

EFFECTIVENESS OF MONETARY POLICY IN CONTROLLING INFLATION

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The role of the monetary policy in any country is to achieve higher rate of growth with a stable inflation rate. These objectives become all the more important in an emerging economy such as India. Since 2009 the monetary authority has been giving higher preference to price control and so has increased the repo rate, or not reduced it, even after constant pressure from the government. Under the recommendation of the Chakraborty Committee since 1998-99, India has been following a multiple targeting approach where the only target or objective is not either price control or higher growth but multiple. However post US crisis, since 2010 it has been trying to target or control inflation. Every increase in the repo rate has been justified by the Governor of Reserve Bank of India as necessary to control uncontrollable inflation rate. But ideally, according to many theories and studies chasing inflation is not suitable for our country. In the light of all this, the present paper studies some important factors affecting inflation which can help us analyze the monetary policy response to inflation. The paper uses annual time series data to study the effectiveness of monetary policy in controlling inflation. Granger causality is also tested across inflation and the factors affecting it, in order to study influential factors and future policy actions. The results drawn are mixed in the multivariate linear regression model.

Keywords: *Monetary Policy, Inflation, Interest Rate*

JEL classification: *E31, E52, E43*

1. Introduction

The conduct of monetary policy is complex. It is not only forward-looking, but also grapples with an uncertain future. Additional complexities arise in the case of an emerging market like India, which is in transition from a relatively closed to a progressively open economy. In an environment of increasing capital flows, narrowing cross-border interest rate differentials and surplus liquidity conditions, exchange rate movements tend to have linkages with interest rate movements. The challenge facing a monetary authority is to balance the various choices into a coherent whole and to formulate a policy as an art of the

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possible.

Monetary policy is defined as a public interventionist action that aims at manipulating the level and array of economic activity so as to accomplish specific, desired goals. Specifically, monetary policies are aimed to work under two economic variables that affect the level of inflation in an economy. The two aggregate variables are supply of money in circulation and the respective interest rate in an economy. Dominance of this channel was also evident from the policy actions of Reserve Bank of India (RBI). Over the years, in comparison with other monetary policy instruments, the use of interest rate instruments (repo and reverse repo) by RBI has been more frequent. Except for the year 2008-09, when cash reserve ratio (CRR) and repo rate were reduced 10 times and 8 times, respectively, in the wake of global financial crisis, RBI has shown increased preference of using interest rate as a primary tool of monetary policy. During 2010-11, the repo rate was increased 13 times for controlling the high rate of inflation.

The objectives of monetary policy are interrelated, and there are trade-offs as well. Traditionally, central banks have pursued the twin objectives of price stability and growth. For this the central banks have to keep in mind the considerations of exchange rate stability and financial stability in pursuing these basic objectives. Economists often talk of Phillips curve, according to which there is a short-run negative relation between inflation and unemployment. However, the central bank can reduce inflation only at the cost of higher unemployment. Similar trade-offs exist among the other objectives as well. Faced with multiple objectives that are equally desirable, there remains the problem of assigning to each policy instrument the most appropriate objective.

“In recent years in order to have some fix for influencing inflation expectations at a time when many central banks were inflation-targeters, the RBI elaborated its objective of price stability. While price stability remains a key objective, an inflation targeting framework alone is inadequate because India is subject to a number of shocks and special regulatory and administrative structures not necessarily present in other countries. These shocks include recurrent supply shocks from vagaries of the monsoon; large weight of food prices (46-70 per cent) in various consumer price indices; large differences in consumption habits across different regions and thus large differences in how these shocks affect spending power; large fiscal deficits and market borrowings by both the central and state governments; and impediments to monetary transmission due to administered interest rates in some government savings instruments” (Mohan, 2007).

In order to study the effectiveness of monetary policy in controlling inflation, the Taylor rule is of great importance in the present economic conditions of high inflationary patterns. In economics, a Taylor rule is a monetary-policy rule that stipulates how much the central bank should change the nominal interest rate in response to changes in inflation, output, or other economic conditions. In particular, the rule stipulates that for each one-percent increase in inflation, the central bank should raise the nominal interest rate by more than one percentage point. This aspect of the rule is often called the Taylor principle.

