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The Dynamics and Determinant of Money Demand in India: An Econometric Analysis

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Abstract

The present study tries to examine the key factors that determine money demand in India over the period from 1996 to 2020. The Auto-Regressive Distributed Lag model is applied to capture both short-run and long-run dynamics. The long run results show that income, interest rate, and foreign exchange reserves have a significant impact on money demand, while the exchange rate appears statistically insignificant. The error correction term indicates that short-run disequilibrium adjusts toward equilibrium at a rate of 32 percent annually. Overall, the findings show the importance of broad money (M3) as a useful indicator to assess output gaps and inflation expectations, and highlight its role in the formulation of India's inflation-targeted monetary policy.

Keywords: Monetary Policy, Inflation targeting, ARDL Model, India.

1. INTRODUCTION

The demand for money is a critical area of study in monetary economics, as it holds implications for both macroeconomic theory and policy. Understanding the dynamics and determinants of money demand is essential for effective monetary policy formulation, especially in emerging economies like India. In recent years, India has undergone significant transformations in its financial sector, accompanied by rapid economic growth, inflationary pressures, and structural shifts in consumption and saving behavior (Rao, 2024). These factors make the study of money demand in India particularly relevant, as it provides a deeper understanding of the behavior of the economy in the context of changing policy measures and global economic uncertainties. In India the relationship between money demand and economic variables has been a subject of extensive research. The traditional quantity theory of money, which posits a direct relationship between money supply and price levels (Hayes, 1989), has been challenged in the face of changing economic dynamics. The rising importance of informal financial markets, the introduction of digital currencies, and the shift towards a cashless economy have introduced new complexities to the money demand function. Moreover, India's unique institutional setup, including its diverse financial systems and the uneven distribution of financial literacy and access, further complicates the relationship between money demand and its determinants.

Economic agents in India exhibit complex behavior, influenced by a range of factors including demographic trends, technological advancements, and policy interventions. A primary determinant of money demand is the level of income or output, which typically exhibits a positive relationship with the demand for money, as higher income levels generally increase transaction volumes (Judd and Scadding, 1982). The role of interest rates, as an opportunity cost of holding money, is another well-established determinant. However, in an economy undergoing rapid financialisation, where people increasingly hold financial assets like stocks and bonds, the responsiveness of money demand to changes in interest rates is not always straightforward. Additionally, inflation expectations, central bank policies, and global economic conditions significantly impact the money demand function, as they influence agents' preferences for liquidity.

By employing econometrics techniques the paper aims to identify the key variables that influence

money demand, and how they have evolved over time in response to India's unique economic challenges. The analysis incorporates both conventional and non-conventional monetary policy instruments, providing a comprehensive understanding of the factors that affect the demand for money in the country.

The findings of this paper have important implications for policy makers in India. A robust understanding of the factors influencing money demand can assist the Reserve Bank of India (RBI) in formulating effective monetary policies, adjusting interest rates, and managing inflationary pressures. Furthermore, as India continues its path towards greater financial inclusion and modernization, insights into the evolving money demand behavior will be crucial for designing strategies that promote economic stability and growth. In the following sections, we explore the existing literature, empirical model, and data analysis that shed light on the dynamics and determinants of money demand in India, providing a deeper understanding of this crucial area of monetary economics.

2. LITERATURE REVIEW

Several studies have investigated the demand for money in different countries, providing a deeper understanding of the factors that influence it. Bhattacharya (1995) analyzed India's money demand function from 1950 to 1980 using M1, M2, and M3. He found that long-term interest rates respond more quickly than short-term interest rates. Pradhan and Subramanian (1997), Das and Mandal (2000), and Pawan (2014) studied the money demand function in India and observed that the demand for money, especially M3, remained stable during their study periods. On the other hand, Ramachandran (2004) obtained a stable relationship between money demand and real income. Noer and Achsani (2010) concluded that income positively influenced money demand, while interest rates had a negative impact on it. Ben-Salha and Jaidi (2014) applied the Auto-Regressive Distributed Lag (ARDL) model to study the factors affecting money demand in Tunisia. Their results showed that in the short term, interest rates and investment influence money demand. Azeem and Ayub (2014) used the ARDL model to examine the relationship between money demand, interest rates, and investment. Their findings indicated a positive relationship between money demand and investment. Similarly, Nchor and Adamec (2016) concluded that while interest rates impacted money demand in the short term, GDP influenced it over the long term. In more recent studies, Adil *et al.,* (2022) showed that both M1 and M3 money demand functions were stable, whereas Barnett *et al.,* (2022) found that broad money (M3) was more stable than narrow money (M1).

