INSTITUTE OF DEVELOPING ECONOMIES

IDE DISCUSSION PAPER No.242

Effectiveness of the Monetary Policy
Framework in Present-day India:
Have Financial Variables Functioned as Useful
Policy Indicators?

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July 2010

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In April 1998, the RBI, the Indian central bank, formally announced a shift in its policy framework from monetary targeting to a multiple indicator approach, and since then, under this framework, the bank has considered a range of economic and financial variables as policy indicators for drawing policy perspectives. This paper aims to examine the effectiveness of this current policy framework in India by analyzing the causal relationships of each indicator variable on the objective variables. The results reveal that, except for bank credit, all indicator variables considered in this study have a causal relationship with at least either output or price level, suggesting that most preannounced economic and financial variables have served as useful policy indicators under the multiple indicator approach.

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Have Financial Variables Functioned as Useful Policy Indicators?

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Abstract

In April 1998, the RBI, the Indian central bank, formally announced a shift in its policy framework from monetary targeting to a multiple indicator approach, and since then, under this framework, the bank has considered a range of economic and financial variables as policy indicators for drawing policy perspectives. This paper aims to examine the effectiveness of this current policy framework in India by analyzing the causal relationships of each indicator variable on the objective variables. The results reveal that, except for bank credit, all indicator variables considered in this study have a causal relationship with at least either output or price level, suggesting that most preannounced economic and financial variables have served as useful policy indicators under the multiple indicator approach.

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1. Introduction

In India, the Reserve Bank of India (RBI) Act sets out the central bank's objectives as being "to regulate the issue of the bank notes and the keeping of reserves with a view to securing monetary stability and generally to operate the currency and credit system of the country to its advantage." These objectives have generally been interpreted as implying pursuit of price stability and economic growth, and they have remained unchanged since the passage of this act in 1934. In contrast, due to financial sector reform and the resultant financial liberalization, the central bank has experienced an evolution in its monetary policy framework.

From 1985 to 1997, the RBI adopted flexible monetary targeting, under which the central bank focused on M3 growth as the intermediate target. As financial deregulation increased, however, it was increasingly felt that financial innovations and technology had systematically eroded the predictive potential of money demand estimations relative to the past, though empirical studies point out the stability of money demand functions in India (Mohan 2008: p.260). Accordingly, the RBI thought it necessary to monitor a set of additional variables as indicators for policy formulation, while monetary aggregates such as M3 continued to serve as an important information variable (Kannan et al. 2006: p.70). In April 1998, the RBI formally announced the shift of its policy framework from monetary targeting to a multiple indicator approach and since then, to draw policy perspectives under this framework, the bank has considered economic and financial variables such as interest rates in financial markets, currency, bank credit, fiscal position, trade, capital flows, inflation rate, output, exchange rate, refinancing and transactions in foreign exchange.

Although a growing body of literature has begun to examine Indian monetary policy, there is still limited literature on the monetary policy framework in present-day India. The few relevant prior studies are Kannan et al. (2006) and Samantaraya (2009). Kannan et al. (2006) constructed the "monetary conditions index" from a weighted average of the real interest rate, real effective exchange rate and/or real bank credit growth and examined whether they could supplement the existing set of information variables under a multiple indicator approach. By comparing this index with the actual

policy stance, they stated that the index would play the role of a leading indicator of economic activity and inflation rates. Similarly, Samantaraya (2009) developed the "monetary policy index" by synthesizing qualitative information derived from the RBI governor's statements and quantitative information on M3 growth and the call money rate. Using this index to capture the monetary policy stance, he illustrated that monetary policy has an instant influence on the interest rate, while it also exerts impact on bank credit, inflation rates, and industrial production with some lag.