Taylor's rule is not a suggested framework for India despite its increased popularity in the world. In the light of literature review, different factors have been identified that lead to the conclusion that India is not yet ready for Inflation Targeting Framework (ITF). The primary reasons for this are: (1) Supply side dominance as opposed to demand side, as explained in the Taylor's Rule; (2) Inflation cannot be the sole objective of RBI and the interest rate is not the sole instrument for intermediate target of inflation, whereas Taylor's rule requires refraining from using any other nominal anchor; (3) There is no strong relationship found between inflation and interest rate in India; (4) RBI does not have complete independence as required for the successful implementation of Inflation Targeting Framework; (5) The stability of exchange rate and capital flows is of great concern for RBI and inflation targeting creates greater volatility in exchange rate through adjustment in interest rate; (6) High fiscal deficits also lead to high inflationary pressures in the economy and Indian economy is also characterized by fiscal deficit (although this pressure is reducing with passage of time).

Furthermore, adoption of ITF could imply volatility in interest and exchange rates and persistent deviations from equilibrium levels. The Indian economy, with a large fiscal deficit and a significant portion of financing under administered interest rates together with indications of supply side dominance, could have difficulty coping with that monetary stance which relies on influencing the demand side. However, the past and the present Governors of RBI provide some justification for maintaining high interest rates in order to control inflation.

According to D. Subbarao (2013), many contend that since inflation in India is largely due to supply shocks, it is imprudent for the monetary policy to control it. Text book economics tells us that if the supply shock is temporary, monetary policy need not react to it; on the other hand, if the supply shock is structural in nature, it can lead to generalized inflation - in the first round by the higher input costs, and in the second round through its

impact on inflation expectations and wage bargaining. In the presence of excess demand relative to supply, the generalization of inflation could be rapid unless prevented through a forward-looking anti-inflationary monetary policy stance. In short, when supply shocks impact the core component of inflation, monetary policy should respond. Determining whether the supply shock is temporary or structural is a frequent challenge that central banks of Emerging Market Economies (EMEs) have to confront.

Central bankers cannot control inflation today as it is already realized. What they can control is future inflation hence the objective is medium term inflation. Current inflation matters only because it conveys information about what might happen over the medium term. But a good central banker will pay attention to why inflation is high today, and to the likely future pattern of growth, in deciding about interest rates. For instance, the U.S. Federal Reserve, despite being governed by an implicit inflation objective, is not raising rates in the face of higher current inflation because it believes slower future growth will quell inflation over the medium term. To reiterate, the logic behind an inflation objective is that the best the central bank can do is to keep growth at a level consistent with the supply constraints in the economy. Attempts to push growth beyond this through lower interest rates will simply result in more, and accelerating, inflation, while high rates that keep growth below potential will reduce inflation below the objective, and waste the economy's potential.

In light of the monetary policy framework in India, the present paper attempts to study the following: (a) the factors and their extent of impact on the level of inflation rate in the economy; (b) granger causality between inflation and the factors affecting it; (c) to what extent the inflation drives the monetary decision-making; (d) to what extent the interest rate changes influence the growth and price stability or the level of trade-off between the two; (e) the effectiveness of monetary policy in controlling inflation; and (f) to make suggestions for monetary policy framing.

2. Review of Literature

The stance of monetary policy of the Reserve Bank is intended to anchor inflationary expectations, while being prepared to respond appropriately, swiftly and effectively to further build-up of inflationary pressures; actively manage liquidity to ensure that the growth in demand for credit by both the private and public sectors is satisfied in a non-disruptive way; maintain an interest rate regime consistent with price, output and financial stability. In recent years, the efficacy of the monetary policy in maintaining inflation and simultaneously achieving good growth rates for the economy is under scanner. Many economists world over

have done a lot of research for studying the efficacy of monetary policy in controlling inflation or Inflation Targeting (IT) as a solution to the ever rising inflation. The paper discusses some of the relevant studies in this regard.

Ilbas *et al.* (2013) found that while decomposing the various shocks hitting the US economy, in the period 2001 - 2006, large negative demand-side shocks were dominating. These are the type of disturbances that should make policy makers deviate from the Taylor rule. Indeed, the optimal policy response to these shocks implied an even lower interest rate than the actual Fed Funds Rate. We thus find that in the period 2001 - 2006 the Fed conducted a more contractionary policy than what would be implied by their historical reaction pattern.

