPPLY AND INFLATION IN INDIA*

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Abstract

This study tries to examine the long-run relationship between money supply and prices in the Indian context with the help of both annual data for the period 1953 to 1998 and monthly data for the period 1993:1 to 1998:12. The study finds that there still exists a strong influence, though not immediate, of money supply on the price changes in India in the long run. It was also found that money supply is not exogenous and is influenced by prices and output. The results raise doubts about shifting the focus from money supply to interest rates by RBI. The shift to interest rate targeting is not supported by this study. Financial liberalisation has not made income velocity of money unstable in India. Monetary targeting is still useful.

Introduction

The main focus of macroeconomic thinkers and policy makers is achieving macroeconomic stability. Macroeconomic stabilisation needs the achievement of an 'acceptable' inflation rate, optimal growth of output, a respectable value for the currency abroad and a favourable balance of payments. This can be achieved, in any open economy, through the dynamic interaction of economic variables such as money supply, interest rates, fiscal deficit, etc. It means that the policy impact on one variable will have its effect on all other variables in the system. The present paper delves

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into the question of which variable should be affected to have a high impact on the economy's stability. The present study examines this problem in the context of India's experience with the IMF-sponsored structural adjustment and stabilisation programmes designed to attain macroeconomic stabilisation since mid-1991. The present study uses the annual data of the Indian economy for the period 1953 to 1998 and monthly for the period 1993:1 to 1998:12. First it discusses the theoretical debate of the problem, and then critically reviews major works that exist in the literature. It then deals with the methodological aspects of the study, and finally discusses the results obtained.

Theoretical Overview

Different schools of thought have provided many versions to explain the relationship among money supply, prices, and output in the economy. Earliest among them are the Classical School, which explained that changes in prices, the most important target variable in achieving stabilisation, is basically due to changes in the money supply. The relationship between the price level and money supply has its foundations way back in 1752 following the publication of David Hume's *Of Money*. In his opinion there exists a proportional relationship between money supply and the absolute price level. To quote, "if we consider any one kingdom by itself, `t is evident, that the greater or less plenty of money is of no consequences, since the prices of commodities are always proport'd to the plenty of money". It means that a change in the money supply will lead to changes in the price level proportionately.

The view of the Classical School that money supply is the dominant source of instability in the economy has been questioned by the Keynesians. Their basic argument is that effective demand, which is caused by autonomous spending in the economy comprising investment by business and Government spending, is the main source of instability but not the quantity of money. Any change in the money supply will be weakened by an opposite change in the movement of velocity that is highly adaptable. An increase (decrease) in money supply will decrease (increase) velocity and in totality there will be no effect on either the price level and/or the volume of transactions. Further, they embellished this position with a non-monetary 'cost-push' determination, mostly of wages, of the price level and the rate of inflation.

As almost all the economies suffered from high inflation rates due to the cheap monetary policy adopted in the Second World War, the Keynesian ideas were criticised by Monetarists, particularly by Milton Friedman. This led to *monetarism*, which propounded that central bankers should concentrate on quantity of money, which has to be exogeneously determined, rather than dependent on interest rates. In the words of Friedman (1991) "... fiscal policy by itself is largely ineffective, that what matters is what happens to the quantity of money". Further, he says, "it seems absurd to say that if the Government increases its expenditure without increasing taxes, that may not by itself be expansionary. Such a policy obviously puts income into the hands of taxpayers. Is that not obviously expansionary or inflationary.... We have to ask where the Government gets the extra funds it spends. If the Government prints money to meet its bills, that is monetary policy...". The above statement attribute to their claim that inflation is always and everywhere a monetary phenomenon (in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in the effective demand). It also attributes to the monetarist claims of exogenous money supply as against the claims of the 'endogeneity money supply' school.

