

**MONEY SUPPLY AND ITS EFFECTS ON
OUTPUT AND PRICE LEVEL WITH
SPECIAL REFERENCE TO INDIA
(1950-87-90)**

*Thesis submitted for the degree of Doctor of Philosophy
in Economics to the University of North Bengal, 1997*

by
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*Dedicated to my parents
Late Manoranjan Sarker
and
Smt. Dhakeswari Sarker
whose memory inspires me always*

ACKNOWLEDGEMENT

In writing this thesis I obtained valuable helps and guidance of many. Without them, it would have been an insurmountable task for me. I am very much indebted and grateful to all of them.

My greatest debts are to Dr. Chandan Kumar Mukhopadhyay, my guide, for guiding, inspiring, painstaking reading of my manuscript and helping me in many other ways. Actually, words are few to express my gratitude to him. Words are the only coin I have to offer in repayment. However, I offer my sincerest gratitude to him and acknowledge that his memory will remain vivid in my life.

I am grateful to my teachers Prof. Manas Dasgupta, Dr. J.C. Debnath and Mr. Jeta Sankrityayan, Head deptt. of Economics, North Bengal University for their love and inspiration and helping me in many ways. I am also grateful to other teachers and staff of my department, helping me directly and indirectly in my work.

I am also grateful to all the associates of DTP Point (Ghosh Printing), S.N. Bose Road, Shivmandir for their cordial relation and typing me out the thesis carefully and in no time.

Finally, I thank my wife, Joyshila for letting me free from household work while I worked. I also offer my love and affections to my daughters, Miss Asima and Miss Alivia for not disturbing me in my work time.

In the end, I accept all the responsibility of errors and omissions and other drawbacks in my work.

Dated: 10th Sept. '97.

Anil Ranjan Sarker

CONTENTS

	Pages
CHAPTER- I Introduction	1-7
1.1 Main features of the Indian Economy: Inflation	1
1.2 Money Supply	1
1.3 Money Supply and Price Level	3
1.4 Growth of Output	3
1.5 Objective of the study	4
1.6 Plan of the study	5
CHAPTER-II LITERATURE SURVEY	8-28
2.1 Introduction: Literature Survey of Price-Money Relationship	8
2.2 Quantity Theory and Indian Economy	18
2.3 Literature Survey of Output-Money Supply Relationship	20
2.4 Relevancy of the quantity theory in Indian Economy (in respect of Output-Money relation)	28
CHAPTER-III METHODOLOGY AND DATA RESOURCES	29-32
3.1 Introduction :Nature and period of data set	29
3.2 Data for money supply	29
3.3 Sources of data	29
3.4 Rationale behind the use of IFS data set	31
3.5 Methodology	31
3.6 Data transformation	32
CHAPTER-IV MONEY SUPPLY AND PRICE LEVEL IN INDIA OVER THE PERIOD 1950-92.	33-42
4.1 Introduction	33
4.2 Objective of study	34
4.3 Price level and money supply: graphical examination	35
4.4 The Model	36
4.5 Rationality behind the choice of the Model	37
4.6 Estimation and findings	38
4.7 Further verification of the findings	40
4.8 Summary and conclusion	41

CHAPTER-V MONEY SUPPLY AND OUTPUT LEVEL IN INDIA OVER THE PERIOD 1950-91	43-52
5.1 Introduction	43
5.2 Objective of study	46
5.3 The Model	46
5.4 Estimation and findings	49
5.5 Implication of the findings	49
5.6 Further verification of the findings	51
5.7 Summary and conclusion	52

CHAPTER-VI WINDOW FINDING OF STRUCTURAL CHANGES IN PRICE LEVEL AND MONEY SUPPLY RELATION- SUB-PERIOD ANALYSIS	53-68
6.1 Introduction	53
6.2 Objective of study	54
6.3 Identification of sub- periods	54
6.4 Graphical Method	55
6.5 Window findings of structural changes: Methodology	56
6.6 Identification of sub-periods and structural changes:Result of Chow Test	60
6.7 Analysis of the table 6.1 and identification of sub- periods	62
6.8 Price-Money Relationship over different sub- periods	64
6.9 Price-Money Relationship over different sub- periods --further explanation	65
6.10 Summary and Conclusion	68

CHAPTER-VII IDENTIFICATION OF SUB -PERIODS AND ANALYSIS OF OUTPUT MONEY RELATION OVER VARIOUS SUB-PERIODS	69-77
7.1 Introduction	69
7.2 Identification of sub-periods: Graphical Study	69
7.3 Identification of sub-periods and Structural changes:Result of Chow Test	70
7.4 Analysis of the Table 7.1	71
7.5 Study of output money supply relationship over different sub-periods	73
7.6 Further explanation of output money relationship in different sub-periods	75
7.7 Overview of the relationship between output money supply in different sub-periods	76
CHAPTER-VIII JOINT STUDY OF OUTPUT, PRICE AND MONEY SUPPLY RELATIONSHIP OVER DIFFERENT SUB-PERIODS	78-82
8.1 Introduction	78
8.2 Sub-period observations from price money and output money supply relation:over various sub-periods	78
8.3 Further Study:Analysis of the Table 8.1	82
CHAPTER-IX :SUMMARY AND CONCLUSION	83-88
9.1 Introduction	83
9.2 Presentation of the findings from section 4.8	83
9.3 Presentation of the findings from section 5.7	84
9.4 Hypothesis of structural change in the relationship of the concerned variables	84
9.5 Identification of various sub-periods in price money relationship over the period of study	85
9.6 Sub-period estimation and findings in price money relation.	85

9.7 Sub-period identification in output money supply relation	85
9.8 Analysis of estimation (Table 7.2)	85
9.9 Further analysis of output money relation	86
9.10 Further analysis of price money relation in various sub-periods	86
9.11 Joint study of price money and output money relation over different sub-periods	87
9.12 Public policy implication	87
9.13 Conclusion	88

SELECTED BIBLIOGRAPHY

ADDENDUM :SELECTED BIBLIOGRAPHY

CHAPTER - I

INTRODUCTION

1.1 Main features of Indian Economy - Inflation :

Indian economy, over the last few decades has been witnessing a growing inflationary pressure - with some occasional relieves. The growing inflationary pressure is almost a common phenomenon for most developing countries like Mexico, Egypt, Peru, Brazil, Argentina, Israel and Bangladesh etc. India is no exception to this. In case of inflation, the prices of goods and services, rise. Income of a vast majority of people can not keep pace with the rise in the cost of living. The relative income position of different classes of people basically changes for the worse on this account. A very small section of people becomes undeservedly¹ richer and rest grows poorer and poorer. Inflation is, by and large, an inequitable process.

It is, therefore, pertinent on the part of economists to identify the main factors behind such inflationary trend. Is the inflationary pressure due to the growing rate of money supply in Indian economy ? If not, what is it ?

1.2 Money Supply - Money supply has been steadily increasing over the last few decades. Needs for financing different projects for economic development have called for increasing rate of money supply in India. Economic Plans have emphasised on rapid industrialization alongwith steady growth of agricultural sector and economic justice for the downtrodden. All these have claimed for voluminous government spending. Nationalization of bank enabled the government to have an easy access into bank resources for the developmental projects. This indicates an increasing dose of money supply into the economy.

A part from this , budgetary deficits² have become a regular feature and practice for the last few years.

Deficit financing was quite modest in the initial plans. The total expenditure during the First Five Year Plan was of the order of Rs. 1960 crores of which a gap of Rs. 333 crores was met through deficit financing. The second plan envisaged deficit financing of the order of Rs. 1200 crores. However, following a substantial step up in tax efforts during the period, the actual deficit was of the

1. J.M.Keynes, Economic Consequences of Peace, p.220.

2. Agarawal, A.N. Indian Economy, Wishwa Prakashan, 21st edition, 1995, p.641.

order of Rs. 954 crores. During the Third Plan, the actual deficit came to Rs. 1133 crores. Deficit financing during the Fourth Plan was of the order of Rs. 2060 crores and in the Fifth Plan it was Rs. 3560 crores.

Table-1.1

Deficit Financing in India (in different plan periods)

<u>Plan period</u>	<u>Deficit financing (Rs. crores)</u>
First Plan(1951-56)	333 (17.0)
Second Plan(1956-61)	954 (20.4)
Third Plan ((1961-66)	1133(13.2)
Fourth Plan(1969-74)	2060(12.8)
Fifth Plan (1974-79)	3560(8.6)
Sixth Plan (1980-85)	15684(14.1)
Seventh Plan(1985-90)	28256(15.3)

Figures in the parenthesis represents the percentage of total plan expenditure covered through deficit financing.

It may be noted that percentage of plan expenditure covered through deficit financing had been declining over years until the Fifth Plan. A noticeable increase in volume in deficit Financing along with a rising trend is obtained since the Sixth Plan. Deficit Financing in the Sixth Five Year Plan Period stood to more than 340%, while in Seventh plan it registered a rise by more than 693% of the Fifth Five Year Plan deficit Financing . An attempt is undertaken to curb the volume of deficit financing in the Eight Five Year Plan period . The volume of deficit Financing in the Eight Plan none the less, stood at 600% of that in the Fifth Plan Period.

Money Supply, as a result thereof, continued to increase. This led to a common belief that the continuous rise in money supply might have contributed to price hike³ in Indian economy.

1.3 Money Supply And Price Level :

Figure 1.1 and 1.2 represent the time plots of Money Supply (M_2) and price level over the period 1950-1992. Both the time plots indicate a steady rise in money supply and price level with some occasional ups and downs over the period concerned.

The Figure 1.3 present both the time plots together. It appears that price level varies in close association with money supply. The extent of such association is not clear. Yet the common idea that spurt in money supply is behind the price rise in India gets a support from such visual verification of the time plots together.

1.4 Growth of Output :

Another important feature of the Indian economy over the last few decades is the phenomenal increase in output level. Since independence India has been striving for achieving self sufficiency in agriculture and for industrial development. India, as a result, thereof, has emerged as an outstanding industrial countries with spectacular achievement in agriculture. National income has been growing over the last few decades, almost steadily. Figure 1.4 presents the time plot of output level over the period 1951-91. It shows that output level has registered almost uninhibited growth with some occasional ups and downs over the period concerned.

