



Causal Relationship Between Money, Income And Prices A Case Study Of Indian Economy During 1990-2010

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ABSTRACT

This paper attempts to investigate empirically the causal relationship between Money Supply (M3, Broad Money), Income/Output (GNP) and Prices using annual data for Indian Economy over the period 1990-91 to 2010-11 with the help of Statistical Regression Models. Regression Analysis shows that Money Stock expansion has influenced both Income/Output and Prices. The tests also indicate changes in Money Supply have an impact on Income/Output and Prices also. The causality tests also show bidirectional causation that Money Stock causes Income/Output and also Income/Output causes Money Supply. Moreover tests indicate unidirectional causality among from Money Supply to Prices. These results are confirmed through the Granger (1969) causality test. We conclude that there is an evidence for Money-Income-Prices Causal Relationship. The empirical results indicate that Money Supply do Granger causes Income/Output and Income/Output also do Granger causes Money Supply and Money Supply causes Prices in the Indian economy.

Keywords : Causality, Money, Income, Prices, Regression, Dependent and Independent Variables

1 INTRODUCTION

Quantity Theory of Money hypothesize that money supply is exogenous and change in money supply leads to rise in general price levels and output level remains fixed at full employment level. (Friedman, M. & Schwartz, A., (1963), Fischer, Stanley, (1977), Laidier, David (1991)). Keynesians believe that expansionary monetary policy increases the supply of loan able funds through the banking system which leads to fall in interest rates. With lower interest rates aggregate expenditures on investment and interest-sensitive consumption goods usually increase and cause real output to rise. They argued that money does not play any significant role in changing income and prices. In fact, changes in income cause changes in money stocks through demand for money implying that there exists a unidirectional causality from income to money. Similarly, changes in prices are mainly caused by structural factors. Friedman (1963) holds that money supply entails output effect, inflation effect and liquidity effect. Consequently, money supply becomes successful in the short-run in generating output variations. He expounded that: "inflation is always and everywhere a monetary phenomenon". In the monetarist view, increase in money supply, may lead to increase in output in the short-run, but in the long-run it influences only prices. Monetarists discard the existence of long-run Phillips curve trade-off, while allowing for the possibility of short-run trade-off as expectations adjust. An extreme rational expectation formulation denies even the short-run Phillips curve trade-off and argues that only an unexpected rise in money supply will lead to change in output, whereas the expected change in money supply will lead to a rise in relative nominal prices with no real effects (Lucas, (1972) and (1973). Which of these positions best describes the Indian context can only be determined by an empirical methodology to know causal relationship between money, income and prices. In view of such shortcomings, it is essential that the causality between money, price and output/income should be reinvestigated. It is with this backdrop, the present study revisits the issue in the context of India.

In our hypothesis, therefore, we attempt to investigate the effects of money supply on income, impact of income on money supply and impact of money supply on prices and their causality in the Indian Economy for study period of 1990-2010. The plan of this study is divided into Nine Sections as follows:

Section Two discusses the theoretical aspect of the money supply-income-price relationship. Section Three reviews the related empirical literature of some selective empirical studies and the Fourth Section provides objectives of the research, Section Five presents the hypotheses of the study, Section Six discusses the data and methodology of research and the Seven Section provides the empirical work, results and discussion and findings, and Section Eight makes a concluding remarks of this research paper. Section Nine is of references.

2 THEORETICAL FOUNDATION

The economists of the Classical School maintained that money supply is exogenous; while the Monetarists School states that money supply is essentially endogenous. Monetarists also, in general, maintain that monetary authorities exercise effective control over the stock of money, while others, especially those who share the new view of monetary theory state that the determination of money stock is a part of the simultaneous solution for all variables in the financial and real sectors of the economy. Monetarists do not necessarily deny this fact but, postulate that the behaviour of patterns of the public and banking system are stable and predictable which can enable monetary authorities to control the stock of money [Sims, 1972]. Hence, Keynes and most of the Monetary Theorists simply treated the supply of money as exogenously given by monetary authority.