The Monetarists' claim of inflation as a monetary phenomenon was also supported by the New Classical School, which is also known as Rational Expectations School. The Keynesian and Monetarist interpretation of the transmission mechanism of money is that increases in money supply produce first interest rate and output effect in the short run, and price and inflation effect only in the long run. The New Classicals of Mark I and Mark II variety argue that prices are flexible at every point of time as in the Walrasian general equilibrium model and that therefore increases in money supply produce inflation in the short run itself. These competing hypotheses have to be empirically tested. One way of doing so is specifying the transmission mechanism of money in various ways and testing the relationship between money and prices.

The new classical macroeconomics, Mark II, treats money supply as endogenous and concludes that monetary policy is irrelevant. Contrasting with the new classical school, Mark I, it considers that supply shocks, particularly the technological shocks,

are the dominant source of price instability in the economy. It further explains that changes in the price levels are due to random changes in the available production technology. It refutes the informational asymmetries concerning the general price levels that were considered by the Rational Expectation School.

The main criticism against the quantity theory is that money supply cannot be exogenous and price may affect its quantity, which is an 'anti-quantity theory' in nature. There will be reverse causation running from price levels to money supply. This is in line with the cost-push inflation theory that prices will be basically influenced by the cost of production of goods and services rather than the purchasing power backed by money supply. In the case of gold standards, as the Banking school argues, it is the cost of production of gold that affects the price level and the money quantity should adjust with the cost. Even some of the quantity theorists are of the same opinion.

Irving Fisher claimed that there is some possibility of reverse causation between the two variables and this 'reverse causation' is an integral part of the transmission mechanism. In his view the causation between the variables is complex and there will be mutual interaction between them. Depending on the price-level fluctuations the business community forms expectations that will induce them to go for speculative loans from the banks. In turn, this act of the business community makes the volume of bank deposits respond endogenously. Recently the same opinion has been expressed by the leading monetarists of the present period, Friedman and Schwartz (1963), that 'while the influence running from money to economic activity has been predominant, there have clearly also been influences running the other way, particularly during the shorter-run movements associated with the business cycle'.

Real Bills doctrine of the Banking school believed that there exists reverse causation running from prices to money supply, thereby arguing for endogeneity of money supply. The argument is that 'provided the Bank regulated its note issue by discounting only good quality short-term commercial paper (known as real bills) in any quantity offered to it, the quantity of money in circulation would be the consequence and not the cause of prices' (Laidler, 1989).

The quantity of money will depend not only on the interest rate policy of the central bank but also on the fiscal policy adopted by the Government, its budget constraint and the exchange rate regime. Government's budget constraint is important in the sense that if the whole expenditure is financed by taxes and borrowing from the public, there will be no reason for money creation and therefore it will adjust to other macroeconomic variables. If the deficit is financed by the creation of money, a common feature at least in the developing economies, it will affect the stability of the economy by creating an 'explosive inflationary spiral'. Further, Government deficit is also a variable that depends on factors like real income and prices. Hence, the endogeneity of fiscal deficit will lead to the possibility of causation running from the level of money income to the rate of change of nominal money supply in a closed economy structure.

In an open economy, with fixed exchange rate regime, monetary expansion will be the cause of balance-of-payments equilibrium, through which the domestic price levels will adjust. This mechanism will ensure the favourable home country's balance of payments, given the increase in the world economy's inflation rate. But under the Rational Expectations model, this increase in the world inflation rate, which causes monetary expansion through the balance-of-payments mechanism, would allow the rational agents to expect that this will affect the time path of domestic prices. Hence, the time path of world prices will directly affect the domestic inflationary expectations. Even the domestic interest rates will adjust with the world prices. Therefore, these expectations will make the monetary expansion rate just an accommodating factor (i.e., the existence of 'reverse causation' running from money to output and prices) rather than an exogenous factor as claimed in monetarism. In Laidler's words: "Under the gold standard, then, and indeed under any other kind of fixed exchange rate regime, an effect in the form of rising prices can precede the necessary and sufficient condition for its occurrence, namely an increasing money supply, and such a sequence of events has long been understood to be quite possible".