Output growth in the Indian economy over this period proceeded along with growing monetization of the economy. With the growing monetization, the barter economy progressively gave into the exchange economy. During the process of transition, money assumed growing importance in economic activities. Again, the cheap money policy in the earlier phases of economic development led to a fall

3. The Committee to Review the working of the Monetary System chaired by Prof. S.Chakraborty (April 1985) . According to the Committee " the large deficit incurred by the govt. and financed by the RBI have led to a significant rise in money supply relative to output in successive years and have consequently fuelled inflationary pressure during seventies.

Fig. 1.1 : Time Plot of Money Supply, M_{2t}

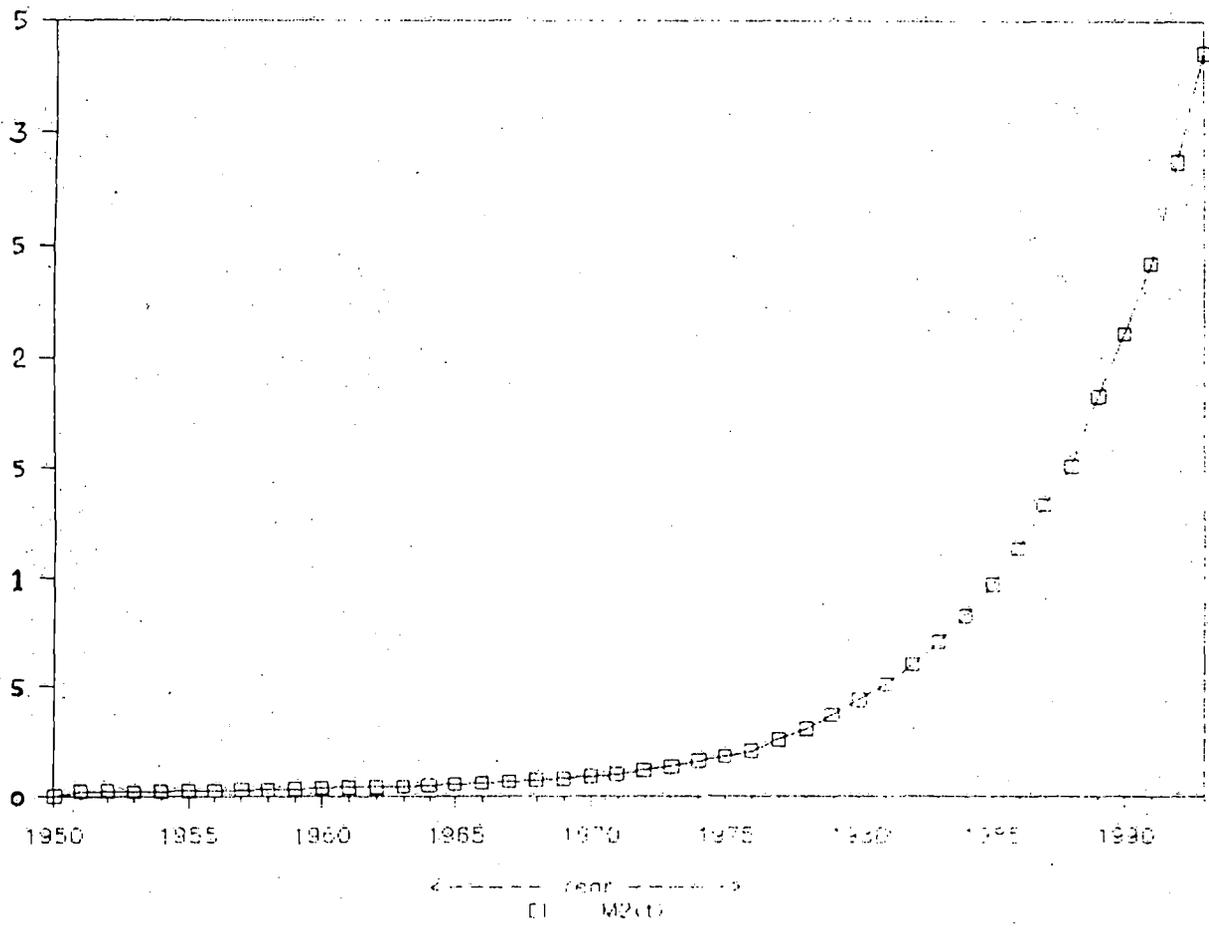


Fig. 1.2 : Time Plot of Price Level, P_t

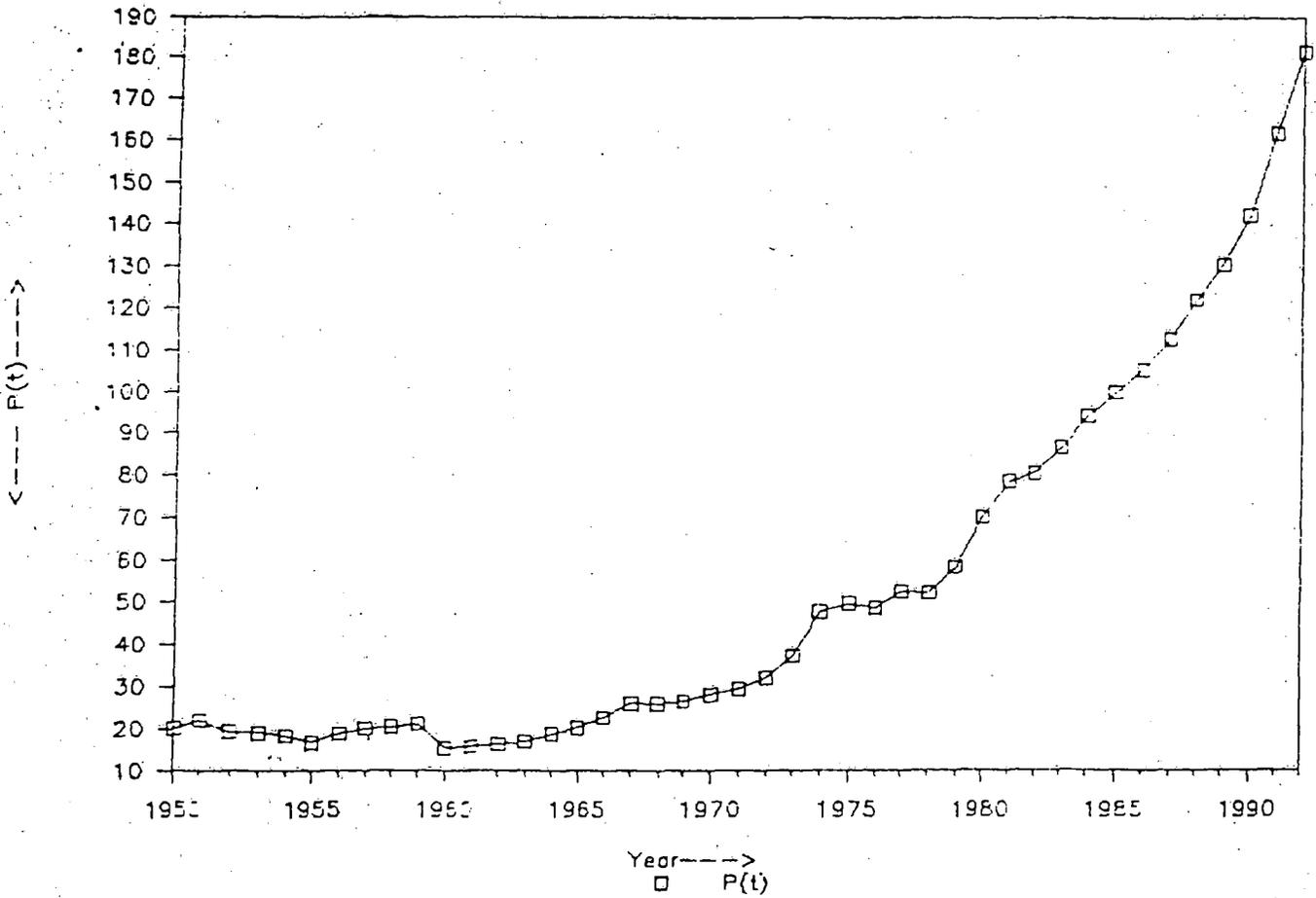


Fig. 1.3 : Time Plot of Price Level (P_t) and Money Supply (M_{2t})