As stated earlier, under the multiple indicator approach, the RBI considers relevant economic and financial variables as policy indicators from which to draw policy perspectives. A good indicator or information variable provides leading or contemporaneous information on the potential movements in policy objectives, and it is normally not treated as an object to be controlled by the central bank (Freedman 1994: p.461). Accordingly, unlike previous studies surveyed, this paper examines the causal relationships of each indicator variable on the objective variables to consider the effectiveness of the multiple indicator approach in India. For empirical analysis, we apply the Granger causality test based on the lag-augmented VAR (LA-VAR) model developed by Toda and Yamamoto (1995).[1] This method has the advantage of testing the coefficient restrictions in a level VAR without paying attention to the properties in the economic time series such as unit root and cointegration.

The organization of this paper is as follows. The next section presents the definitions and sources of the data, and the third section explains the empirical technique. In the fourth section, we show the empirical results. And lastly, the concluding remarks summarize the main findings of this study and point out forthcoming policy issues in India.

2. Data

The RBI explicitly announced that the policy indicator variables under its multiple

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[1] Awokuse and Yang (2003) applied the LA-VAR model to examine the causal relationship between commodity prices and macroeconomic variables in the U.S. from 1975 to 2001. Also, Hamori (2007) analyzed whether the commodity price index is an information variable for the Bank of Japan by using the LA-VAR model.

indicator approach consist of a wide range of indicators, such as financial market variables, fiscal balance, trade, capital flow and so on. Given that quick availability is one of the prerequisites of a policy indicator, however, we focus our attention on monetary aggregates (M1, M2 and M3), bank credit (BC), stock prices (SP), exchange rate (FX) and yield spread (YS) among the relevant variables. Regarding objective variables, we utilize the wholesale price index (WPI) and the industrial output index (IPI) (seasonally adjusted by X12) since both price stability and economic growth are monetary policy objectives in India. We use logarithm values for all variables except for yield spread, which is defined as the difference between the 10-year government bond yield and the call money rate. The exchange rate is the Indian rupee rate against the US dollar.

We obtained the WPI, the IPI, stock prices and the exchange rate from IMF (2010). Bank credit, the government bond yield and the call rate are from RBI (2009) and monetary aggregates from various issues of the RBI Bulletin. The empirical analysis in this paper was conducted using monthly data from April 1998 to June 2009. This corresponds to the period under the current monetary policy framework. In addition, in order to make a comparison with the previous policy framework, i.e., monetary targeting, we also considered the sample period from April 1985 to March 1998.

3. Empirical Technique

In estimating the VAR, it is generally necessary to test whether the variables are integrated, cointegrated or stationary by using the unit root and cointegration tests since the conventional asymptotic theory is not applicable to hypothesis testing in a level VAR if the variables are integrated or cointegrated (Toda and Yamamoto 1995: pp.225-226). On the other hand, however, a unit root test is not powerful enough for hypothesis testing, and the cointegration test is not very reliable for small samples. In order to avoid these potential biases, this paper applied the LA-VAR method, which makes it possible to test the coefficient restrictions in a level VAR without paying attention to the properties in the economic time series such as unit root and

cointegration, but which adds a priori maximum integration order (d_{max}) to the true lag length (k).

Specifically, the Granger-causality test based on the LA-VAR method was carried out in the following way. First, a levels VAR by ordinary least squares was estimated, and the true lag length (k) was selected based on information criteria. Next, the maximum integration order (d_{max}) was set, and the model was estimated again with the lags $k + d_{max}$. Finally, the null hypothesis of Granger non-causality was tested using the Wald test. Asymptotically, the Wald test statistic has a chi-square distribution with the degrees of freedom equal to the excluded number of lagged variables.