Laidler (1991) put it that the quantity theory of money is, a theory of the behaviour of the general price level which identifies variations in the quantity of money as the key factor causing it to change. If it is to be empirically satisfactory, two things must be established: first that, with due allowance being made for the influence of explicitly specified 'other things', there can indeed be observed a proportional relationship between money and prices; and second that causation indeed can be shown to run from money to prices and not vice versa. Many theoretical and empirical studies have been done in the case of developed economies to investigate money-income-prices relationship. However, studies of this relationship in case of developing economies are scanty and favour of the quantity theory rather than Keynesian theory of income determination. Pioneering work in this field has been done by Friedman and Meiselman (1963) for the USA.,

Basically, the Classical-Monetarist School's point of view that output is supply determined, while prices are demand determined. However, the Keynesian thought postulates output to be determined by aggregate demand, while prices are determined by supply of money. Here, we have to remember that the Indian economy is working under Interest-Regulated Reserve banking and Finance system, which encouraged payment and charges of interest rates and that gives us a chance to carry this study.

3. REVIEW OF RELATED LITERATURE

The empirical literature of causal relationship between money, price, and income/output has been vigorously investigated by researchers for different sample time periods and provided the conflicting evidences on this issue. Some of the studies are as follows:

Sims (1972) inspired many empirical studies and introduced the causality tests of money income relationship. His key theoretical issue is whether changes in the nominal stock of money cause subsequent changes in nominal output. He found unidirectional causal flow from money to income in the USA, and offered a formal procedure to test the hypothesis that money causes output. He developed his own statistical technique for testing whether there was evidence of unidirectional causality within a two-variable system, he has used Granger (1969) causality tests and, he applied them to three variables, that is, the nominal gross national product (GNP) of industrial production, money (M₁) and wholesale price index (WPI), with data coverage from 1949 to 1968. His study had two purposes: to examine the substantiated question: whether there is statistical evidence that money is 'exogenous' in some sense in the money-income relationship?; and secondly to display in a simple example sometime-series methodology.

Rangarajan and Arif (1990) This paper presents an econometric model of the Indian economy which emphasises the interrelationships among money, output and prices. The main linkages in the model are as follows: The stock of money varies endogenously through the feedback from reserve money which changes to accommodate fiscal deficits. The price level is determined by money supply and output. The government budget is affected by the price level and output. The latter is influenced, among other factors, by changes in real money supply acting as a proxy for real credit. The empirical results show that the price effects of an increase in money supply are stronger than the output effects.

Das (2003) examined relationship between money, price and output in India and provided the evidence that there exists bidirectional causality between money and prices and unidirectional causality between money and output, with causality running from money to output. Ashra et al. (2004) established bidirectional causality between price (GDP deflator) and M₃.

Inder Sekhar Yadav (2008) investigated empirically the existence of a long-run relationship between money supply and national income (GNP) using annual data for India over the period 1950-51 to 2006-07. It was found that the Granger causality results did not reveal a uniform direction of causality between money and income in India. The direction of causation between real money and real income was found to be unidirectional from real GNP to real MS during the full period of analysis where as no direction of causation was found between real money and real income, during pre and post-liberalization periods. However, a feedback direction of causation was found between nominal MS and nominal GNP during the full period where as, a unidirectional causality between nominal money and nominal income was found in both the pre and post-liberalization periods.

Ashutosh Sharma, Abodh Kumar and Neeraj Hatekar (2010) In this paper, they have examined the issues using a bivariate methodology developed by Lemmens et output.. al. in order to decompose Granger causality between money supply, prices

and output in frequency-domain. They conclude that there is evidence for money-output trade-off over the short -run, but in the long -run, money supply determines prices, not output.

