



# A Study on Money Supply, Income and Price- Empirical Evidence from India

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**Abstract:** *This paper examines the relationship between Money Supply, Income and Price for India during the period 1951-2012. The Pair-wise Granger Causality test and co-integration techniques are used for analysing the relationship between Money Supply, Income and Price in this study. The Johansen co-integration test indicates Money Supply, Income and Price are co-integrated, and that a long-run equilibrium exists between them. The Pair-wise Granger Causality test reveals that there is uni-directional causality running from Money Supply to Income. It means Money Supply leads to Income but Income does not lead to Money Supply. There is no cause and effect relationship between Price and Income. The Pair-wise Granger Causality test also reveals that there is bi-directional causality between Money Supply and Price. It means Money Supply leads to Price and Price leads to Money Supply.*

**Keywords:** *Money Supply, Price, Income, Co-integration, Causality,*

**Jel Classification:** *C1, C22, E4, E31.*

## I. INTRODUCTION

The study of macroeconomic variables is important for understanding the working of the economy. Our main economic problems are related to the money, income and the general price level in the economy. The study of these macroeconomic variables is important for the formulation of useful economic policies for the nation.

There are debates between Keynesian and monetarists about the role of money in the determination of income and price. Monetarists argue that the changes in the amount of money supply lead to unexpected changes in income and prices. The Keynesians, on the other hand, argue that money supply does not play an active role in changing income and prices. In fact changes in income cause changes in money stocks via demand for money implying that the direction of causation runs from income to money without any feedback. Similarly, changes in prices are mainly caused by structural factors. The causal relationship between money, price, and output has been investigated by different researchers.

## II. LITERATURE REVIEW

Money supply, income, and prices are considered three major variables in macroeconomic that play an essential role in determining the rate of economic growth. A number of studies showed the causal relationship between money supply and income. On the other hand, there was still consistency concerning of the results of these studies, some studies showed unidirectional causality either from income to money or from money to income, while others are bi-directional causal. Some did not find any evidence of causal relationship.

Ramchandra (1983) used yearly data for the period 1951-71, to study the causality between money on one hand and both output (real and nominal) and prices. He used NNP at current and at 1960-61 prices, Narrow money, M1 as annual average monthly values, Implicit NNP deflator with base 1960-61. The study used Sims test with independent variables involving past, present and one future lags. The result revealed that Money causes both real income and price level, price level causes real income and Nominal income cause money.

Sharma (1984) investigated the causality between price level and money supply (M1 and M2) using Granger (1969) and Sims (1972) methods for the period 1962-1980 and established bi-directional causality between M1 and Price level as well as M2 and price level.

Nachane and Nadkarni (1985) in paper entitled "Empirical Tests of Certain Monetarist Propositions via Causality Theory" found unidirectional causality from money stock to prices based on their study on quarterly data over the period 1960-1961 to 1981-1982, with causality between real income and money stock remaining inconclusive.

Das (2003) examined relationship between money, price and output in India in his paper "Modeling Money, Price and Output in India: A Vector Autoregressive and Moving Average (VARMA) Approach." The empirical finding revealed that there exist a



bidirectional causality between money and prices and unidirectional causality between money and output, with causality running from money to output.

L Krishna Veni and Pradeep Kumar Choudhury (2007) examined the relationship between inflation and growth of the Indian economy during 1981-2004. The results of the causality test prove that the variables, viz., growth and inflation are independent of each other in India. The results of the cointegration test confirm the fact that the two variables—inflation and growth—are not cointegrated. Therefore, it is evident that there is no long run relationship between these two variables in India.

Medhavin Bhalchandra Dave and Gaurang Dattubhai Rami (2008) in their paper entitled “A study of causality between money supply and price level in India (monthly data): 1953 to 2005” examined the relationship between money supply and price level using monthly data on two alternative measures of Money supply viz. Narrow Money (M1) and Broad Money (M3) and a measure of Price Level viz. the Whole Sale Price Index (WPI) for the Indian economy from June 1953 to December 2005. The results show that there is unidirectional causality running from WPI to M3 and M1. It means WPI Granger causes M1 and M3, However, M1 and M3 not Granger causes WPI.