Patra and Kapur (2012) empirically evaluated the operational performance of the McCallum rule, the Taylor rule and hybrid rules in India over the period 1996-2011 with a view to analytically study the conduct of monetary policy. The results show that forward-looking formulations of both rules and their hybrid version - setting a nominal output growth objective for monetary policy with an interest rate instrument - outperform contemporaneous and backward-looking specifications.

Cristadoro and Veronese (2011) analysed the path of abrupt discontinuation of well-behaving economy in terms of both financial and monetary markets in the recent years. They blamed the sharp rise in inflation and the expected inflation to be the cause.

Patra and Kapur (2010) yield valuable insights and find that aggregate demand reacts to interest rate changes with a lag of at least three quarters, with inflation taking seven quarters to respond. Inflation is inertial and persistent when it sets in, irrespective of the source. Exchange rate pass-through to domestic inflation is low. Inflation turns out to be the dominant focus of monetary policy, accompanied by a strong commitment to the stabilization of output. Recent policy actions have raised the effective policy rate, but the estimated neutral policy rate suggests some further tightening to normalize the policy stance.

Singh (2010) observed that from 1950-51 to 1987-88 monetary policy was more reactive to output gap, but during 1988-89 to 2008-09, it has been more responsive to the inflation gap.

Banerjee and Bhattacharya (2008) used the limited dependent models. Given the non-uniform and discrete nature of intervention, these models are likely to provide a more appropriate framework of analysis than the linear "Taylor Rules" usually used. They concluded that the RBI's monetary policy, since 2000, seems to have targeted the current output gap rather than inflation. There is evidence of greater persistence in the rate hike

sequence than in the rate cut, which might be construed as indirect evidence of asymmetry in the response function. As possible explanation of the targeting of the output gap, we find that the current and lagged output gap does indeed affect inflation.

Jha (2008) concluded that with widespread poverty, inflation control cannot be exclusive goal of monetary policy. Inflation Targeting has not helped reduce inflation substantially or changed volatility of exchange rate. George B. Tawadros (2008) tested it for 27 countries and the strategy has been unsuccessful. So inflation targeting had perverse effect on inflation for almost every country.

Hu (2006) surveyed 66 countries for the period 1980-2000 and found that inflation targeting may not be optimal for all the countries because economic structure may not be conducive or monetary authority may not have the political power to implement such a framework.

Singh (2006) commented that success of this system requires equal commitment from the government and the central bank. In the case of India, inflation targeting is politically sustainable given the overwhelming preference of population for lower headline inflation.

Khatkhate (2006) found that stabilizing the rate of inflation also promotes employment and output growth. Adopting it does not strictly require preconditions such as an independent central bank or a well-developed financial system. According to her, a country like India ought to target headline inflation.

Mohanty and Klau (2004) reviewed the recent conduct of monetary policy and central banks' interest rate setting behaviour in emerging market economies. They used a standard open economy reaction function, and tested whether central banks in emerging economies react to changes in inflation, output gaps and the exchange rate in a consistent and predictable manner. They found that in most emerging economies, the interest rate responds strongly to the exchange rate; in some, the response is higher than that to changes in the inflation rate or the output gap. The result is robust to alternative specification and estimation methods. This highlights the importance of the exchange rate as a source of shock and supports the "fear of floating" hypothesis. Evidence also suggests that in some countries the central bank's response to a negative inflation shock might be weaker than to a positive shock.

Kannan (1999) stated that the countries targeting inflation, and realizing a fall in

inflation, have not necessarily been able to do it because of inflation targeting. During her period of study (1992-97), many countries not following inflation targeting also realized a fall in inflation. The paper also concluded that inflation targeting works well to unforeseen supply shocks, as there is no trade-off with short term output stabilisation. In general, the paper suggested following inflation targeting with an escape clause.

3. Data and Research Methodology

The present study covers the period 1971-72 to 2011-12, i.e. covering two decades before and after 1991 when major macroeconomic reforms took place. A review of the theoretical and empirical literature and the recent economic experiences so far, help us to trace a few important economic variables affecting the level of inflation in India. These variables are Money Supply ($M3$), Exchange Rate (ExR) which is measured as \$/Rs, Interest Rate (Int), One Year lagged WPI (WPI_{t-1}). The data for all these variables has been obtained from Monetary Statistics and Database of Indian Economy, RBI.