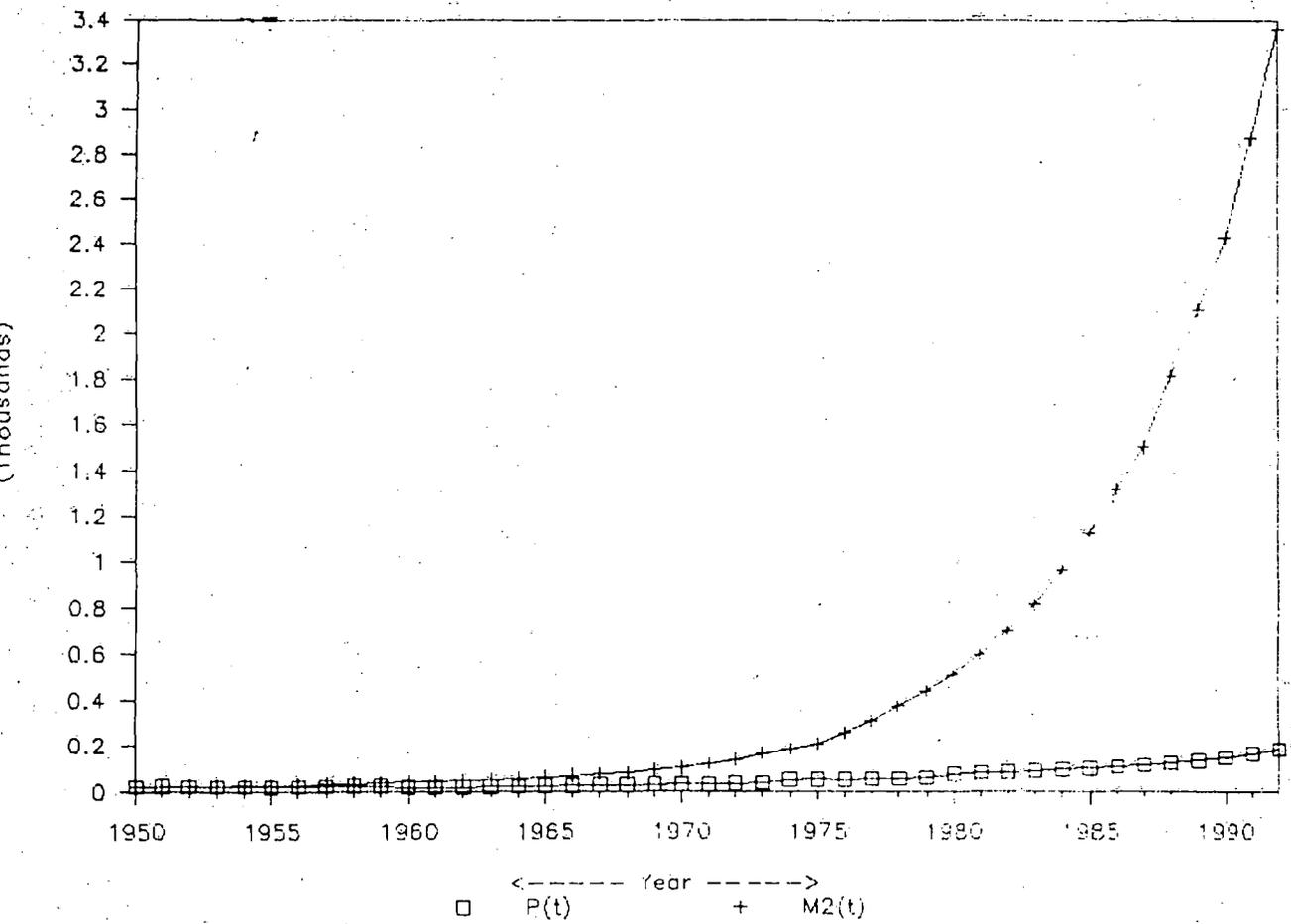
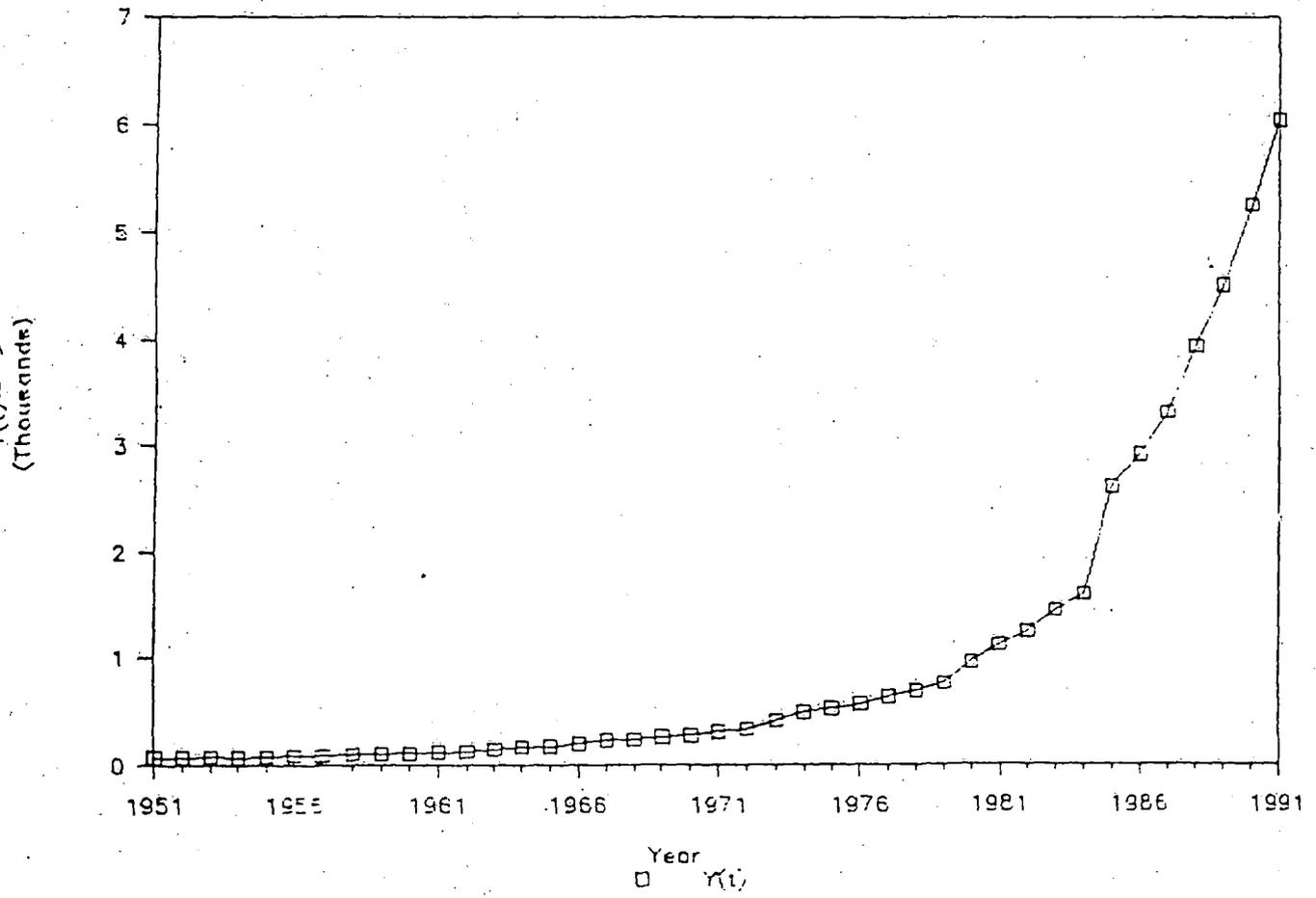


Fig. 1.4 : Time Plot of Output Level (Y_t)



in interest rate which encourages investment. This helped the growth of output level. Simultaneously it increased the purchasing capacity which supported the growth of output. Consequently, income generation may be considered as the result of the expansion of money supply.

The Figure 1.5 presents the time plots of output level and money supply over the period 1951-91. It is observed that output level moved over the period in close association with money supply, though the extent of such association cannot be exactly determined visually. The association is not uniform throughout. Sometimes the association appears to be strong and sometimes it seems weak. Consequently, it becomes pertinent for a researcher to enquire the role of money supply in the growth of output level in Indian economy. This becomes important in view of the fact that price level is also found to maintain an association with the money supply over the period concerned.

1.5 Objective of Study :

This present work is devoted to study output money supply and price money supply relationship in Indian economy over the period 1950-91/92. We seek to examine if price-variations are a purely monetary phenomenon and how far output level has been responsive to variation in money supply.

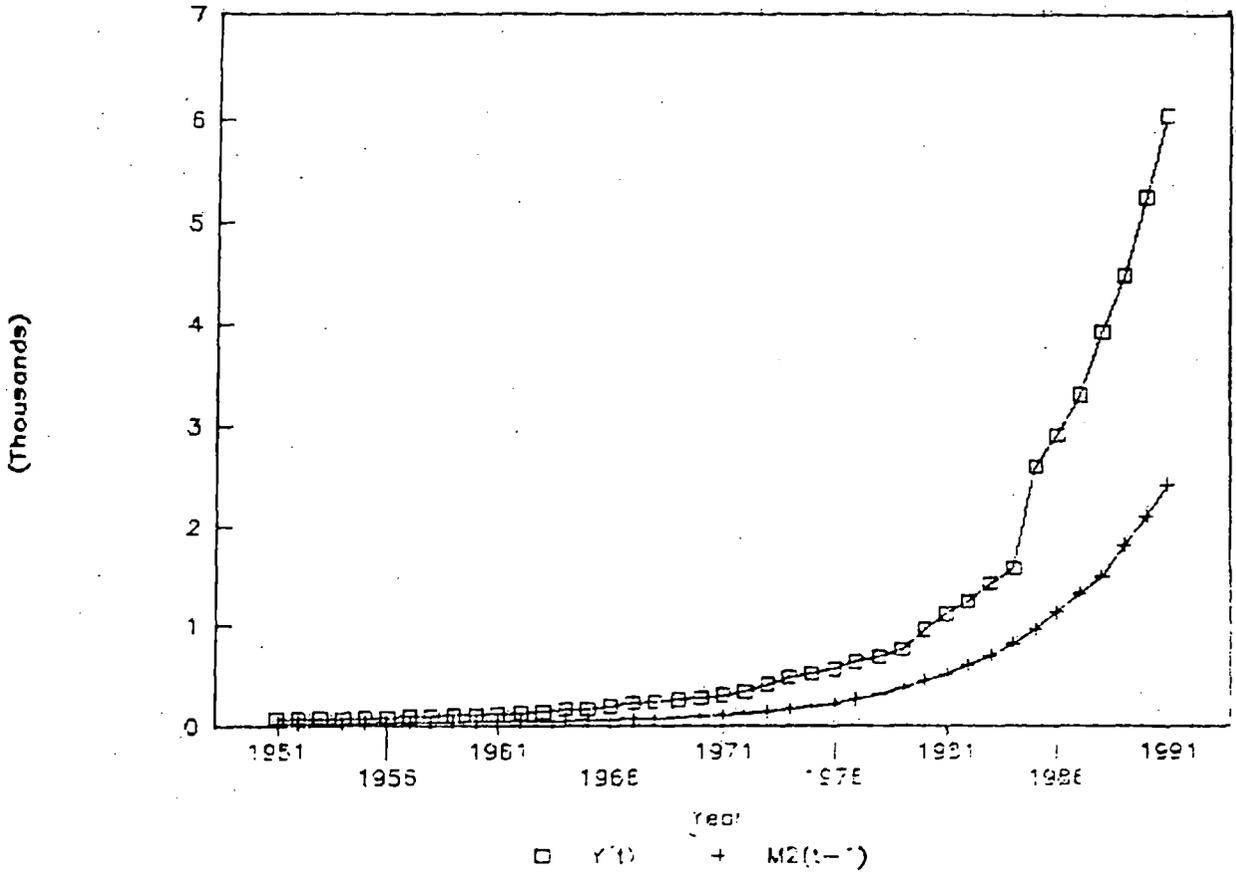
The study is carried along the line suggested by Friedman (1970) where he stresses upon simultaneous examination of the effects of money supply on price and output levels. According to Friedman, overall effects of money supply is dissipated mainly into the effects on output and price level.⁴ If output level remains unaffected, money supply goes entirely for changing price level. More the variation on output level, the weaker will be the variation in price level. Friedman holds that money supply stimulates output level in the short run. In the long run, money is neutral. It affects price level only.