Gaurang Rami (2010) “Causality between Money, Prices and Output in India (1951-2005): A Granger Causality Approach” in his paper investigated relationship between money, price and output. Using pair-wise Granger causality test on annual data of the Indian economy covering a period from 1951 to 2005. Lag length is selected using standard criteria – LR, FPE, AIC, SC and HQ through VAR estimation. The results revealed that the Keynesian views that money does not play an active role in changing income and price is partially supported. However, the monetarist view that money (Narrow Money) plays an active role and leads to change in income in India.

Ashutosh Sharma, Abodh Kumar and Prof. Neeraj Hatekar (2010) investigated causality relation between money and output and money and prices by making use of monthly data covering the period of 1993:1 to 2009:9. The results show that causal and reverse causal relations between money and output and money and prices vary across frequencies. The causality running from money to output remains a short-run phenomenon. The relationship between money and output remained unidirectional for this sample period, with causality running from money supply to output. This study also found a unidirectional causality between money and prices, with causality running from money supply to prices. The unique contribution of this study lies in decomposing the causality on the basis of time horizons and demonstrating that short run causality from money supply to output, long run causality from money supply to prices, as well as lack of long run causality from money supply to output.

Prasanna V salian and Gopakumar. K (2011) in their paper “Inflation and Economic Growth in India –An Empirical Analysis” investigated the cointegration and error correction models have used to empirically examine long-run and short-run dynamics of the inflation-economic growth relationship in India using annual data 1972-73 to 2007-08. The interesting results found in this exercise was that the, inflation and economic growth are negatively related. Second, the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates.

It is clear from the previous studies, the relationship between money supply, output and price is still a controversial subject in the empirical studies, as well as theoretical framework, whether in the short run or long run.

### III. OBJECTIVES OF THE STUDY

Specifically the study aimed at achieving the following objectives:

1. To examine a long run co integration relationship between Money Supply, Income and Price in India.
2. To examine causality between Money Supply and Price in India.
3. To examine causality between Money Supply and Income in India.
4. To examine causality between Income and Price in India.

### IV. RESEARCH DESIGN

In this study, annual data is used from 1951 to 2012. All the data were collected from HAND BOOK OF INDIA (RBI) 2012-13. Variables used in this study and the definitions are Money Supply (log of M3) Price (log of Wholesale Price Index) Income (log of Gross Domestic Product) the data is analyzed to determine the causality between Money Supply, Income and Price in India. Before analyzing the causal relationship between Money Supply, Income and Price data has been transformed in to natural logarithms, and then possible existence of unit roots in the data is examined. The stationarity of each series is investigated by employing Augmented Dickey-Fuller unit root test. The number of lagged differences included is determined by the Schwarz Information Criterion and Akaike Information criteria. Further proceed with the VAR lag order selection criteria to choose the best lag length for the VAR time series model to examine the Pair-wise Granger Causality test for all the series is performed. Johansen co-integration test is also applied to test for co-integration. The basic testing procedure requires three steps. The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable. This is done by using the Augmented Dickey-Fuller tests (ADF). In the second step we test for the existence of a long-run cointegrating relationship between the variables. This is done by the use of the Johansen co-integration test. Finally, the last step, if all variables are integrated of same order and co-integrated then causes and effect relationship test can be computed using the Pair-wise Granger Causality test.

## V. EMPIRICAL RESULTS

### Result of Stationarity Test:

One of the most important attributes of a time series variable is its order of integration. Hence, we first perform unit root tests in levels and first differences in order to determine the order of integration of the series. To test the order of integration, we employ the conventional Augmented Dickey-Fuller (ADF) test.

**Table-1**  
**Result of Unit Root Test Using Augmented Dickey Fuller Test**

Variable	At Level		At First Difference		Conclusion
	ADF	Prob.	ADF	Prob.	
Money Supply	1.8040	0.9997	-4.2093	0.0001	I (1)
Income	6.1989	1.0000	-4.3354	0.0000	I (1)
Price	3.9332	1.0000	-5.6794	0.0000	I (1)

It is evident from the above table that the calculated ADF statistics for level variables are less than the critical values in all cases, suggesting that the variables are not level stationary. Table 1 also shows that the ADF statistics for all the variables imply first-difference stationary.