The study performs a linear regression test to study the relationship between the inflation and these economic variables. Regression analysis is a tool commonly utilized in the determining of the existence of a relationship between variables using historical data.

The equation is presented in the following form:

$$WPI_t = C + \beta_1 M3 + \beta_2 ExR + \beta_3 Int + \beta_4 WPI_{t-1}$$

We use the estimate of Wholesale Price Index (WPI) as a proxy for inflation and not the Consumer Price Index, CPI , as during the study period the basket of consumer commodities included in CPI has changed several times, even the official estimates of inflation are based upon WPI . However, recently (2011-13), this policy has been criticized since during these periods CPI has shown huge fluctuation but the economic policies have been framed according to the WPI . $M3$ is the official estimate of Money Supply as per RBI.

Since the study uses time series data, it is checked for stationarity using the unit root test. The first step involves testing the order of integration of the individual series under consideration. Researchers have developed several procedures for the test of order of integration. The most popular one is Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981). Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favour of the alternative hypotheses of stationarity. The tests are conducted with and without a deterministic trend (t) for each of the series. ADF tests on the series reveals the number of times the non stationary time series are

to be differenced to achieve stationarity

Once the order of integration of individual series is determined using the unit root tests, the study performs Granger Causality test to examine the causality between two or more time series variables. Granger Causality tests are performed for different pairs of all the above mentioned factors to observe their relationship with inflation. This test helps us to find the most important cause of inflation and hence, would be useful for policy framework.

4. Results

In the Table 1 below, the regression results indicate that all the variables are positively related to inflation implying that increase in money supply, exchange rate (depreciation of rupee), interest rate and previous year's inflation lead to further rise in inflation. It is further observed that except exchange rate the relation between inflation rate and money supply (0.0049), interest rate (0.0198) and previous year's inflation (0.0000) is significant.

Table 1: Result of Multivariate Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>C</i>	-2.637928	1.711076	-1.541678	0.1319
<i>M3</i>	0.000215	7.17E-05	2.994562	0.0049
<i>EXCHANGERATE</i>	0.141836	0.088531	1.602109	0.1179
<i>INT_RATE</i>	0.319894	0.131211	2.438005	0.0198
<i>WPI_LAG_</i>	0.923334	0.060825	15.18019	0.0000
R-squared	0.998874	Mean dependent var		56.74908
Adjusted R-squared	0.998749	S.D. dependent var		42.06781
S.E. of regression	1.488035	Akaike info criterion		3.746639
Sum squared resid	79.71291	Schwarz criterion		3.955611
Log likelihood	-71.80610	Hannan-Quinn criter.		3.822735
F-statistic	7983.333	Durbin-Watson stat		2.207660
Prob(F-statistic)	0.000000			

The estimated equation is as follows:

$$WPI = -2.63 + 0.00002M3 + 0.142ExR + 0.32Int + 0.92WPI_lag$$

The regression results show a positive relationship between inflation and Money Supply. According to Monetarists, inflation is always and everywhere a monetary phenomenon. A positive relationship between the two in this study supports the theory.

However, the coefficient value is very low implying *M3* not to be the primary cause of inflation in our period of study.

A positive coefficient of exchange rate implies that depreciation of currency increases the import burden, putting pressure on the current account deficit and inflation in the economy.

Interest rate also impacts inflation positively. A high value of the coefficient implies, rise in interest rate increases the cost burden of investment and production which leads to rise in the inflation rate. This has a special implication because as mentioned before, in order to control inflation, the RBI has been justifying the increase in interest rate since 2010. However, the result does not support the action.

High inflation rate in the past also affects the present inflation positively. It explains building up of inflationary expectations in the economy, which can lead to high present and future inflation rates.

4.2 Unit Root Test Results

As in Table 2, all the variables are observed to be non-stationary at level. This can be seen by comparing the observed values (in absolute terms) of ADF test statistic with the critical values (also in absolute terms) of the test statistics at the 1 per cent, 5 per cent and 10 per cent level of significance.