In this study, we seek to examine if output level is related to money supply in Indian Economy. We will examine how responsive output level has been to the variation in money supply over the period 1950-91.⁵

4. Interest rates may undergo changes following money supply. So money supply may also have "Liquidity Effect".

5. We seek basically to study the associations in output level and those in money supply. The study does not involve the tests of 'Causality' between money supply and output level. Consequently, Granger Wiener Test have not been done in the study.

FIG.1.5 TIME PLOT OF OUTPUT LEVEL (Y_t) AND
MONEY SUPPLY (M_{2t-1})



We seek further to examine if variation in price level exhibited any association with those in money supply over the period of study (1950-92) in Indian Economy.⁶ We seek to examine further if such relationships underwent any changes over the period concerned.

It may again be noted that the long period as represented by the historical data set may be considered as a time span with heterogeneous process of growth. Output level, price level and money supply have been varying at different rates over the period concerned. Consequently, the overall picture obtained from the use of historical data set may have summarized the relation over different individual sub-periods. The sub-periods depict structural changes in the relations among macro-economic variables concerned.

It, therefore, becomes pertinent for a researcher to enquire if structural changes have occurred over the period of study. If so, it also becomes pertinent for the researcher to identify the sub-periods in which structural changes have occurred. We have also sought to include this issue as an objective of our study.

We seek to identify the sub-periods in which structural changes might have occurred. We will further estimate the relations among the macro-economic variables - in these identified sub-periods. We will examine how the relations have undergone changes over time. This may be expected to provide dynamic and better insight into the response of output level as well as price level to changes in money supply over the period of study.

1.6 Plan of the Study :

This study is accordingly divided into nine chapters.

Chapter I : is an introductory chapter.

Chapter II : presents the review of literature.

Chapter III: deals with data and methodology used in the study.

6. In time series regression analysis, the underlying implicit assumption is that various time periods are homogenous except for factors explicitly appearing in the functions. Since underlying condition of an explicit relationship change through time, estimates obtained from time series are considered as short run findings.

Chapter IV: presents the graphical and quantitative study of the relationship between price level and money supply in India over the period, 1950-92. The relationship is examined through the estimation of an appropriate model. The estimated model is the 'best fit' one chosen from among several alternative estimated models. (analysis of the findings follows the estimation of the model).

Chapter V : presents the graphical and quantitative study of the relationship between output level and money supply(lagged money supply) in India over the period concerned. The relationship is examined through the estimation of an appropriate model. Observed nature of the association of output variations with those in money supply has been examined at length.

Chapter VI : is devoted to examine if the price level - money supply relationship so obtained in the historical data set underwent any structural changes over the period concerned. The study in this chapter is motivated by the fact that price money relationship may be expected to undergo changes in different sub-periods over the past few decades. Monetary authorities have adapted different approaches to expansion of money supply in different plan periods. Price variation were not uniform during this period either. Consequently, overall picture about the price money relationship obtained from the use of historical data set might have summarized the relations over different individual sub-periods. It, therefore, seems to be pertinent to analyse the price-money relations in some sub- periods. These may be expected to provide dynamic and more insight into the response to price-level to variation in money supply over the period concerned. The study in this chapter seeks to address this issue.

The sub-period were chosen through the identification of the periods where structural changes have occurred. The identification of structural changes were done with some econometric technique which involve "Window Finding". Such "Window Finding" involve recursive technique. The basic procedure and the findings have been presented in this chapter.

Four sub-periods have been identified in which structural changes in price level money supply relationship are found to occur. These sub-periods are 1950-59, 1960-74, 1975-79 and 1980-92. The relationship between these two macro-variables have been estimated in each individual sub-period. Findings have been presented and the nature of the changes in structural relations has been examined analytically.

Chapter VII deals with identification of sub-periods in which structural changes in the relationship between output level and money supply (lag money supply) have occurred. The Method of 'Window Finding' is used for this purpose. Four such sub-periods have been identified. These are - 1950-60, 1961-70, 1971-80 and 1981-91. The relationship between output level and money supply has been estimated for each sub-periods. Findings have been reported along with analysis of the nature of the dynamic movement of the relationships between the variables concerned.

Chapter VIII : presents the review of the findings in the last two chapters. We seek to examine how the effects of money supply got dissipated into 'output effect' and 'price effect' in different sub-periods . Consequently, an idea about the dynamic movement of price money and output money relationships across different sub-period is obtained.

In Chapter IX : summary of findings and observations in different chapters has been presented for review alongwith a note of public policy implications of these findings.

CHAPTER - II

SURVEY OF LITERATURE

2.1 Introduction :- Literature Survey of Price-money relationship :

This chapter deals with the survey of literature of the research thesis : Money Supply and its effects on price and output level in an economy with special reference to India. The importance of the study springs from the influences of inflation rate and the growth of output on the daily lives of the people. These two macro-economic variables dominate the research agenda in macro-economics.

The rapid and persistence rise in the general price level has unfavourable consequences¹ on the social, political and economic lives of the people in an economy. Inflation is a discriminatory process and it creates an imbalance among the consumers and producers. The real income of the low and fixed income group falls. While major portion of the population faces great hardship and sufferings, income, wealth and consumption of the minority of the privileged and propertied class increase conspicuously at the same time. Moreover, inflation is connected with the general atmosphere of perverseness which simultaneously produces explosions of student unrest, growing crime etc². U.S presidents Ford and Carter call inflation " Public Enemy Number One"³. Hence the task of containing inflation is brought to the fore front of the government's stabilization programmes.

It is, therefore, pertinent on the part of economists to identify the main factor behind such inflation. It is assumed that increase in money supply is the major cause of inflation. The realization of the notion is not of recent origin but of past, nearly of two thousand years⁴. This notion rings well in the statement of Bryan and others while criticising the U.S. government's policy from Hamilton's (1789) time until 1933 to maintain the value of dollar⁵. Explanation of this sort is also found in the quantity Theory of money.

-
1. S.Mukherjee , "Financial Stability and Planning" Finance and Development , Vol 9 No.1 March 1972, P - 5
 2. R.Harrod " The Issue : Five Views" In : Inflation as a Global Problem, edited by R. Hinshaw John Hopkins University Press, Baltimore 1972
 3. W. Wilson : Inflation Causes Consequences and Cures, Indiana University Press Bloomington . First Midland Book Edition 1982. P- 1
 4. Harry G. Johnson : Inflation and the Monetarist Controversy, North Holland Publishing Company, Amsterdam, - London, 1972, P-36. According to Johnson "For well over two thousand years, at least men at least sometimes and in some places have realized that inflation is the consequences of or at least associated with, the excessive issue of money".
 5. R.S. Morrison: Inflation Can Be Stopped, Western Reserve Press INC First Edition Nov.1973,cleveland -P-8

The quantity theory of money is usually quoted for demonstrating relationship between money supply, price and output level. The Theory has passed through many refinement and reformulation over time. Jean Bodin is generally regarded the originator of the quantity theory of money. Bodin states that the principal reason which raises price of every thing, where ever one may be, is the abundance of that which governs the appraisal and price of things⁶. It seems to us that his statement of the theory is simple and rudimentary.

In the two centuries following Bodin, many writers embraced the quantity theory and developed it in their own way. William Petty,⁷ Sir Dudley North⁸, John Locke⁹ Jacob Vanderlint¹⁰ David Hume¹¹ and Richard Cantillon¹² were prominent among them.

It appears that Petty referred to labour theory of value. Yet, it relates money supply with price level. North tacitly speaks of the effect of money on the price level in an economy. Locke holds the view that the value of money in exchange depends on the proportion of the quantity of money to the total volume of goods in the market. His view is based on the demand and supply theory of price. J. Vanderlint states about a positive and proportional relationship between price level on the one hand, and the amount of gold and silver, on the other hand.

6. A.E. Monroe, *Early Economic Thought*, P - 127 Bodin in his *Re'ponse aux Paradoxes de Male stroit*, Published in 1569, gave the first elaborate explanation of the revolution in prices in the sixteen century. He ascribed this rise in the prices to five causes: the abundance of gold and silver; the the luxury of the king and the great lords; and the debasement of the coin. He gave main empphasis to money supply to explain the rise in prices.
7. William Petty; *A Treatise of Taxes and Contribution*, London, 1667, P - 32
Petty states that "if a man can bring to London an ounce of silver out of the earth in peru, in the same time that he can produce a bushel of corn, then the one is the natural price of other, now, if by reason of new or more easie mines a man can produce two ounces of silver as easily as formerly did one, the corn will be as cheap at ten shilling the bushel as it was before at five shillings *Ceteris - paribus*"
8. In Dudley North "Discourses Upon Trade"
London, 1691, PP - 11 -15
North writes "Money being - - - the common measure of buying and selling, every body who hath any thing to sell and can not procure chapman for it is presently apt to think that want of money in the kingdom, or country, is the cause why his goods do not go off and so want of money is the common cry. The farmer complains - - - he thinks that were more money in the country, he should have a price for his goods".
9. Eric Roll, *A History of Economic Thought*, Oxford University Press, Farday House Calcutta 13, Fourth Edition, Revised and Enlarged PP - 13-16
10. Jacob Vanderlint, "Money Answers All Things" London, 1734, P - 5
Relating quantity of money with price level he states that "the Prices of things will certainly rise in every nation as the gold and silver increase amongst the people, and consequently, where the gold and silver decrease in any nation, the prices of all things must fall proportionately to such decrease of money".