However, under the flexible exchange rate regime also, monetary policy was forced to maintain the exchange rate at a particular value, rather than to achieving domestic targets. There are theories that explain inflation as an outcome of changes in the

exchange rates. That is, domestic exchange rate depreciation will lead to an increase in the domestic price of imported goods in both consumption and production (raw materials) sectors. This increase in imported goods' prices will lead to an increase in the domestic prices that require further depreciation in a vicious manner. This mechanism may exist in the developing and transitional economies.

The above discussion brings us to the point, yet unresolved, whether there exists a relationship among money supply, price levels and output. The scores of different schools of thought can be settled through empirical analysis.

Review of Literature

One of the important empirical studies on the monetarists' propositions is Sims (1972). The study, using Granger causality test, concluded that money stock is exogenous to income for the post-war period where he used only three variables, viz., money supply, industrial production and the wholesale price index. Later, in his 1980 paper, two separate periods, post-war period (1948-78) and the inter-war period (1920-41), were considered. He used the monthly data for the same variables, as in his earlier study, in its logarithmic terms with twelve lags of each variable. It was shown that money stock was exogenously determined, and it explained a substantial change in the industrial production in both the periods, more significantly in the inter-war period. Changes in prices were explained by money stock but less than what he had found when he used quarterly data rather than monthly data. Since the industrial production and wholesale price index responded positively to a change in money stock in both the periods, this model suited the monetarists' framework.

Sims further estimated the VAR system by introducing the short-term interest rates (the rate on 4-6 months prime commercial paper) for both the periods and concluded that money stock is no longer exogenous. When the system without interest rate was used for forecasting, innovation in money stock explained 37 per cent of the forecast error variance of industrial production at the forty-eighth-month horizon for the post-war US data. However, after the inclusion of interest rate in the model, his proportion fell sharply to 4 per cent, which is a non-monetarists'

explanation for the same data. Further, the study showed that changes in industrial production and money stock were mostly attributed to common responses to changes in interest rate in the post-war period. And a change in production variance was not due to changes in money stock.

Benjamin Friedman & Kenneth Kuttner (1992) examined the role of quantity of money (or its growth rate) via monetary policy, in influencing national income, prices and other aspects of economic activity. The standard quarterly data of the United States for three-sample periods viz., 1960:2 - 1979:3, 1960:2 - 1990:4 and 1970:3 - 1990:4 were considered for this purpose. Three money definitions viz., monetary base, M1 and M2 (based on the conventional Federal Reserve Board definitions) credit (the outstanding indebtedness of domestic non-financial borrowers); Gross National Product and interest rates were considered. All the data except interest rates were adjusted to remove seasonality in the time series. The main aim of this study was to show how the passage of time, particularly since the 1980's due to Federal Reserve's change in operating procedures, had altered familiar empirical relationships that supported the central role for money in the monetary policy process. Autoregressive tests and forecast error variance decomposition were used to establish whether fluctuations in money or interest rates were useful for predicting subsequent fluctuations in income or prices.

For the first sample period, 1960:2 - 1979:3, the study arrived at a result that is consistent with the monetarist propositions i.e., monetary base, M1, M2 and credit each contained information about future income movements which was statistically significant at one per cent level. But when the sample was extended to include data up to 1990's, the result showed that it is not quantity of money that influenced income but interest rates. It also arrived at a result that the difference between the two interest rates, commercial paper rate and the Treasury bill rate, contained incremental information about real income but not prices. For the sample period 1970:3 - 1990:4 only M1 was found to be significant among the three aggregates even at the 10 per cent level. When the money term was replaced by interest rates, the relationships between interest rates and income had changed with the passage of time. But the change is from weaker to stronger ability to predict income fluctuations.

For the sample period 1960:2 - 1979:3, the interest rates were not containing statistically significant information about future fluctuations in income. But for the remaining two sample periods, the information about income contained in interest rates was significant at least at 5 per cent level. Analogously, the movements in the price level were also estimated in this study. The study also used multiple cointegration test to establish the long-run relationships among the variables. This test also led to the same results as in the autoregressive tests, suggesting that the relationships that would have to hold in order to warrant using money as the central focus of monetary policy disappeared when the analysis included data from the 1980's.