Mishra P K , Mishra U S and Mishra S K (2010) In this paper, authors have investigated the dynamics of the relationship between these macro-economic aggregates for India over the period 1950-51 to 2008-09. The estimation of VAR indicates the existence of long-run bidirectional causality between money supply and output and unidirectional causality from price level to money supply and output. Though this is not an exhaustive survey of the literature that has gone into this area, we feel that it does provide analytical framework for enabling us to undertake the present study.

4. OBJECTIVES OF THE PAPER.

To investigate empirically the effects of Macroeconomic variables namely: money supply(M₃, Broad Money)Income/output(GNP) and prices(WPI) and their interrelationship and their causality using annual data for Indian Economy over the period 1990-91 to 2010-11.

5. HYPOTHESES OF THE STUDY.

This paper seeks answers to the hypotheses as set below:

- (i) There is causal relationship among various macro-economic variables namely Money Supply(M₃ Broad Money), National Income/Output(GNP) and Prices in the Indian economy.
- (ii) There is a bidirectional causal relationship between Money supply(M₃) and National Income/Output(GNP) for the Indian economy. Both National income/Output (GNP) and Money supply(M₃) determine each other in the Indian economy
- (iii) There is a causal relationship between Money Supply(M₃) and Prices in India.

6. DATA SOURCES AND METHODOLOGY

In this paper, an empirical analysis is undertaken with a view to establish relationship between Money Supply (M₃, Broad Money), Output / National Income (GNP), and Prices / Wholesale Price Index (WPI) and their causality using annual secondary data for Indian Economy over the period 1990-91 to 2010-11

All these data are collected from the Handbook of Statistics on Indian Economy published by Reserve Bank of India, except, the data on WPI which is collected from the International Financial Statistics (IFS) database. All the variables are taken in their natural logarithms. The methodology employed in this paper is the Two Variable Regression Model and Granger Causality Test modeling technique.

Here we have estimated and fitted double natural logarithmic (log) of two variable for the Indian economy's money output-price relationship below with the corresponding statistical values of student's t-statistics, R², F-value, D-W Statistics and the regression coefficients.

7.0 EMPIRICAL WORK, RESULTS AND DISCUSSION

By fitting the double natural logarithmic (Log) relationship to the cross -sectional data (20 x 3) macro-economic variables matrix for the study years 1990-91 to 2010-011 and having taken these variables as both dependent and independent variables, we have obtained the following results as shown below by examining the casual relationship.

7.1 Money-Income/output-Prices Relationship:

Here, we applied the Autoregressive model to measure money-output-income relationship in this study as specified in two variables model and simultaneous regression model below:

7.1.1 Two Variables Regression Model

Regression estimates covering period from 1990-91 to 2010-011 is presented with both dependent and independent variables in natural logarithmic (Log) below one after another.

7.1.1.1 Dependent Variable: Money Supply (M3), Independent Variable: Gross National Product (GNP)**Model: $\text{Log M3} = a + b_1 \text{Log GNP} + u_1$ (1)****Regression results: (For 1990-91 to 2010-011 data)** **$\text{Log (M3)} = 0.7095 + 0.6147 \text{ log (GNP)}(2.34)(4.26)^*$**

R2 = 0.995 F (1, 20) = 1713.67 D-W = 2.478

*** Significant at 5% level of significance**

The above regression results supports the fact that the relationship between Gross National Product (GNP) and Money Supply (M3) is significant and positive as shown by the student's t-values attached to it. R2 is significant which shows that year-wise data of 'GNP' is an important factor and explains 99.5 % of variations in Money Supply (M3). Besides, F-value is statistically highly significant which reveals a positive relationship between the variables of the whole result. D-W statistics is significant and it indicates the absence of auto-correlation among the residuals.

From the above analysis, we can conclude that the National Income is significant and has positive effect in determination of Money Supply in India during the study period of 1990-91 to 2010-011. Thus this regression analysis confirms to our hypothesis that 'there is casual relationship between money and income. It indicates that money supply is the function of income.