David Hume expressed price level to be a function of the quantity of money. That is $P = \phi(M)$. He says that money represents commodities and its value is determined in the process of exchange by the relation between its own quantity and the quantity of goods for which it is to be exchanged. It follows from this that changes in the quantity of money affects the prices of goods. He, again, assumes that changes in the quantity of money are not immediately, attended with proportionable alteration in prices of commodities. Some time is needed before to match the price level proportionate to the money supply. His version dominated economic thinking throughout most of the the nineteenth century.

Richard Cantillon maintains that increase in the money stock leads to increase in the prices because the larger money stock leads people to increase the rate of their spending. Other early expositions of the quantity theory which make it clear that an increase in the quantity of money raises prices through its prior effect in increasing demand are provided by Henry Thornton¹³, David Ricardo¹⁴ and J.S. Mill¹⁵

11. Hume, D, "Political Discourses"

In : Hansen A.V. "Monetary Theory and Fiscal Policy", International Student Edition 1949, Appendix - A, PP-215-16 & In : John Hicks, "Critical Essays in Monetary Theory, Oxtord Clarendon Press, 1967, PP - 160-61

Hume writes, "Money is nothing but the representation of labour and commodities and serves only as a method of rating or estimating them. When coin is in greater plenty - as a greater quantity of it is required to represent the same quantity of goods - it can have no effect either good or bad taking nation within itself; any more than it would make an alteration in merchant's books. We must condiser that though the high price of commodities be a necessary consequence of the increase of gold and silver , yet it follows not immediately upon that increase ; but sometime is required before the money circulates through the whole state ; and makes its people be felt on all ranks of people . At first no alteration is percieived; by degrees the prices rise first on one commodity , then another, til the whole atl .ast reaches a just proportion with the new quantity of specie which is in the kingdom.

12. Essay on the Nature of Trade (1755) translated and edited by H. Higgs, London, 1931 , Part II, Chapter VI - VII, PP - 161 and 179.
13. Thornton, H : An Enquiry into the Nature and Effects of the Paper Credit of Great Britain. London , Hatchard , 1802 PP - 195 , 259 -67
14. Laurence Harris , Monetary Theory, International Student Edition, MacGrow Hill Book Company 1985 , P - 111
Ricardo writes " When any particular country excels in manufacturers, so as to occasion an influx of money towards it, the value of money will be lower and prices of corn and labour will be relatively higher in that country, than in any other.
15. J.S. Mill, Principles of Political Economy, ed W.J. Ashley, London 1909, PP - 491 - 93, 496 and 524. Mill writes " Money acts upon prices in no other way than by being tendered in exchange for commodities".

In a nut shell, the views of the classical economists about the price money relationship are summed up in the quantity theory of money. The non rigid version of the transaction approach, states an inverse relationship between the quantity of money and the price level. It merely states the tendency of the relationship. It does not tell us by how much price will alter as money supply alters. It seems to us that its efficacy regarding accurate policy making is less.

The quantity theory in its strictest form uses Fisher's equation of exchange¹⁶ and states that price always changes in exact proportion with the changes in the quantity of money. The equation of exchange is :

$$MV = PT \text{ ----- 2.1}$$

Where M = amount of money

V = velocity of circulation of a unit of money

P = Price level

and T = Volume of trade

According to Fisher, factors such as institutional arrangement of the banking and payment system affecting velocity may change from time to time, they are sufficiently stable for velocity to be treated as a constant at any point of time. With the assumption of full employment of resources and constant velocity, the theory leads to a proportionate change in the price level; since

$$P = MV/T \text{ ----- 2.2}$$

Equation 2.2 states that the price level varies directly as the quantity of money (M) and the velocity of its circulation (V) and inversely as the volume of trade (T) done by it.

The classical economists, therefore, conclude that the price level rises with the rise in money supply and relative price remains the same. Consequently, entrepreneurs find no reason to change their output level. Money is, therefore, neutral and works like a veil over the real sector of the economy. Almost all economists writing before Keynes put some stress on the price money relationship.

Keynes criticises the quantity theory on the ground that it is a truism which holds in all circumstances though without significance¹⁷ Crowther also states¹⁸ that it is only another way of writing the obvious fact that money given in exchange for any thing equals the price paid for it.

To avoid such criticism, Marshall and other Cambridge economists formulate another approach, namely cash balance approach to explain price money relationship. This approach takes into account the fact that mere creation of money by the government without there being a willingness in the public to spend it, result only the new money standing idle having no effect on the price level. Every prudent person strikes a balance in his mind between the convenience and security of having a stock of money and sacrifice of real consumption for holding money. The Cambridge equation brings the economic behaviour into the analysis. The cash balance approach, or Cambridge equation is

16. Fisher, Irving, Purchasing Power of Money, Macmillan 1922 PP - 17 -21

17. J.M. Keynes, The General Theory of Employment Interest and Money, Macmillan & Co Ltd. New York, St. Martin's press, 1957 P - 209

18. G.Crowther, An Out Line of Money Thomas Nelson and Sons Ltd. Reprinted 1977, Chapter IV P - 112

$$M^d = k P_1 y \text{ ----- 2.3}$$

Where M^d = Money demand , k = Proportion of income held by the people in terms of money. P_1 = Price of final goods and services and Y = real national income.

In equilibrium , the exogeneous stock of money is equal to the quantity of money demanded

$$\text{Hence } M = M^d = k P_1 Y \text{ ----- 2.4}$$

The price equation from 2.4 is

$$P_1 = M^d / kY \text{ ----- 2.5}$$

The equation states that price level is positively related with the money demand and inversely with k and y . Under the assumption of full employment of resources, the higher the proportion of real income that the people decide to keep in money form, the lower will be the effect in the price level. The Cambridge equation is related with the income velocity of circulation in the following way :

$$\text{Where } V_1 = 1/k \text{ ----- 2.6}$$

The Cambridge equation represents a step towards more modern monetary theories. It focuses on the quantity theory as a theory of the demand for money. The proportional relationship between quantity of money and the price level results from the fact that the proportion of nominal income people wish to hold in the form of money (k) is constant and the level of real output is fixed by the supply condition.

Keynes criticises that "the income velocity of money" is in itself merely a name which explains nothing. There is no reason to expect that it will be constant. Keynes thinks that the use of this term obscures the real character of causation and has led to nothing but confusion¹⁹. Alvin H. Hansen²⁰ supports the view of Keynes on velocity. Again, the inability of the quantity theory as it existed in the 1920²¹ to explain the great depression offers the Keynesians the point of attack on orthodoxy and the opportunity for the success of the Keynesian revolution. Keynesian theory developed during the great depression of the 1930s and shows way out of such depressions.

19. J.M. Keynes, The General theory of Employment Interest and Money. Macmillan & Co Ltd. New York , ST. Martine's press 1957 , P - 299
20. Alvin H. Hansen , The American Economy, MacGraw Hill Book company New York, 1957, P - 50 Hansen Write " I think we should do well to eliminate once and for all the phrase velocity circulation from our vocabulary because the actual role of this parameter remains unclarified.
21. Harry G. Johnson, Inflation and the Monetary Controversy : North Halland Publishing Company . Amsterdam , London 1972 , P - 43

At that time, it was found that money supply affected output and employment rather than prices. With the publication of "The General Theory of Employment, Interest and Money (1936), the Keynesian theory gained ground before 1950s.

Keynes enunciated²² the quantity theory in the way that "an increase in the quantity of money will have no effect whatever on prices, so long as there is any unemployment, and that employment will increase in exact proportion to any increase in effective demand brought about by the increase in the quantity of money; whilst as soon as full employment is reached, it will thence forward be the wage-unit and prices which will increase in exact proportion to the increase in effective demand". He thought that money supply affects price level through a complicated set of interrelationship. In symbolic form, the generalized statement of the quantity Theory of Money is,

$$e = e_a(1 - e_e \cdot e_o + e_e \cdot e_o \cdot e_w) \text{ - - - - 2.7}$$

Where e = clasticity of price with respect to money supply.

e_a = clasticity of price with respect to effective demand.

e_p = elasticity of price with respect to demand., $1 - e_e \cdot e_o(1 - e_w) \text{ - - - - 2.8}$

e_e = elasticity of employment with respect demand.

e_o = elasticity of output with respect to effective demand.

and e_w = elasticity of wage with respect to affective demand in terms of money.

Equation 2.7 states that prices depend on demand and effective demand . Again 2.8 states that e_p depends on e_e , e_o and e_w .

From this, it appears that the effect of money supply on price level is not direct and simple one as the classical and others propounded it, it is an indirect relationship. In a nutshell, the Keynesian theory of inflation is based on inflationary gap between aggregate effective demand and aggregate supply. Before full employment of resources in the economy, any change in money supply will affect output through employment and money supply affects prices: after full employment is reached creating aggregate demand larger than aggregate supply. After full employment of resources, any change in money supply will increase price level proportionately with the increase in money supply. The Keynesian and the Monetarist agree on the view that as long as full employment is reached prices rise by the excessive growth of money supply. The subsequent development of the process, according to Keynes, fully corresponds to the quantity theory of money, for output does not alter and prices rise in exact proportion to MV^{22} . It is to be noted that Keynes' work went unchallenged until the mid 1960s.

22. J. M. Keynes The General Theory of Employment, Interest and Money, Macmillan & Co. Ltd. New York, ST. Martin's Press, 1957, PP - 295-296 and 304-306.

However, in the post war period, western economists²³ came out with serious and extensive opposition to Keynesian theory. In course of the debate concerning the real importance of Keynesian theory, there was a rapid revival of the neoclassical theory of money. Concern over inflation led to a growing popularity of the quantity theory of money which after many years of decline and stagnation once again came on the scene as a rival of Keynesian theory. Monetarism developed during the 1960s, promising a way for solving the inflation problem.

Friedman starts with the restatement of the Quantity Theory of Money as a capital theory of demand for money.

He uses the Cambridge version of the quantity theory to explain price-money relationship. He concentrates his attention on money balance which is a stable²⁴ proportion on money supply and income. People increase their spending when their money balances are above the required level; and reduce their spending when they feel that the money balances are below that level. Stability of income velocity of money, k is a necessary condition for the conclusion concerning equi-proportional change in prices following monetary change i.e. money supply.