### Result of Co-Integration Test Based on Johnson Juselius Method:

Once we have the results of unit roots, the next step is to determine whether there exists co-integration, using the same order of integrated variables. To test for co-integration, the Johansen and Juselius (1990) procedure was used, which leads to two test statistics, trace test and maximum eigen value test, for cointegration.

**Table-2**  
**Result of the Co-integration Test for Money Supply, Income and Price**

Johansen Test for Co-integration (Trace Test)				
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.	Conclusion
None	32.22939	29.79707	0.0257	No Co integrating Relationship
At most 1	8.355395	15.49471	0.4282	
At most 2	0.002905	3.841466	0.9555	
Johansen Test for Co-integration (Maximum Eigen value Test)				
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.	Conclusion
None	0.328271	21.13162	0.0200	No Co integrating Relationship
At most 1	0.129953	14.26460	0.3440	
At most 2	4.84E-05	3.841466	0.9555	

**Source: Estimated by researcher**

Above tables express the results of the co-integration test. The Trace-Statistic value is shown to be greater than the critical values 5% levels. Therefore, we reject the null hypothesis of no co-integrated equation among the variables. Thus, we conclude that there is at most one co-integrated equation among the variables. The Maximum Eigen value test statistic gives same results. Finally, we can say that there is long run relationship between Money Supply, Income and Price in India.

### Result of Pair-wise Granger Causality Tests for Money Supply, Income and Price:

After we have looked for the long-run relationship between Money Supply, Income and Price, we now test for the direction of causation between Money Supply, Income and Price for the Indian economy during the period 1951-2012. As pointed out earlier, the present study has adopted the Granger Causality test to examine the pair wise relation between variables. The results are provided in Table 3.

**Table-3**  
**Result of Pair-wise Granger Causality Tests**

Null Hypothesis:	Lag	F-Statistic	P-Value	Result
Money Supply does not Granger Cause Income	59	7.76248	0.0011	Uni directional Causality
Income does not Granger Cause Money Supply		1.72572	0.1877	
Price does not Granger Cause Income	59	0.18901	0.8283	No Causality
Income does not Granger Cause Price		0.06306	0.9390	
Price does not Granger Cause Money Supply	59	4.97821	0.0104	Bi -directional Causality
Money Supply does not Granger Cause Price		4.65560	0.0136	

**Source: Estimated by researcher**



The Granger Causality test results from Table 3 revealed that uni-directional causation between Money Supply and Income in the India. The direction of causation between Money Supply and Income runs from Money Supply to Income. On the other hand, there is no reverse causation from Income to Money Supply. The test also provides evidence of a bi-directional causation between Money Supply and price. It means Money Supply lead to Price and Price lead to Money Supply during the 1951 to 2012. Finally, no much amount of causation was found between Price and Income.

## VI. CONCLUSION

The main objective of this paper is to examine the relationship between Money Supply, Income and Price for India during the period 1951-2012. This study uses the ADF unit root test, Johansen co-integration and Pair-wise Granger Causality to investigate causality between Money Supply, Income and Price in India. From the above study, it can be concluded that the Augmented Dickey Fuller unit root tests show that Money Supply, Income and Price series become stationary when first difference are considered. The empirical result reveals a long run co-integrating relationship Money Supply, Income and Price in India. We also found evidence of uni-directional causality running from Money Supply to Income. It means Money Supply lead to Income but Income does not lead to Money Supply. There is no cause and effect relationship between Price and Income. The Pair-wise Granger Causality test also reveals that there is bi-directional causality between Money Supply and Price. It means Money Supply lead to Price and Price lead to Money Supply.