7.1.1.2: Dependent Variable: Gross National Product (GNP), Independent Variable: Money Supply (M3)**Model: $\text{Log GNP} = a + b_2 \text{log M3} + u_2$ (2)****Regression Results: (For 1990-91 to 2010-011 data)** **$\text{Log GNP} = -1.3504 + 0.8991 \text{ log (M3)}$** **$(-2.7421) (3.2537)^*$**

R2 = 0.989 F (1, 20) = 787.697 D-W = 1.997

***Significant at 5% level of significance**

The above regression results, explains the fact that the Money Supply (M3) is statistically significant at 5 % level of significance and has positive influence / relationship on the determination of Gross National Product (GNP) year-wise in India. This is indicated by the above critical level of student's t-value attached to 'M3'. R2 is highly significant which shows that year-wise number of 'M3' is an important factor and explains 98.9 % of variations in Gross National Product (GNP). F-value is highly significant at 5 % level of significance with 20 degree of freedom which shows that the relationship between the two variables is significant. D-W statistics is significant which indicates the absence of auto-correlation among the residuals.

From the above analysis, we can conclude that the Money Supply (M3) is significant and has positive impact in determination of Gross National Product (GNP) in India during the study period of 1990-91 to 2010-011.. Thus this regression analysis also confirms to our hypothesis that there is a causal relationship between National Income and Money Supply. It proves that national income depends on money supply in India.

7.1.1.3 Dependent Variable: Wholesale Price Index (WPI), Independent Variable: Money Supply (M3)**Model: $\text{Log WPI} = a + b_3 \text{log (M3)} + u_3$ (3)**

Regression Results: (For 1990-91 to 2010-011 data)

 $\text{Log WPI} = -0.6364 + 0.8463 \text{ Log (M3)}$ **$(-0.8463) (2.3980)^*$** **R2 = 0.783****F (1, 20) = 30.775 D-W=2.080***** Significant at 5% level of significant**

The above regression results supports the fact that the relationship between Money Supply (M3) and Wholesale Price Index (WPI) is significant and positive as shown by the student's t-values attached to it. The R2 is significance which shows that year-wise number of "M3" is an important factor and explains 78.3 % of variations in Wholesale Price Index (WPI). F-value is significant which shows positive relationship between the variables for the whole result. Thus, Money Supply actually has positively influenced Wholesale Price Index in India for this study. D-W statistics is significant which indicates the absence of auto-correlation among the residuals.

From the above analysis, we can conclude that the Money Supply (M3) is significant and has positive role in the determination of Wholesale Price Index (WPI) in India during the study year 1990-91 to 2010-011. Thus this regression analysis also confirms to our hypothesis that there is a causal relationship between Prices and Money Supply. It means that money supply determines prices in India.

8. CONCLUDING REMARKS

Our empirical results keep no doubt in our minds that what-ever may be the cause of rise in stock of money in the India, it definitely leads to rise in income, and rise in money supply in turn raises the income.. In our empirical analysis in equation of Money as a function of Income R2 is 99% and in equation of Income as a function of Money R2 is 98% which indicates money supply depends slightly more on Income and Income depends slightly less on Money Supply. Therefore, it is found that Reserve Bank of India needs to provide much needed liquidity system regulation, which is very much required according to the Interest-rates for Banking System. This shows rising price-level causes the nominal policy variable like money stock to raise in the India and also cause the national income to rise. Our study results also show that prices depend on money supply in Indian Economy. Therefore, in order to obtain economic stability, the Indian Central-Monetary-Authority, that is, Reserve Bank of India has to concentrate in the control of supply of money as well as price level. Therefore, our study reflects that there is a causal interrelationship between Money Supply, Output/Income and Prices that demands wider and comprehensive package of economic policy to ensure economic stability in the Indian economy.

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