On the contrary, Radcliffe committee holds²⁵ (1959) the view that instead of the demand for money balance being a stable function of the price level and interest rate, it is highly volatile function. This volatility is supposed to be due to the private sector's unstable propensity to replace money to credit as a medium of exchange, so that the velocity of money at any interest rate is unstable. If people, instead of relying on money to facilitate exchanges, increasingly exchange goods on the basis of credit, the velocity of money - the value of transaction that can be made with a stock of money in society - will increase accordingly. If the inflation and money supply do not keep pace with it, the private sector will finance its high level of expenditure, by extending credit within the sector or through financial intermediaries. The committee holds the view that changes in the aggregate demand is unpredictable.

Again, Gurley and Shaw criticise the functioning of the monetary economy in accordance with the real balance effect by dividing money into Inside money and Outside money. The evolution of monetary system creates a situation in which credit money (inside money) is most typical and wide-spread element of money supply and the chief instrument of the payment turn-over.

23. S. Slichter, "The Passing of Keynesian Economy In: the Mean to Prosperity, Economica-Book, Buffalo, 1959, P-79

24. Milton Friedman "The Quantity Theory of Money A Restatement, In: Studies in the Quantity Theory of Money, The University of Chicago Press Chicago, 1956, P - 21

Friedman states "There is an extra ordinary empirical stability and regularity to such magnitude as in come velocity that can not but impress any one who works extensively with monetary data"

25. Laurence Harris "Monetary Theory, ISE Macgraw Hill Book Company 1985, P - 107

This type of money, being the evidence of debt, is not netwealth, and consequently does not provide a basis for the emergence of the real balance effect²⁶. The credit money, issued by the private banks, simultaneously serves as asset for the non financial sector and liabilities for the banks themselves. Changes in the purchasing power of money has opposite effect for the creditors and for debtors, the total effect, being equal to zero, so the change in the real value of cash balances consisting of credit money does not alter aggregate demand in the private sector and hence can not produce equi proportional effect²⁷ on the price level following variation money supply.

However, Gurley and Shaw's view that inside money is not a net asset of the private sector has been criticized by Pesek and Saving (1967). Pesek and Saving take a diametrically opposite view : that "all money is a net asset." They argue that the distinction between inside money and outside money is irrelevant. Again, the morden quantity theory approach to inflation is strong opposition to the Radcliffe version for it emphasizes the stability of the demand for money.

Friedman stresses upon the proportional relationship²⁸ between a substantial rise in the stock of money and that in the prices. This becomes tenable in view of the statistical work of Friedman and Meiselman which establishes monetary velocity to be is more stable and predictable than the simple Keynesian investment multiplier²⁹.

26. Laurence Harris "Monetary Theory" ISE Macgraw Hill Book Company, 1985, P - 67 Patinkin states that the real balance effect is the sine qua non of monetary theory for an exchange economy ; without it monetary theory can not exist. It states the demands for goods (and for real money balances) are not only functions of relative prices and the endowment of goods; it is also function of the realvalue of money balances. According to Patinkin economic agents are forced to respond to any deviation of the actual money balances from the desired level. Here is the main channel through which money influences the functioning of the economic mechanism. A disruption of the normal of habitual relation between the real stock of money and the amount of payments disturb the equilibrium and produces a response on the part of the consumers which is eventually expressed on the commodity market. In the event of excess money balances over the normal level there arises an additional demand for commodities so leading to a rise in prices. This process continues until prices rise in exact proportion to change in the real value of money balances.
27. John G. Gurley and Edward S. Shaw, Money in a Theory of Finance , The Brooking Institution , Washington, D.C. 1960, Chapter - 3
- & Inside Money and Outside Money , In : Monetary Theory by Laurnce Harris, ISE., MacGraw Hill Book Company, 1985, PP - 44
28. M. Friedman " Inflation its Causes and Consequences in : The Council For Economic Education, Bombay, 1963 P - 10. Friedman says , " I know of no exception to the proposition that there has been one to one relation between substantial rise in the prices and substantial rise in the stock of money".

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Subsequently, of course, the monetarists assert that velocity is a behavioural functional relationship of a few variables such as GNP or NNP and interest rate. This paves the way of the monetarist to deal with inflation in a better way than before. It allows the monetary velocity in certain conditions may change and monetarist say that such changes are one of the key aspects of inflationary process. In the new situation monetarists prefer to take a more flexible approach, although some western economists and government official documents frequently assert that monetary velocity remain constant over fairly a long period. There is still a gradual shift of emphasis in the theoretical constructs that stability of monetary velocity is derived from the stability of the relations between the indicators and other parameters of economy developments.

Friedman rejects other concept and believes that purely monetary considerations can explain the growth of prices over a period of nearly two centuries, so that this provides an adequate explanation of the inflation that gather momentum during the 1960s³⁰.

According to Friedman inflation occurs only when the quantity of money increases faster than the quantity of product³¹

The role of money supply on inflation also gets supports from the statement of Jacques Rueff³² that "there can be no inflation without the existence of surplus cash and no surplus cash without inflation."

In the late 1960s and early 1970s³³ the Monetarists embodied their theoretical principle in the monetarist econometric models. In those models, monetarists show that the growing money supply is the only cause of steady growth of prices. These models incorporate the impact of expectation for analysing inflation. However, the monetarist use elementary adaptive process to describe the shaping of inflation³⁴ The Andersen - Kasnosky model relating the period 1964-1973 shows that the growth of money supply from 3% to 6% a year led to an additional price growth of 2.3% a year³⁵ thus shows almost proportional increase in price level following an increase in money supply.

The monetarists assert that growing money supply accompanies with it a growth of nominal income. This may be due to an expansion of output and rise of price. In this way the impact of money supply is split between nominal magnitude and real economic variables and thus leads to the inadequacy of the monetarist models. In order to find a way out of this difficult without jeopardising the idea of the crucial role of monetary factor, some western economists³⁶ suggest a distinction between the impact of a growth in the absolute money supply and the velocity, rather, the acceleration or deceleration in the movement of the total monetary instruments.

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29. Milton Friedman-David Meiselman, "The Relative Stability of Money Velocity and the Investment Multiplier in The United States 1897-1958" In: Stabilization policies, Engle Woodcliff, 1963, P - 174.
 30. Industrial Relation Research Association, Proceedings of the 11th Annual Meeting, New York 1958, pp- 212 - 213
 31. M.Friedman, "The Counter Revolution in Monetary Theory" In: IFA, Occational paper No. 33 . London, 1970. P - 24

This implies that the economic activity and the level of prices crucially depend on the changes in money supply^{**37}

However, our study could not reveal any invariable proposition regarding the short term effect of money supply on price level and it is found to be obscure.^{***38} This obscurity³⁹ in the price level are due to changes in the output and changes in the amount of money that public desires to hold relative to their income. A more general view⁴⁰ on this aspect is that "there are several factors which affect price level in the short run. The short run impact of a change in money growth may differ depending on the state of inflation expectations. The immediate effect of given change in money growth also depends on whether it is perceived as permanent or just a temporary deviation from long term policy path. Factors affecting aggregate demand and supply are attributed to be the other factors behind the short term price change.

On the contrary, long run effect of money supply on price level is supported by many economists. There is a well established causal link between money supply and inflation over long run that has been supported by empirical evidence for the United States as well as many other countries. The exact nature of this relationship varies with time and institutions, but the long run relationship between appropriately defined money growth and inflation is difficult to refute⁴¹

In a nut shell, the views of the monetarists are that while short term price changes can be caused by various factors, protracted inflation is always and every where a monetary phenomenon.

32. D.C.Hauque " The Control of Inflation by Monetary and Credit Policy In: Inflation proceedings of a conference held by IFA, Macmillan & Co. Ltd. London 1962, P - 162
33. L.Andersen, K. Carlson " a Monetarist - Model for Economic Stabilization " In: Review of Federal Reserve Bank of ST. Louis , April , 1970, PP - 7 - 25., D. Karnosky, " The Link Between Money and Prices 1971-1976' In: Review of Federal Reserve Bank of St. Louis, June , 1976, PP - 17-23
34. M. Friedman, A Monetary Theory of Nominal Income In: The Journal of Political Economy, March April , 1971 Ph. Cagn , " The Monetary Dynamics of Hyper Inflation "In: Studies in the Quantity Theory of Money, Ed by M. Friedman, The University of Chicago Press, Chicago, 1956, PP- 25-117,
35. L.Andersen, D.Karnosky, " A Monetary Interpretation of Inflation " In: Analysis of Inflation 1965-1974, Cambridge Massachusetts , 1977, PP - 22-25.
36. Karl Brunner, " the Monetarist View of Keynesian Ideas" In: Lloyds Bank Review Oct. 1971 , No. 102, P - 39
Brunner says: " The Pressure of monetary growth is dominant on the price level. Monetary accelerations or decelerations on the other hand, dominantly influence the pace of economic activity"
37. Karl Brunner " The Role of Money and Monetary Policy" In: Reserve Bank of ST. Louis Review, Vol. 50 July.
38. Cagan. Ph. " Determination and Effect of Changes in the stock of Money 1875-1960.NBER distributed by Columbia University Press, New York and London, 1965. Ph. Cagn Considering long term statistical series concludes that "In the short run one can establish a fairly clear connection between changes in money supply and price level only in a few cases.
39. Friedman, M. " The Optimum Quantity of Money and Other Essays " Macmillan and Co. Ltd. Reprinted, 1970, P - 174

2.2. Quantity theory and Indian Economy :

Very few studies have been made by Indian economists over the issue of price money relationship. Sushil Kumar⁴² found the relevancy of the quantity theory of money in Indian Prof. Gyan Chand studies it and opines that the validity of the quantity theory is taken to be subject to certain refinements and even reservation, but the theory, in broad terms is taken to hold good and explains the changes in price level and the degree and the rate of inflation⁴³ studies⁴⁴ made by Saxena and Srivastava show a very high degree of correlation between the indices of money supply and price level during the period 1951-52 to 1967-68 in Indian. Guru⁴⁵ opines that there exists a board trend showing a close relationship between changes in money supply and changes in the price level in India. Relating proportional relationship between money supply and price level Mehta⁴⁶ states that he has not found any -

single year out of eighteen years 1950-69 holding the proportional relationship between money supply and price level. In the first 8 years the percentage increase in money supply is greater than in the price level and in the later 6 years, the percentage increase in price level is greater than that in money supply. However, during all those 14 years both money supply and price level move in the same direction. Shah's study⁴⁷ reveals that money supply does not affect price level directly but through the income earned and expenditure made there from i.e.

$$e_{PM} = (1 - e_{OY}) e_{YM} \text{ ----- } 2.8$$

Nagpal calculated the co-efficient of correlation⁴⁸ between raw data of money supply indices and price indices as 0.9 for the period 1950-51 to 1974-75. Ojha reports that increase in the state of inflation can fully be explained ever with a lag by the rate of monetary expansion. It only indicates that factors neither of pure monetary nor of keynesian nature operate in the inflation process. Probably in Indian condition the inflation is not only a combination of the keynesian and monetary varieties but is complex in nature⁴⁹.