The stability of money demand has been widely examined. However, there is a significant gap in studies that focus specifically on the money demand function in India within the context of an open economy. This study aims to fill this gap by analyzing the dynamics of the money demand function in India during the post-liberalization period.

3. DATA AND METHODOLOGY

The dynamics and determinants of money demand in India have been analyzed during the period between 1996 and 2020. Broad money (M3) represents money demand, gross national product serves as a measure of income, and 10-year government securities are used to represent interest rates. Foreign reserves (FR) and exchange rates (ER), measured in rupees per US dollar, are also included in the analysis. Data on broad money, income, interest rates, and foreign reserves were obtained from the Reserve Bank of India, while exchange rate information was sourced from the World Development Indicators provided by the World Bank. The hypothesized long-term relationships between the selected variables are as follows:

$$LN(M3) = \beta_o + \beta_1(Y) + \beta_2(R) + \beta_3(FR) + \beta_4(ER) + \varepsilon_t \quad 1$$

Where M3 = broad money, Y = income measured by real GNP, R = Government Securities-10 years, FR = stock of foreign reserves and ER = Exchange Rate, measured as domestic currency units (Rupees) per unit of foreign currency (US dollar).

3.1 Model Specification

Once the data is identified and gathered, a crucial step is establishing the stationarity order of the chosen variables. The study uses the Kwiatkowsky–Phillips–Schmidt–Shin (KPSS) test as proposed by Kwiatkowsky *et al.,* (1992). The stationarity result provides the basis for the ARDL model. This approach provides several advantages over other cointegration methods. It is effective for detecting cointegration in small sample sizes (Pesaran *et al.,* 1999). It allows for the inclusion of multiple lags to reflect the data generation process accurately (Laurenceson and Chai, 2003). It also enables the construction of an error correction model that integrates short-run adjustments with long-run equilibrium (Pesaran *et al.,* 1999). Lastly, it does not require the same lag length for dependent and independent variables. Laidler (1993) noted that ignoring short-run dynamics can lead to instability. To address this, an error correction model is estimated to include short-run dynamics. Accordingly, we reformulate Equation (1) within the ARDL framework, often called an unrestricted error correction model (UECM)

$$\Delta M3_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta M3_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta Y_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta R_{t-1} + + \sum_{i=0}^{p} \beta_{4i}\,\Delta FR_{t-1} + \sum_{i=0}^{p} \beta_{5i}\,\Delta ER_{t-1} + \theta_1 M3_{t-1} + \theta_2 Y_{t-1} + \theta_3 R_{t-1} + \theta_4 FR_{t-1} + \theta_5 ER_{t-1} + \epsilon_t \quad 2$$

To examine the presence of co-integration among the variables, we conducted a bound test. In the bound test, we set up a null hypothesis where the long-run coefficients are all equal to zero, suggesting no co-integration. If the null hypothesis is rejected, it implies the existence of a long-run relationship among the variables. This analysis provides insights into the interdependencies and dynamics among the variables over an extended period.

To test the combined significance of lagged variables, F-test is used. However, the bounds testing approach, developed by Pesaran *et al.,* (1999) and Narayan (2005), introduces a specific set of critical values for different significance levels. This method considers whether variables are either I (0) or I (1). If the calculated F-statistic exceeds the upper bound, it confirms cointegration, rejecting the null hypothesis of no cointegration. When the result falls within the bounds, the test becomes inconclusive, and the error correction term (ECT) is examined to establish cointegration. After confirming a long-term relationship, the error correction model is then computed as follows.

$$\Delta M3_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i}\,\Delta M3_{t-1} + \sum_{i=0}^{p} \beta_{2i}\,\Delta Y_{t-1} + \sum_{i=0}^{p} \beta_{3i}\,\Delta R_{t-1} + + \sum_{i=0}^{p} \beta_{4i}\,\Delta FR_{t-1} + \sum_{i=0}^{p} \beta_{5i}\,\Delta ER_{t-1} + \boldsymbol{\lambda ECT}_{t-1} + \varepsilon_t \quad 3$$

Finally, diagnostic tests are conducted to ensure the robustness of the model. These tests assess various aspects, including serial correlation, functional form, normality of residuals, and heteroscedasticity. The Lagrange Multiplier (LM) test examines the presence of serial correlation in the residuals, with the null hypothesis stating there is no serial correlation. Ramsey RESET test is applied to verify the correct specification of the functional form. The Jarque-Bera test evaluates the normality of the data. To detect heteroscedasticity, the Breusch-Pagan-Godfrey test is used. Lastly, the cumulative (CUSUM) and cumulative sum of squares (CUSUMSQ) tests are employed to examine the stability of both the short-run and long-run parameters (Brown *et al.,* 1975).