Forecast error decomposition were estimated for the periods 1960:2 - 1979:3 and 1970:3 - 1990:4 for four and eight quarter horizon. It was found that there was a sharp deterioration in the money-income relationship. In the first sample period, M1 and M2 and credit each accounted for 20 to 30 per cent of the income error variance and the monetary base share was in the 10-15 per cent range, and all the shares were statistically significant. But in the second sample period, these shares dropped to about one-half of what they were in the first period, and the credit share was almost equal to zero. There was no change in the results when nominal income was replaced by real income. The study also concluded that even when the industrial production used, in place of real income and with the producer price index used instead of the implicit price deflator, with monthly data, the results were not changed.

Fackler and Rogers (1995) estimated a small open-economy macro model for Bolivia and Brazil, which had undertaken stabilisation programmes to control inflation. The study used the quarterly data 1983:I to 1990:IV of Bolivia and the monthly data 1983:1 to 1990:9 of Brazil to establish the sources of fluctuations in output and inflation. The variables considered in the study were Government spending/tax ratio, output, inflation rates, real exchange rate and real money balances. Impulse response functions, variance decomposition and historical decomposition have been estimated for this purpose. They followed an approach that combines both structural and reduced form analysis and has been implemented by a two-step process. In the first process, an unconstrained vector autoregression has been estimated. In the

second process, a just identified structural model of VAR residuals from the first stage has been specified and then estimated using a method of moments estimator. From the residual of the second stage, impulse response functions, variance decompositions were obtained.

From the estimated impulse response functions, the study concluded that the responses of output were very similar in both the countries. There existed a long-run positive change in output in response to output, money, and exchange rate shocks, but negative response to fiscal and asset shocks. They also found that the response of inflation to the various shocks differ across Bolivia and Brazil. Fiscal view of inflation that asserts that budget deficits are the fundamental cause of inflation in countries was established in Bolivia where the response of inflation to the fiscal shock was inconsistent with the fiscal view, but consistent with the monetarists' view. Variance decompositions also gave the same results. In the case of Bolivia, output was affected mainly by monetary shock and its own shock, and the variance of inflation was explained by several shocks, with the money shock having the strongest influence. The authors claimed that the monetary shocks likely represented the effects of monetising the deficit; hence variance decomposition results for Bolivia were consistent with the fiscal view. For the Brazilian economy, output was affected by its own shock, although each shock was influential.. For the variance of inflation, all the shocks contributed approximately equally in the long run.

In the Indian context Bhattacharya & Chakravarty (1995), using the annual data for the period 1950-51 to 1990-91, tested the monetarist model of inflation (both static and dynamic) by using both the narrow and broad definitions of money supply with the help of an alternative Bayesian methodology developed to select an appropriate inflation model developed by Spiegelhalter & Smith (1982). The study also estimated ordinary least squares estimates to verify the monetarists' claim that 'inflation is a monetary phenomenon'. The study divided the whole period into two sub-periods; 1950-51 to 1969-70 and 1970-71 to 1990-91 to test the effect of bank nationalisation on the operation of monetary policy in India. With the help of OLS estimates the study concluded that, in the static framework, the monetarist model could have a little impact on the inflation in the case of India. In the dynamic

model also monetarist variables explain only slightly more than 50 per cent of the variation in the inflation rate. When they used the Bayesian model, it also showed the dynamic relation between money and price in India. Further, the study concluded that the pure theoretical monetarist model of inflation is not valid in India.