4. Empirical Results

We tested the causality of an indicator variable on the objective variables by using the trivariate VAR models composed of each policy indicator, output and price levels. Table 1 indicates the Wald test statistic for the period from April 1998 to June 2009. This sample period corresponds to the period under the multiple indicator approach. In this table, we selected the true lag length (k) from the maximum 12 periods based on the Akaike information criterion (AIC), while we set the maximum integration order (d_{max}) to 1 since the unit root test shows that the variables are integrated of order 1 in all cases except for YS, which is stationary in levels.[2]

The empirical results in Table 1 indicate the following findings. First, regarding monetary aggregates, both M1 and M2 Granger-cause output at the 5% significance level, although M3 causes neither output nor price level. Second, like M3, bank credit does not have a causal relation to any objective variables in the Granger sense. Third, stock prices and the exchange rate cause output level at the 1% and the 5% level, respectively. Finally, yield spread Granger-causes not only output level at the 10% level but also price level at the 5% level. In sum, among policy indicators, yield spread could predict the future movements of both output and price levels, while M1, M2, stock

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[2] These are the results derived by using the Phillips-Perron test (result not shown). We also conducted the KPSS test as an alternative unit root test and confirmed that it does not change the results of the Phillips-Perron test except for FX, which becomes stationary in levels.

prices and the exchange rate are useful in predicting only output level.

Table 2 provides the Wald test statistic for the period from April 1985 to March 1998, which roughly corresponds to the period the RBI adopted monetary targeting. In this table, we also selected k based on the AIC, while d_{max} was set to 1. Here, we could not show the result for YS since data on the 10-year government bond yield was not available for this sample period. From this table, we can derive the following results. First, regarding monetary aggregates, M1 and M2 Granger-cause output at the 10% significance level, whereas M1, M2 and M3 also cause price level at the 1% level. Second, bank credit causes neither output nor price level in the Granger sense. Finally, stock prices and the exchange rate cause output level at the 5% and the 10% level, respectively. To sum up, as in Table 1, M1, M2, stock prices and the exchange rate are found to be useful in predicting output level, whereas all monetary aggregates considered also have a causal relation to price level, which is in contrast with the results of Table 1. The existence of the significant causal relationships of monetary aggregates on the objective variables seems to be a reflection of the fact that the RBI was implementing monetary targeting during this sample period.

To check the robustness of our empirical results, we selected the true lag length (k) based on the Schwarz information criterion (SIC), instead of the AIC. Table 3 presents the Wald test statistic for the period from April 1998 to June 2009. In spite of the fact that a different k is selected for monetary aggregates, from this table we can derive the same results as those of Table 1. Similarly, Table 4 presents the Wald test statistic for the period from April 1985 to March 1998 and confirms the same results as Table 2, except for the significance level for M1 and FX. Therefore, our findings seem to be robust in this sense.

5. Some Concluding Remarks

In 1998, the Reserve Bank of India (RBI) officially shifted its monetary policy framework from monetary targeting to a multiple indicator approach. Since then, it appears that the RBI has monitored relevant economic and financial variables as policy indicators and has utilized them to draw policy perspectives. It is generally thought that

a good indicator or information variable may be expected to provide leading or contemporaneous information on future movements in policy objectives, though such an indicator or information variable is not under the control of the central bank just as in the case of an intermediate target. Accordingly, in order to examine the effectiveness of the current policy framework in India, this paper tested the causal relationships of each policy indicator on the objective variables by employing the LA-VAR model developed by Toda and Yamamoto (1995).

Empirical analysis indicates that, under the multiple indicator approach starting in April 1998, yield spread Granger-causes not only output level but also price level, while M1, M2, stock prices and the exchange rate are useful in predicting output level. Concomitantly, we conducted causality tests for the period during which monetary targeting was adopted in India, i.e., from April 1985 to March 1998. Empirical results show that monetary aggregates such as M1, M2 and M3 cause price level in the Granger sense, while M1, M2, stock prices and the exchange rate are useful in predicting output level. Incidentally, the result for yield spread could not be obtained for the period before 1998, since data on the 10-year government bond yield was not available during this sample period.

In sum, our empirical results indicate that, except for bank credit, all indicator variables considered in this study have a causal relationship with at least either output or price level, suggesting that most preannounced economic and financial variables have served as useful policy indicators under the current policy framework in India. Among them, yield spread in particular is found to have played an important role since it contains information for predicting future movements of both output and price levels. Meanwhile, recently, monetary aggregates seem to be playing a weaker role in monetary policy-making in India.