4. RESULT AND DISCUSSION

Using the above econometric model, the empirical analysis is conducted. The summary statistics for equations 2 and 3 are presented in Table 4, while the stationarity results are shown in Table 1.

Table 1: Kwiatkowsky–Phillips–Schmidt–Shin (KPSS) test Result

Stationary at Level				
Variables	LM-Stat. (Constant)	Critical values	LM-Stat. (Constant Linear Trend)	Critical values
LNY	0.713119**		**0.117147**	
INT	0.444836*		**0.105387**	
		1%: 0.739		1%: 0.216
		5%: 0.463		5%: 0.146
		10%: 0.347		10%: 0.119
Stationary at First Difference				
Variables	LM-Stat. (Constant)	Critical values	LM-Stat. (Constant Linear Trend)	Critical values
LNM3	0.434148*		**0.115588**	
LNFR	0.350861*		**0.100926**	
LNER	**0.119402**			
		1%: 0.739		1%: 0.216
		5%: 0.463		5%: 0.146
		10%: 0.347		10%: 0.119

Source: Author Calculations based on data obtained from the RBI and the World Bank

Note: *The statistics values show that the null hypothesis can be rejected in marked with * 10%; ** 5%; and *** 1% level.*

The stationarity results, as obtained from the KPSS test, are presented in Table 1. The results indicate that income and the interest rate are stationary at levels, whereas money demand, foreign reserves, and the exchange rate are stationary at their first differences. Therefore, the series exhibit mixed-order integration,

with the variables being integrated of order 1 (0) and order I (1), at the 5% significance level. Given the mixed-order integration of the variables, the ARDL model is employed for further analysis, as it is suitable for series that are integrated at different orders.

Table 2: Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	31.19995	NA	7.05e-08	-2.278257	-2.031410	-2.216176
1	183.3177	224.8697	1.19e-12	-13.33197	-11.85089	-12.95948
2	223.9175	42.36499*	4.39e-13*	-14.68847*	-11.97316*	-14.00558*

Source: Author Calculations based on data obtained from the RBI and the World Bank
Note: *indicates lag order selected by the criterion

The VAR lag order selection criterion in table 2 determined the selection of the lag length. At the 5% significance level, four lag selection criteria out of five suggest that the optimal lag length is 2. Therefore, further econometric analysis was done with the help of lag 2.

Table 3: ARDL Bounds Test

Level of Significance	Lower Bound I(0)	Upper Bound I(1)	F-statistic	Conclusion
10 %	2.45	3.52	**23.27**	Cointegration Exists
5 %	2.86	4.01		
2.5 %	3.25	4.49		
1 %	3.74	5.06		

Source: Author Calculations based on data obtained from the RBI and the World Bank

The ARDL bound test is used to find long-run relationships among variables. The estimated F-statistic value is 23.27, which exceeds the upper and lower bounds at the 1%, 5%, and 10% significance levels. This indicates that M3 is cointegrated with Y, R, FR, and ER, as shown in Table 3.

Table 4: Empirical results based on Auto-regressive Distributed lag Model

Panel (A): Long-Run Analysis				
Variable	**Coefficient**	**Std. Error**	**t-Statistics**	**Prob.**
LN(Y)	1.020381	0.117434	8.688950	**0.0000**
R	-0.127677	0.051660	-2.471499	**0.0269**
LN(FR)	0.282126	0.058296	4.839574	**0.0003**
LN(ER)	0.091866	0.187250	0.490606	0.6313
Constant	1.875175	0.143634	13.05520	0.0000
Panel (B): Short-run Dynamics and ECM				
CointEq (-1)	**-0.325491**	0.026607	-12.23338	**0.0000**
R-Squared				**0.90**

Source: Author Calculations based on data obtained from the RBI and the World Bank