Inter-relationships between money supply, output and prices in the case of India have been tested by Rangarajan & Arif (1990) with the help of a macroeconometric model consisting of linear and log-linear equations. This model used the Indian economy's annual data for the period 1961-62 to 1984-85 and tried to establish the link between the fiscal, monetary and real sectors of the economy, when the money stock was changing endogenously with the fiscal deficit. It considered broad money (M3) as a monetary indicator and wholesale price index as a proxy for the price level and net national product at factor cost as income indicator. The study concluded that price level was responding positively to monetary expansion and that there was no response to changes in the real output. Hence it concluded that the steady growth of money supply is not a good policy measure given the trade-off in terms of inflation.

The expectations-augmented Phillips curve leads to the excess activity model of inflation, which can be empirically implemented by taking the difference between the real output trend growth and the actual output for a particular year as an independent variable. According to the hypothesis when excess activity is high, inflation will be high and unemployment will be less. The excess activity is presumed to result from more employment than from the trend level employment, at a particular point of time. But Bhalla (1981) argues that for the predominantly agricultural economy of India, the Phillips curve relationship can be just the opposite. A rise in agricultural output caused by good weather should lead to a decline or deceleration in agricultural prices and an increase in output of the industrial sector as raw material costs decline and urban wage demands are dampened.

Paul & Pradan (1992) found that unanticipated money supply is statistically significant in explaining inflation in India, and also that import prices are important for explaining inflation. They have argued that an expectations-augmented Phillips curve with error learning process combined with buffer-stock approach to money supply are empirically relevant for India.

From the above selected literature survey it can be concluded that the results are sensitive to the methodology that was adopted and the time period considered in the study. This may be due to inconsistent monetary policy adopted by the economies and it is clearly evident in LDCs. The present study, after drawing lessons from the existing literature, found that there is a need to examine the interrelationships between money supply, output and prices on a continuous basis to facilitate policy making. Hence, in this paper, we examine the money supply, output and price relationship in the context of India by using the annual data for the period 1953 to 1998. We also examine these relationships with the help of the monthly data for the period 1993:1 to 1998:12. In this period Reserve Bank of India (RBI) seems to have tilted towards exchange rate and interest rate targeting. The RBI has taken the view that with the onset of financial sector liberalisation, the relation between money and prices has become very tenuous, and the focus has shifted to interest rate targeting and a whole list of financial market indicators for tightness of policy. The argument inherent is that financial liberalisation has made income velocity of money unstable. This raises doubts about the monetarists' view of money-price relationship in India that was corroborated by various studies on India. In this context, the present study assumes significance to find out whether the traditional relationship between money and inflation holds in India and also to know whether there is an output effect of money in the short run.

Methodology and Data Source

To test the interrelationships between the variables the present study uses the Vector Autoregression (VAR) method. VAR is an atheoretical model that uses observed time series properties of the data to forecast economic variables. Since the focus of this study is to examine the views of monetarists and non-monetarists using the Indian data, a single VAR model is appropriate. The main and most useful component for drawing policy conclusions of the VAR method is the impulse response functions (IRF) that show the dynamic responses of the endogenous variables to a one standard deviation innovation in each of the variables in the system. The IRF also helps in understanding whether a variable is exogenous or endogenous. Further, the present study also uses

the multiple cointergration model due to Johansen to study the long-run relationship between the variables in question. (The technical details of these methods are presented in a simple fashion in Enders (1995)).

The present study uses the annual data for the period 1953 to 1998. The variables considered in this model are RBM (Real Broad Money), WPI (Wholesale Price Index Base1981-82=100, average of weeks) and GDPR (Gross Domestic Product at factor cost at 1980-81 prices). We have calculated inflation (INF) from the WPI (% change of WPI). The present study also uses the monthly data for the period 1993:1 to 1998:12 and the variables considered are broad money (BM), Index of Industrial Production (IIP with base 1981-82=100), Call Money Rate (CALLRATE), stock return (STRETURN) and (WPI). All the data are taken from various issues of RBI *Monthly Bulletin.*

Estimation and Discussion of Results

The VAR model we fit was of the order [RBM INF GDPR] in its natural logarithmic terms. The lag length of the model is fixed at four, which was derived through Akaike Information Criteria (AIC). Further, we used Kalman filtering to the system that will sequentially update the estimated coefficients.