Even following its shift from monetary targeting, the RBI still announces the forecast growth rate for M3 and focuses on it as the measure of future price movements in its policy statement. Considering our empirical results, however, it is recommended that the Indian central bank should utilize the information content of M1 and M2 rather than M3 in the process of monetary policy formulation and that it should attach greater

importance to newly available yield spread as well as conventional financial variables, including monetary aggregates, stock prices and the exchange rate.

References

Awokuse, T.O. and J. Yang (2003) "The Informational Role of Commodity Prices in Formulating Monetary Policy: A Reexamination" *Economics Letters* 79, issue 2: 219-224.

Freedman, C. (1994) "The Use of Indicators and of the Monetary Conditions Index in Canada" in T.J.T. Balino and C. Cottarelli eds., *Frameworks for Monetary Stability: Policy Issues and Country Experiences*, 458-476, Washington, D.C.: IMF.

Hamori, S. (2007) "The Information Role of Commodity Prices in Formulating Monetary Policy: Some Evidence from Japan" *Economics Bulletin* 5, no.13: 1-7.

International Monetary Fund (2010) *International Financial Statistics*, Washington, D.C.: IMF, April.

Kannan, R., S. Sanyal and B.B. Bhoi (2006) "Monetary Conditions Index for India" *Reserve Bank of India Occasional Papers* 27, no.3: 57-86.

Mohan, R. (2008) "Monetary Policy Transmission in India" *BIS Papers* 35: 259-307.

Reserve Bank of India (2009) *Handbook of Statistics on Indian Economy 2008-09*, Mumbai: RBI.

Reserve Bank of India (various issues) *RBI Bulletin*, Mumbai: RBI.

Samantaraya, A. (2009) "An Index to Assess the Stance of Monetary Policy in India in the Post-Reform Period" *Economic and Political Weekly* 44, no.20: 46-50.

Toda, H.Y. and T. Yamamoto (1995) "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes" *Journal of Econometrics* 66, nos.1-2: 225-250.

Table 1: Causality during the Period of the Multiple Indicator Approach

(k is selected based on the AIC)

Explained variables	Explanatory variables (k)						
	M1 (8)	M2 (8)	M3 (12)	BC (2)	SP (2)	FX (2)	YS (2)
WPI	12.905	12.950	16.077	1.436	0.575	4.076	8.751**
IPI	15.578**	15.662**	7.462	0.229	23.113***	6.003**	4.976*

Note: Numbers in the table are the Wald test statistics. ***, ** and * indicate that the null hypothesis of Granger non-causality is rejected at the 1%, 5% and 10% significance level, respectively.

Table 2: Causality during the Period of Monetary Targeting

(k is selected based on the AIC)

Explained variables	Explanatory variables (k)					
	M1 (3)	M2 (3)	M3 (2)	BC (2)	SP (3)	FX (2)
WPI	51.408***	50.355***	26.797***	2.990	2.503	2.178
IPI	7.050*	6.910*	1.543	0.612	17.861**	5.211*

Note: See note for Table 1.

Table 3: Causality during the Period of the Multiple Indicator Approach

(k is selected based on the SIC)

Explained variables	Explanatory variables (k)						
	M1 (2)	M2 (2)	M3 (2)	BC (2)	SP (2)	FX (2)	YS (2)
WPI	0.369	0.363	3.228	1.436	0.575	4.076	8.751**
IPI	6.067**	6.138**	0.348	0.229	23.113***	6.003**	4.976*

Note: See note for Table 1.

Table 4: Causality during the Period of Monetary Targeting

(k is selected based on the SIC)

Explained variables	Explanatory variables (k)					
	M1 (2)	M2 (2)	M3 (1)	BC (1)	SP (2)	FX (1)
WPI	36.900***	36.505***	20.284***	2.405	1.316	1.989
IPI	6.057**	5.942*	1.680	0.321	14.823**	4.439**

Note: See note for Table 1.