Table 4, Panel (A), displays the empirical findings of Equation 2. The results suggest that income, interest rates, and foreign reserves are statistically significant and exhibit the correct signs, while the exchange rate is positive but insignificant in relation to money demand during the study period. The income coefficient indicates that a 1% increase in income results in a 1.02% rise in money demand. The positive relationship between income and money demand suggests that money serves as a store of value, and its demand may increase at a rate greater than proportional to the increase in income (Hossain, 2012). The negative and statistically significant impact of interest rates on money demand provides empirical support for Keynes' theory of speculative demand for money (Liliana *et al.,* 2019). The speculative demand for money changes inversely with interest rates (Appelt, 2016; Sanyal, 2019). Further, the positive impact of foreign reserves suggests that they can protect an economy from the negative consequences of fluctuating exchange rates, reducing swings in the domestic currency's value (Fukuda and Kon, 2012). An increase in foreign reserves may enhance the credibility of the domestic currency, w'Ich, in turn, could lead to an increase in money demand (Jindal, 2016). However, the exchange rate is insignificance in explaining money demand in India may be attributed to several factors. First, India's economy is largely influenced by domestic factors such as income and inflation rather than external variables like exchange rates (Zhang, 2025). Second, the Indian Rupee has been relatively stable in recent years, with government interventions and foreign reserves helping to manage fluctuations. As a result, exchange rate movements may not have a significant direct impact on money demand (Kumar *et al.,* 2024). Lastly, the increasing use of digital payment systems and a shift towards a cashless economy

may have reduced the role of exchange rate fluctuations in influencing money demand (Garg, 2023).

Moreover, the short-term dynamics, shown in Panel (B) of Table 4, are represented by the error correction term (ECT). The negative and statistically significant ECT value of -0.32 indicates that short-term disturbances are corrected at a rate of 32 percent per year.

Table 5: Diagnostic Results

Test Name	P-Value	Result
Breusch-Godfrey LM	0.10	No serial correlation
Breusch-Pagan-Godfrey	0.17	No heteroscedasticity
Ramsey RESET	0.30	No specification error
Jarque- Bera	0.09	Normally distributed residuals

Source: Author Calculations based on data obtained from the RBI and the World Bank

The outcomes of the diagnostic tests are shown in Table 5. The BG LM test shows that the model does not have serial correlation. Furthermore, the BP test result confirms that the model has constant variance, indicating it is homoscedastic. Additionally, the Ramsey RESET test probability value demonstrates that the model does not suffer from specification errors. Moreover, the JB test also confirms that the residuals follow a normal distribution. Finally, the graphs of the CUSUM and CUSUMSQ in Figure 1 remain within the 5 % critical boundary, which indicates that the model remains stable throughout the period.

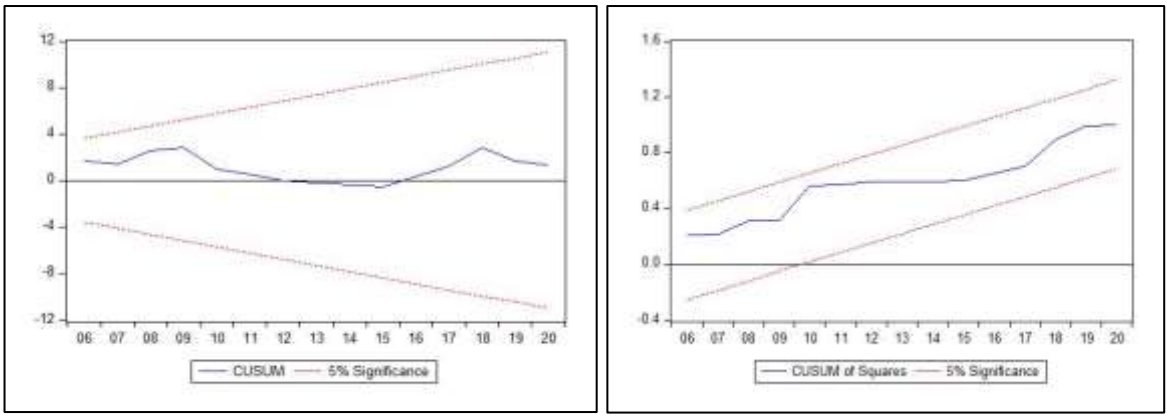

Figure 1: Stability Test

5. CONCLUSION AND SUGGESTIONS

In order to examine the determinants of money demand in India, the study employed the ARDL approach using data from 1996 to 2020. The findings indicate that income and foreign exchange reserves have a positive and significant impact on money demand, while the interest rate shows a significant negative relationship. The exchange rate, however, does not have a significant impact on money demand, likely because India's economy is primarily influenced by domestic factors. Further, government interventions and the accumulation of foreign reserves have helped stabilize the exchange rate, and the increasing adoption of digital payments and reliance on the domestic currency further reduce the effect of exchange rate fluctuations.

Overall, the findings highlight the importance of broad money (M3) as a critical monetary aggregate in India, providing valuable support for inflation-targeting monetary policy. These results establish a basis for future research into the changing dynamics of money demand in emerging economies.

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