The VAR model estimated in the present study is as follows:

$$RBM_t = a_{10,0} + a_{11,s}\sum_{s=1}^{4} RBM_{t-s} + a_{12,s}\sum_{s=1}^{4} INF_{t-s} + a_{13,s}\sum_{s=1}^{4} GDPR_{t-s} + u_{1t}$$

$$INF_t = a_{20,0} + a_{21,s}\sum_{s=1}^{4} RBM_{t-s} + a_{22,s}\sum_{s=1}^{4} INF_{t-s} + a_{23,s}\sum_{s=1}^{4} GDPR_{t-s} + u_{2t}$$

$$GDPR_t = a_{30,0} + a_{31,s}\sum_{s=1}^{4} RBM_{t-s} + a_{32,s}\sum_{s=1}^{4} INF_{t-s} + a_{33,s}\sum_{s=1}^{4} GDPR_{t-s} + u_{3t}$$

It was found that a shock in RBM has a positive and significant impact on INF up to the fourth lag and no impact on the GDPR (money is neutral). This result corroborates the view of the monetarists' school. It was also found that BM is influenced by the shocks in INF and GDPR in the long run, thereby rejecting the money exogenity proposition. In the short run, output effect is significant (see table-1). This corroborates the Keynesian and monetarist claim of transmission mechanism of money that in the short run there is output effect and in the long run money produces only inflation. Further it was found that shocks in INF have a positive effect on RBM and no effect on the GDPR. It shows that monetary policy in India is not independent and sometimes it accommodates to the rise in prices. The F-statistics derived from the VAR model that is presented in Table-4 also provide the same conclusions.

To establish the long-run relationship between the money supply, output and prices, we also used the multiple cointegration technique. With monthly data we have undertaken multiple cointegration technique to estimate the long-term coefficient for RBM demand and also to know the relationship between money and inflation. We have also included the intercept term in the cointegration procedure. The results show that there is a long-run cointegrating relationship between demand for money, industrial production index, call rate and return on stocks. The results also corroborate (from the normalised long-term coefficients of cointegrating relation) the long-term significance of the demand for money with a slightly more than unit elasticity for industrial production and theoretically expected negative sign for call rate and a slightly positive wealth effect of the stock market return on the demand for money in India (see table 4). The monthly data also show that there is a long-term relationship between inflation and money supply. There exists a significant cointegrating vector from the three variable system (BM, INF and IIP). The normalised long-term coefficients show that the long-term positive effect of an increase in money supply on inflation in India and the negative effect of an increase in the Industrial production index on inflation. It may be noted that when we have included WPI instead of INF in the model there was no cointegration between these variables. It may be noted that a study by Nag & Upadhyay (1993) concluded that there is no cointegration between money supply and WPI. But from this result they have wrongly concluded that the

Dep	In level forms			In difference forms		
Indep	BM	GDPR	INF	BM	GDPR	INF
$GDPR_{-1}$	-0.098 (-0.086)	0.309 (1.481)	0.00001 (0.056)	0.466 (0.388)	-0.193 (-0.979)	0.0001 (0.759)
INF_{-1}	-329.03 (-0.348)	87.561 (0.507)	-0.038 (-0.228)	1169.81 (1.188)	326.9** (2.02)	0.264*** (1.917)
INF_{-2}	-1019.81 (-1.214)	-36.212 (-0.236)	-0.208 (-1.375)	-640.96 (-0.655)	66.716 (0.415)	-0.018 (-0.129)
INF_{-3}	998.59 (1.273)	68.825 (0.479)	-0.076 (-0.536)	1673.8*** (1.848)	135.791 (0.913)	0.038 (0.299)
INF_{-4}	167.169 (0.218)	226.846 (1.616)	-0.2401 (-1.731)	-54.095 (-0.059)	234.162 (1.576)	-0.146 (-1.15)
R_2	0.988	0.997	0.259	0.535	0.511	0.373