## REFERENCES

1. Biswas Basudev and Peter J Saunders (1990). Money and Price level in India: An empirical Analysis, *The Indian Economic Journal*, Vol. 38, 1990.
2. Chakrabarty, I. (2006). "Capital Inflows during the Post-Liberalisation Period", . *Economic and Political Weekly*, Vol-XLI No. 02, pp. 143- 150, January 14, 2006.
3. D.N., G. (2007). *Basic Econometrics*, 4rd Edition. New York: McGraw Hill International Editions.
4. Das, S. (2003). Modelling money, price and output in India: A vector autoregressive and moving average (VARMA) approach. *Applied Economics*, 1219-1225.
5. Datta, K. and Kumar, C. (2011). Relationship between Inflation and Economic Growth in Malaysia. . *International Conference on Economics and Finance Research IPEDR* , Vol. 4, No. 2, pp. 415-16.
6. Dibold, F. X. (2007). *Elements of Forecasting*. Mason, Ohio: Thomson/South-Western.
7. Dickey, D. A. (1979). "Distributions of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, Vol. 74, Part I, 427-31.
8. Dickey, D. W. (1986). Unit Roots in Time Series Models: Tests and Implications. *American Statistician*, , vol. 40, pages 12-26.
9. Dougherty, C. (2007). *Introduction to Econometrics 3rd Edition*. New York: Oxford University Press.
10. Engle, R. A. (1987). Cointegration and Error Correction: Representation, Estimation and Testing", . *Econometrica* , 55.
11. Gaurang, R. (2007). Some Aspect of Monetary Development in India Since 1950: An Econometrics Investigation. Veer Narmad South Gujarat University.(Unpublished Ph.D Dissertation)
12. Gaurang, R. (2009). Interrelation between Money, Price and output in India:New Evidence. Working Paper Series No. 7, Veer Narmad South Gujarat University .
13. Government of India. (2013-14). *Economic Survey*, Government of India, New Delhip. 1-14.
14. Granger. (1988). Some Recent Developments in the Concept of Causality. *Journal of Econometrics*.
15. Granger, C. (1969). Investigating Causal Relations by Economic Models and Cross-Spectral Methods. *Econometrica* , Vol. 37, No. 3, 424-438.
16. Gujarati ND, P. D. (2009). *Basic Econometrics (5th edition)*. New York: McGraw Hill/Irwin.
17. Makin, J. (1983). Real Interest, Money Surprises, Anticipated Inflation and Fiscal Deficits. " *Review of Economics and Statistics*. , 65(3): 374–84.
18. Mallik, G. and Chowdhury, A. . (2001). Inflation and Economic Growth: Evidence from Four South Asian Countries. *Asian Pacific Development Journa* , Vol. 8, No. 1, pp. 123-135.
19. Medhavin Bhalchandra Dave, Gaurang Dattubhai Rami. (2008). A study of causality between money supply and price level in india (monthly data): 1953 to 2005. *International Conference on Applied Economics, ICOAE 2008*.
20. Nachane D M andNadkarni. (1985). Empirical Test of Certain Monetarist Propositions via Causality Theory: The Indian Case',. *Indian Economic Journal* , Vol. 33, July-September, pp.13-41.
21. Nachane, D. M., A. V. Karnik, and N. R. Hatekar. (1997). The Interest Rate Imbroglia: Monetary and Fiscal Dimen sions.". *Economic and Political Weekly* , 32(20/21): 1167–74.
22. Paneerselvam, R. (2007). *Research Methodology*. New Delhi: Prentice–Hall Of India Private Limited.
23. Ramanathan, R. (2002). *Introductory Econometrics with Applications*. 5th edn. Fort WorthHarcourt College Publishers.
24. Ramchandra. (1983). 'Direction of Causality between Monetary and Real variables in India – An Empirical results,. *Indian Economic Journal* , Vol. 31, July-September, pp.65-76.
25. Rami, G. (2010). Causality Between Money, Prices and Output in India (1951-2005): a Granger Causality Approach , *Journal of Quantitative Economics* , vol. 8 no. (2), july 2010.
26. Reserve Bank of India *Handbook of Statistics on Indian Economy*. (2013-14). New Delhi: Reserve Bank of India.
27. Wooldridge, J. M. (2007). *Introductory Econometrics A Modern Approach 3rd Edition*. South- Western: Thomson Corporation.