40. Dornbusch and Fischer , Macro Economics, 5th Edition P- 647
41. The Economic Report of the President 1986, In: Macro Economics by Dorn busch and Fischer , 5th Edition. MacGraw Hill Publishing Company, 1990 P - 646
42. Kumar, Sushil, Price Behaviour in India during 1901 to 1960 an unpublished doctoral dessionation submitted to Delhi University.
43. Chand, Gyan, " The Menance of Inflation. Maniktala Bombay, First Publication, 1967
44. Srivastava and Saxena A note on the Quantity Theory of Money " In; Indian Economic Journal, Oct. Dec. 1968
45. Guru, DD. " Study of the Quantity Theory of Money in a Developing Economy ed by Ojha, P.D. Indian Economic Association, Popular Prakashan, Bombay , 1971, P - 29
46. Meh. ta, S.B. Quantity Theory and Developing Economy of Indian a paper in a collection of paper by Ojha P.D. Quantity Theory and Developing Economies, . . . Popular Prakashan, Bombay, 1971 PP - 33-38

47. Shah, V.C. Unpublished doctoral dissertation submitted to Columbia University, New York, p-265
48. Nagpal , C.S. "Monetary Policy and Inflation in India"BR Publishing Corporation, Delhi, 1982, P - 158
49. Ojha P.D. " Inflation Control and Price Regulation" In: Mongi a ed.Indian's Economic Development Strategies 1951 to 2000 A.D. New Delhi, 1985, P - 254

2.3 Literature survey of output money relationship: - Fluctuating and low growth rate of real GNP per person poses a macro-economic problem in an economy. It leads people to have a lower standard of life. People's wellbeing to a great extent depends on the high growth rate of real GNP per person. It is the target and hope of most societies⁵⁰. That is why, in recent period the macro economists renewed their interest in the issue of economic growth. Economists have attributed several factors to the growth of output. Our study concerns with one of the factors i.e. money supply to the growth of output in an economy.

The realization that money affects output is not a new idea to the people. From a very early period, people accord a very active role to money affecting output in an economy. Mercantilists⁵¹ view is note worthy in this case

"Money,⁵² according to Mercantilists was— to use the terminology of to-day — a factor of production on the same footing as land". They held the view that unduly high rate of interest is the main obstacle to the growth of wealth ; and knew that the rate of interest depends on the quantity of money. This view of the mercantilists is found in the statements of Locke⁵³, Gerard Malynes⁵⁴ and Edward Meisselden⁵⁵ etc. It is to be noted that they emphasized on the indirect effect of money supply via interest rate on out-put level .

50. Dornbusch and Fischer, Macro-Economics, Fifth edition, MacGraw Hill International edition Economic series P - 12

51. J.M.Keynes, The General Theory of Employment, Interest and Money, Macmillan & co Ltd. New York, ST. Martin's Press, 1957, P- 347
Mercantilists' view reflected in the British House of common concerning the serious depression of 1921, Sir Edwin Sandys stated that " the Farmer and artificer had to suffer almost every where, that looms were standing idle for want of money in the country, and that peasants were forced to repudiate their contracts not for want of fruits of the earth, but for want of money".

52. Ibid 341

53. Ibid 344

In " A Letter to a Friend Concerning Usury" Locke wrote (Printed in 1621)"High Interest daccays Trade. The advantage from Interest is greater than profit from Trade, which makes the the rich Merchants give over, and put out their stock to Interest and the lesser Merchants Break".

54. Ibid 342

Gerard Malynes asserts that "Plenty of money decreaseeth usury in price or rate".

55. Ibid 342

Edward Meisselden states that " The remedy for Usury may be plenty of money".

David Hume also states⁵⁶ about the stimulating effects of money supply on output. The role of money on output level is also found in the writings of R.G. Hatrey⁵⁷, Kunt Wicksell⁵⁸, F.A. Hayek⁵⁹, Mitchell⁶⁰ and Irving Fisher⁶¹ etc.

The classical economists upto 1930 held the view that money is neutral and works like a veil over the real sector of the economy. Under the impact of the unprecedented crisis of 1929-33 Keynes criticized the monetary theory as "Money does not matter" for economic growth and proposed a new view of the reproduction mechanism. The Keynesian model emphasised on non-monetary factors for the growth of output. Vigorous use of counter cyclical fiscal policy was the preferred method for reducing cyclical fluctuation.

56. D.Hume "Of Money"

In : David Hume, Writing on Economics ed by Eugen Routhwen, London, Nelson 1955, PP-37-38

Hume states "In the short run, we find that in every kingdom into which money begins to flow in greater abundance than formerly, everything takes a new face, labour and industry gain life, the merchant becomes more enterprising, the manufacturer more diligent and skillful and even the farmer follows his plough with greater alacrity and attention. In my opinion, it is only this interval or intermediate situation between acquisition of money and rise of prices that the increasing quantity of gold and silver is favourable to industry".

57. Hatrey, R.G. "Trade and Credit"

London, Longman, 1982, P- 76 Hatrey asserts that "the trade cycle is a monetary phenomenon because general demand is itself a monetary phenomenon".

58. Wicksell, K. (1934-35) Lecture on political Economy ed by L.Robbins. Translated by E Classen, London, Routledge and K. Paul, In his lecture Wicksell discusses economic fluctuation as being caused by changing credit conditions which cause deviation of money rate of interest from its natural rate.

59. Hayek, F.A. "Monetary Theory and the Trade Cycle" 1933 Jonathan Cape London
Hayek in his exposition of the monetary theory of trade cycle, holds that changes in the money supply is primarily responsible for cyclical fluctuation.

60. Wesley C. Mitchell "Business Cycle; the Problem and its Setting" New York NBER (1927) chapter II P - 62, Mitchell says, that business cycle occurs only in an economy in which economic activities are - - - carried on mainly by making and spending money".

61. Irving Fisher, "The Business Cycle Largely—a Dance of the Dollar,"
In : Journal of the American Statistical Association, December, 1923.

However, Keynes does not accord much importance to monetary policy⁶² for increasing output and employment in the economy. According to Keynes, full or even approximately full employment is of rare and short lived occurrence⁶³. In other words, the economy does not always remain at full employment level. The economy works normally under the condition of under employment equilibrium. In such a situation, there is possibility of pushing the output level further towards full employment level. Whether money supply will promote investment is not certain.

Money supply affects rate of interest. If marginal efficiency of capital (MEC) exceeds the rate of interest, there may be a spurt in investment. The stimulus⁶⁴ to output depends on the marginal efficiency of a given stock of capital rising relatively to the rate of interest. Referring the case of liquidity trap, when entire additional money supply goes to match the additional demand for money. As a result, money supply, can not affect investment, as a result, output remains unchanged in such situation.

Following the idea of Keynes' depressed economy, Harris and Hansen predicated a permanent stagnation after the second world war equal in scale to the 1929-33 crisis. Their prediction failed and in 1950s and 1960s despite painful recessions, the capitalist economy entered the period of revival which was characterised by a relative excess demand instead of a shortage as the Keynesian had predicted.

M. Friedman and his Co-workers challenge the Keynesian emphasis on fiscal policy and emphasise on the role of money and monetary policy during the 1950s and 1960s. The renaissance of the quantity theory is most explicit in the theoretical conception of a collection of essays⁶⁵ where monetarist claim that "**money does matter**" in the process of production. In the introduction, Friedman formulated a special version of the monetary view of the performance of the capitalist economy. In the 1930s, criticism of the postulates of the quantity theory had been a necessary prerequisite for the Keynesian break up of the whole structure of neoclassical economies. The very opposite situation developed during the 1960s. The refurbished quantity theory was used as a weapon for counter attack against Keynesian doctrine and the standard macro-model of income formation, dominant in present day theoretic literature in the capitalist countries comes into view. The present day monetarists emphasise the historical continuity of the works of the monetary theorists of trade cycle, with special reference to Fisher's article in which he identified the cycle with the dance of the dollar. This was followed by a series of empirical statistical studies to develop and polish upto the new theory⁶⁶.

The idea that monetary factors have a decisive influence on the general economic process is the main subject matter of the Monetary History. The Monetary History traces the changes in the stock of money - - - examines the factors that accounted for the changes and analysis the reflex influence that the stock of money exerted on the course of events⁶⁷. Their argument is based on historical evidences.

62. J.M. Keynes, The General Theory of Employment, Interest and Money.
Macmillan & Co Ltd: New York, ST. Martin's Press, 1957, P- 164

63. Ibid PP - 249 - 250

64. Ibid P - 143

In almost 100 years under review, there were six cases of deep economic depression each of which was preceded by a considerable reduction in money supply. From these instances they draw the conclusion that there is a close connection between cyclical fluctuation of money supply and changes in real income. However, they do not agree on one to one relation between economic change and monetary change on the ground that out of variety of factors attributed to monetary change, many of which are connected directly neither with contemporary business development. This is true for both short and long period.