Table 1: Regression estimates that are derived through VAR model

Dep	In level forms			In difference forms		
Indep	BM	GDPR	INF	BM	GDPR	INF
BM_{-1}	0.424** (2.277)	0.012 (0.375)	-0.0001 (-1.651)	-0.271 (-1.397)	0.047 (1.461)	-0.000 (-1.29)
BM_{-2}	0.373*** (1.92)	0.015 (0.431)	-0.0001 (-1.463)	0.183 (0.906)	0.071** (2.119)	-0.0001*** (-1.945)
BM_{-3}	0.314 (1.6)	0.014 (0.698)	0.00003 (0.894)	0.402*** (1.887)	0.087** (2.5)	0.0000 (0.073)
BM_{-4}	0.274 (1.233)	-0.026 (-0.643)	0.0001** (2.623)	0.266 (1.283)	0.027 (0.803)	0.0001* (3.889)
$GDPR_{-1}$	0.814 (0.763)	0.804* (4.125)	-0.0004*** (-1.883)	1.999*** (1.701)	-0.029 (-0.154)	-0.0003 (-1.589)
$GDPR_{-2}$	-1.399 (-1.03)	-0.013 (-0.052)	0.0001 (1.468)	0.4196 (0.348)	-0.033 (-0.166)	0.0002 (1.389)
$GDPR_{-3}$	0.752 (0.586)	-0.034 (-0.136)	0.0001 (0.335)	1.058 (0.873)	-0.113 (-0.569)	0.0002 (0.921)

Table 2: Regression estimates that are derived through VAR model

Dep	In level forms		In difference forms	
Indep	BM	GDPR	BM	GDPR
BM_{-1}	0.409**	0.021	-0.261	0.067**
	(2.368)	(0.676)	(-1.393)	(2.052)
BM_{-2}	0.356***	-0.002	0.174	0.069***
	(1.945)	(-0.067)	(0.863)	(1.952)
BM_{-3}	0.345***	0.011	0.394***	0.0696***
	(1.808)	(0.313)	(1.897)	(1.921)
BM_{-4}	0.260	-0.018	0.276	0.012
	(1.262)	(-0.484)	(1.362)	(0.335)
$GDPR_{-1}$	0.981	0.825*	1.974***	0.036
	(1.016)	(4.647)	(1.756)	(0.181)
$GDPR_{-2}$	-0.893	0.030	0.715	-0.065
	(-0.706)	(-0.129)	(0.617)	(-0.319)
$GDPR_{-3}$	0.397	0.021	1.183	-0.0236
	(0.314)	(0.091)	(1.018)	(-0.117)
$GDPR_{-4}$	-0.45	0.264	0.305	-0.165
	(-0.447)	(1.428)	(0.265)	(-0.824)
R_2	0.989	0.997	0.525	0.435

Table 3: Regression estimates that are derived through VAR model

Dep	In level forms		In difference forms	
Indep	BM	INF	BM	INF
BM_{-1}	0.421**	0.0001	-0.138	0.00003
	(2449)	(-1.52)	(-0.826)	(-1.295)
BM_{-2}	0.378**	-0.0000	0.399*	-0.00004**
	(2.093)	(-0.996)	(2.781)	(-2.059)
BM_{-3}	0.319***	0.0001	0.60*	0.00001
	(1.729)	(1.182)	(3.735)	(0.837)
BM_{-4}	0.312	0.0001**	0.426**	0.0001*
	(1.497)	(2.174)	(2.365)	(4.299)
INF_{-1}	-343.21	0.132	1122.6	0.303**
	(0.428)	(0.812)	(1.213)	(2.254)
INF_{-2}	-768.24	-0.212	-345.21	-0.115
	(-1.049)	(-1.412)	(-0.378)	(-0.864)
INF_{-3}	879.52	0.011	1574.***	0.063
	(1.23)	(0.075)	(1.832)	(0.503)
INF_{-4}	408.12	-0.211	374.802	-0.185
	(0.589)	(-1.492)	(0.437)	(-1.480)
R_2	0.989	0.138	0.541	0.331

monetarists' hypothesis of the positive relation between money supply and inflation is rejected for Indian data. This conclusion can be rejected as Milton Friedman argued that changes in money supply will have a positive effect on the rate of change of prices i.e., inflation, and not on the price level. This argument is abundantly corroborated by our results.