Table 2: ADF Unit Root Test Result

Variable	Test Critical Values			ADF	Status
	1%	5%	10%		
<i>WPI</i>	-2.627238	-1.949856	-1.611469	-10.59478	I(2)
<i>logM3</i>	-2.625606	-1.949609	-1.611593	-0.451925	I(1)
<i>Interest Rate</i>	-2.625606	-1.949609	-1.611593	-6.291451	I(1)
<i>Exchange Rate</i>	-2.625606	-1.949609	-1.611593	-4.502926	I(1)

The coefficients are compared with the critical values (1 per cent, 5 per cent and 10 per cent) and this revealed that stationarity was achieved for *WPI* at the second difference while exchange rate, inflation rate and money supply (*M3*) achieved stationarity at first difference. This implies that exchange rate, inflation (*WPI*) and Money Supply (*M3*) are integrated of order one, i.e. I(1) and *WPI* is integrated of the order 2 i.e., I(2).

4.3 Granger Causality

1. *WPI* and *M3* do not Granger cause each other.

The Table 3 reports results of Granger causality test (Granger, 1969). Following the result, both the null hypotheses are rejected- i.e., *WPI* does not Granger Cause *M3* and *M3* does not Granger Cause *WPI*. It is safe to conclude that no causality runs from Inflation to GDP or GDP to inflation at lag two (2). This shows that factors causing inflation are beyond the explanation of the Monetarists' theory.

Table 3: Granger Causality between Inflation and Money Supply

Null Hypothesis:	Observation	F-Statistic	Probabilities
DIF_ <i>WPI</i> does not Granger Cause DIF_ <i>LM3</i>	37	0.62181	0.5433
DIF_ <i>LM3</i> does not Granger Cause DIF_ <i>WPI</i>	1.2	2055	0.3084

2. *WPI* and Interest rate do not granger cause each other

In the result shown in table 4, the null hypothesis that *WPI* does not Granger cause interest rate is rejected, confirming a unidirectional causality from *WPI* to interest rate at lag 2. This result between interest rate and inflation is of special interest for monetary policy framing. As we have already mentioned that during 2010-11, the interest rate was revised 13 times to control the soaring inflation. The test also confirms the same. In terms of the Taylor Principle, our results confirm that changes in interest rate are a result of inflation. However, the change in interest rate is not causing change in inflation implies inefficiency of the interest rate to do so. Hence, the continuous attempts of the Monetary Authority of raising the interest rate/ not reducing it, does not have much of justification.

Table 4: Granger Causality between Interest rate and Inflation

Null Hypothesis:	Observation	F-Statistic	Probabilities
DIF_ <i>WPI</i> does not Granger Cause DIF_ <i>LM3</i>	37	0.62181	0.5433
DIF_ <i>LM3</i> does not Granger Cause DIF_ <i>WPI</i>	1.22055	0.3084	

3. *WPI* and Exchange Rate do not Granger cause each other

Following the result in table 5, both the null hypothesis that exchange rate does not Granger Cause inflation and inflation does not Granger Cause exchange rate are rejected .It

is safe to conclude that no causality run from inflation to exchange rate or exchange rate to inflation at lag two (2). This further shows that factors causing inflation are beyond the explanation of the Monetarists' theory.

Table 5: Granger Causality between Inflation and Exchange Rate

Null Hypothesis:	Observation	F-Statistic	Probabilities
DIF_EXCHANGERATE does not Granger Cause DIF_WPI	37	15.0263	3.E-05
DIF_WPI does not Granger Cause DIF_EXCHANGERATE	0.79174	0.4617	

5. Conclusion and Recommendations

The broad objective of the study is to establish the effectiveness of monetary policy in controlling inflation. The paper has attempted to analyse the impact of money supply, exchange rate, interest rate and previous year's inflation as a few important variables affecting inflation. Based on regression results, the paper concludes that there is a positive relationship between inflation and the economic variables taken into consideration. The Granger Causality results confirm that out of all, it is only the interest rate which is affected due to inflation, which is compatible with the theory. However, recent inflationary patterns in India are not supportive of interest rate as a control variable. Hence, there is not much of justification for either increasing the interest rate or not reducing it.

There are some other repercussions also. The theory on inflation suggests the relation between growth and inflation is non-linear and there is a threshold below which there is a trade-off between growth and inflation implying increase in inflation will promote growth. However, beyond the threshold, growth suffers due to inflation. Recently, the growth rate of our country has been low, when inflation has been quite high, supporting this logic. Hence, the RBI must frame the monetary policy in a way that the economy realises controlled inflation and the growth is also not hampered.

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