Conclusion

From the above results the study concludes that there still exists a strong influence of money supply on price changes in the Indian context. It was found that though the effect of money supply on inflation is not immediate, it has a positive impact on inflation in the long run, which is the main proposition of the Monetarists school. The changes in money supply, initially, have shown a positive impact on real income. The 'output effect' of money is only in the short run. The 'price effect' dominates in the long run. In India, it takes almost four years to have the full price effect of money supply growth. But, after a two-year lag it was found that money supply is positively affecting the price changes. It was also found that money supply is not exogenous in the system as it was found to be influenced by changes in the price and output. Therefore the short-term cyclical effect has to be de-linked from the long-term trend effect of the relation between money and inflation. The implication is that the monetary policy cannot be actively used for stabilisation purposes in the short run. Because the short-term money demand equation may mislead as it involves the transmission mechanism of money, output and prices and also the cyclical reverse-causality from prices and output to money. The estimation of long-term cointegrating relations is important and our study has been able to discern such a long-term relationship between money and inflation.

The results that are derived in this study certainly raise doubts about shifting the focus from money supply to interest rates by RBI. The shift to interest rate targeting is not supported by this study. Monetary targeting is still useful.

Table 4: ESTIMATED VARs: F - STATISTICS (Level/difference forms)

VARIABLES	BM	GDPR	INF
BM	81.15*/1.45	0.92/2.47***	2.63**/5.12**
GDPR	0.32/0.89	269.05/0.29	2.31***1.54
INF	0.96/1.19	1.01/2.23***	1.48/1.38

Note: * denotes significant at 1% level
** denotes significant at 5% level
*** denotes significant at 10% level

Table 5: Johansen Cointegration Results Based on Maximal Eigenvalue

69 observations from 1993M4 to 1998M12. Maximum lag in VAR=2, chosen r = 2.
List of variables included in the cointegrating vector:
LRBM LIIP CALLRATE STRETURN

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	32.6786	27.1360	24.7830
r ≤ 1	r = 2	19.4561	21.0740	18.9040
r ≤ 2	r = 3	11.2332	14.9000	12.9120
r ≤ 3	r = 4	.14102	8.1760	6.5030

The Normalized Long Term coefficients for Real M3 demand in log terms given below :
LRBM = 1.2074 LIIP - 0.00896 CALLRATE + 0.0008062 STRETURN

Table 6: Johansen Cointegration Results Based on Maximal Eigenvalue

67 observations from 1993M6 to 1998M12. Maximum lag in VAR = 4.
List of variables included in the cointegrating vector:
INF BM INDEXIP

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	25.5102	21.0740	18.9040
r ≤ 1	r = 2	14.4394	14.9000	12.9120
r ≤ 2	r = 3	10.6264	8.1760	6.5030

The Normalized Long Term coefficients for inflation is given below :
INF = 1.73344E-7 BM - 0.009352 INDEXIP

Table 7: Johansen Cointegration Results Based on Maximal Eigenvalue

67 observations from 1993M6 to 1998M12. Maximum lag in VAR = 4, chosen r= 1.
List of variables included in the cointegrating vector:
INF LRBM LIIP

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	25.3353	21.0740	18.9040
r ≤ 1	r = 2	14.7989	14.9000	12.9120
r ≤ 2	r = 3	.2379E-3	8.1760	6.5030

The Normalized Long Term coefficients for inflation is given below:
INF = 1.9833 LRBM - 5.2703 LIIP

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