Friedman and Schwartz give a more detailed analysis of the correlation between U.S. money supply and nominal income in the article *Money and Business Cycle*⁶⁸ using formal statistical method. They give emphasis on the turning point of business cycle in their analysis. From this they draw the conclusion that "appreciable changes in the rate of growth of the stock of money are a necessary and sufficient condition for appreciable change in the rate of growth of money income"⁶⁹.

This sort of notion is also echoed in the writings of Leonal C. Andersen and Keith M. Carlson⁷⁰ and Leland B. Yeager⁷¹ etc.

As regards to the direction of causation, the monetarists⁷² view that the monetary stimulus is spread from the financial market to the market for goods and services. On the contrary J. Tobin criticized the monetarist, on the ground that cyclical leads of money over money income say virtually nothing about direction of causation⁷³. Stil, Friedman insists on his version of the causes behind the cycle, claiming that the major direction of influence is from money to business and this is the key element in monetary theory of cyclical fluctuation⁷⁴.

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65. M.Friedman, Studies in the Quantity Theory of Money, Chicago : University of Chicago press, 1956.
66. M.Friedman, Anna J.Schwartz A. Monetary History of the United States, 1867 - 1960, Princeton University Press Princeton , 1963.
67. Lbid, P - 3
M.Friedman, The Optimum Quantity of Money and Other Essays Macmillan, Reprinted 1970 London and Basingstoke, PP - 264 - 265
68. M.Friedman Anna J. Schwartz, *Money and Business Cycle In : The State of Monetary Economics* NBER , New York, 1963
69. I bid P - 53
70. Leonal C. Andersen and Keith M. Carlson, "A Monetarist Model for Economic Stabilization . In: Fedesal Resesve Bank of St. Louis April 1970 , Vol. 52 No 4, P - 8
Leonal C. Andersen and Keith M. Carlson write "The Economy is basically stable and not necessarily subject to recurring periods of severe recession and inflation. Major business cycle movemnts that have occurred in the past are attributed primarily to large swings in the rate of growth in the money stock".

However, the monetarists do not provide with any clear transmission mechanism⁷⁵ by which money influences the economic system. According to monetarists there are many possible channels through which money may exert its powerful role on GNP through interest rates affecting investment or consumption through direct or indirect wealth effects on consumption through influencing the liquidity of business or personal balance sheets or simply because people receiving money are unable to refrain from immediately spending it on something whether goods, services, property or securities. Some monetarist specify one or more of the above channels as more important than others. Friedman, however, has continued to express his view that money may operate through any one or all of these channels, but how it operates is irrelevant and unimportant. The empirical fact is that velocity is constant. They apply a black box approach for it. They assign an important place to the stability of the demand function for money in the transmission mechanism model. They hold the Cambridge version of the quantity theory according to which there is a stable proportion between money supply and income. A disruption of this proportion by the haphazard changes in money stock upsets the portfolio balance. According to Friedman⁷⁶ whenever the volume of cash balance changes under the impact of some external factors economic agents response to it by a change in their assets and liabilities structure. This, changes the relative prices of different assets and the rate of return they earn. This changes in the consumption and investment spending which in turn shape the amount of final product.

It is to be noted that the extraordinary importance of money is curiously laced in the works of the monetarists with the traditional conclusion of the quantity theory that money factors are inessential in the long run and that they mainly influence the price veil. This dichotomy gives rise to a real contradiction⁷⁷ in assessing the effect of government's stabilization measures : monetary and credit policy are regarded as the most powerful and effective instrument for exerting an influence on the economy and this fails to square with the neoclassical view of money as a veil.

71. Leland B. Yeager, *Monetary Policy and Economic Performance*, American Enterprise Institute, Washington 1972, P - 13. He writes, "Certain unsatisfactory aspect of the performance of the capitalist economy - inflation, recession, cyclical unemployment, and balance of payments crisis are not characteristic of capitalism itself but result instead from a defective monetary policy and monetary policy is a govt. function".
72. M. Friedman, *The Optimum Quantity of Money and Other Essays* P - 231
73. Jame Tobin, *Money and Income : Post Hoc Ergo Propter Hoc ?* In *The Quarterly Journal Economics*, Vol. LXXXIV, May 1970, No 2, pp - 301 - 17
74. M. Friedman, "Comment on Tobin", In: *The Quarterly Journal Economics* Vol. LXXXIV, May 1970, No. 2, pp - 321,326
75. Ackley G., *Macro Economics : Theory and Policy*, Collier Macmillan International Editions Reprinted 1987, New York London P - 402
76. M. Friedman, *The Optimum Quantity of Money and Other Essays* pp - 229 - 234
77. David I. Fand, "A Monetarist Model of the Monetary Process, In: *Journal of Finance* vol. XXXV, May 1970, p - 279

To avoid such contradiction the monetarists are forced to formulate a more clear cut model reflecting their notions about the key interrelationship in the economy and Friedman did it in two long articles⁷⁸

In "A Theoretical Frame Work for Monetary Analysis", Friedman outlines a simple model of six equations in seven variables. It starts with the key point of the quantity theory by dividing variables into nominal and real economic variables. The model consists of

$$\begin{aligned} M^D &= P \cdot I(Y/P, r) \text{ ----- (1)} \\ M^S &= h(r) \text{ ----- (2)} \\ M^D &= M^S \text{ ----- (3)} \\ C/P &= f(Y/P, r) \text{ ----- (4)} \\ I/P &= g(r) \text{ ----- (5)} \\ Y/P &= C/P + I/P \text{ (or } S/P = (Y-C)/P = I/P \text{ --- (6)} \end{aligned}$$

Where C is consumption; I investment P price level Y nominal income, M^D money demand, M^S money supply and r rate of interest.

Equations 1 to 3 describe monetary sector and 4 to 6 real sector of the economy. Equation 1 states that money demand depends on real income, prices and interest rate. (2) States that money supply depends on interest rate and (3) states the equilibrium condition in the money market. Equation (4) states that real consumption depends on real income and interest rate (5) States that investment depends on rate of interest and (6) states the equilibrium condition in the real market.

To make the model explicitly complete the advocate of the monetary theory adds the equation.

$$Y/P = y \text{ ----- 7(a)}$$

7(a) states that real income is determined outside the model.

Friedman claims that prices are the chief instrument for correcting the market situation because prices adjust faster than the quantities of commodities exchanged in the market indeed so fast that the price correctives may be regarded as instantaneous. This enables one to determine the three real variables :C/P, I/P and r .

The equation of money demand in the money market sector takes the form of fisher's equation of exchange which determine the price veil. The monetarists believe that economic agents are not interested in nominal money balance but in the stock of money evaluated in accordance with actual purchasing power. Changes in nominal balance affect the value of money through the mechanism of demand and prices which generate a process of economic correctives which result in a fluctuation of the final product.

Friedman also went on to analyses the Keynesian Income expenditure theory in his article adding the equation $P = P_0 \text{ ----- 7 (b)}$

7(b) states that price level is determined outside the model. This enables to define the relation between the interest rate and real income (Hick's LM curve and Hick's IS Curve). Their simultaneous solution gives the equilibrium interest and real income. However, this article could not provide a satisfactory answer to real economic development and it is based on some arbitrary assumptions. Neither of the two approaches can say anything about the factors which determine the proportion in which the short term changes in nominal income are divided between prices and output.

In view of the unfavourable response to his first article, Friedman subsequently proposes another model in which the nominal income is not divided into physical and value component.

On the assumption of the unit elasticity of demand for money with respect to real income Friedman reformulates the demand for money equation as

$$M^D = Y.l(r) \quad (1)$$

Carrying the idea from Keynes, that the current market rate of interest (r) is largely determined by the long run expected rate (r^*), he writes

$$r = r^* \quad (2)$$

According to Fisher, current market interest rate depends on real interest rate and the expected change in the commodity price

$$\text{i.e. } r = \rho + (1/P) \cdot dp/dt \quad (3)$$

Combining the idea of Keynes and Fisher and assigning asterisks to denote permanent rate to both real and nominal part of the right hand side terms.

Friedman formulates

$$r = \rho^* + (1/P) \cdot dp/dt \quad (4)$$

Keeping in mind that $y = Y/P$, he writes

$$r = \rho^* + (1/Y) \cdot dY/dt - (1/y) \cdot dy/dt$$

$$\text{or } r = \rho^* - g^* + (1/Y) \cdot dY/dt \quad (5)$$

Where $g^* = [(1/y) \cdot dy/dt]^*$ permanent rate of growth of real income.

Again, he put $\rho^* - g^* = k_0$.

Friedman assumes that k_0 is determined outside the system.

It follows that

$$r = k_0 + (1/Y) \cdot dY/dt$$

78 M.Friedman A Theoretical Frame Work for Monetary Analysis [In : The Journal of Political Economy vol 78, No. 2 March April 1970 pp - 193 - 238

A Monetary Theory of Nominal Income In: Monetary Theory and Monetary Policy in the 1970s proceedings of the 1970 Sheffield money seminar Oxford University Press London 1971, pp - 74 - 71

Friedman's second article consists of the following equations

$$M^D = Y.l(r) \text{ ----- (1)}$$

$$M^S = h(r) \text{ ----- (2)}$$

$$M^D = M^S \text{ ----- (3)}$$

$$r = k_0 + (1/Y.dY/dt)^* \text{ ----- (4)}$$

Friedman states that at any point of time $[(1/Y.dY/dt)]^*$ is predetermined variable presumably based partly on considerations outside the model. Thus, the model becomes a model of four equations in the four unknowns : M^D , M^S , Y , and r . As price and quantity do not enter separately in the models, so this is a model of nominal income.

To simplify the model more, Friedman assumes that money supply is exogeneously determined.

$$\text{He writes } Y_t = M(t)/l(r) \text{ ----- (5)}$$

$$\text{or } Y_t = V(r).M(t)$$

Where v = stands for velocity of circulation. He states that $r = k_0 + (1/Y.dY/dt)^*$ and $Y_t = V(r).M(t)$ constitute a two equation system for determining the level of nominal income at any point of time.

From the two articles, it appears that although Friedman's theoretical model is not adapted for describing and analysing the effects produced by the mechanism of government economic policy which is very important in the economic development, his second article of nominal income model contains all the chief components of monetarist doctrine: the neoclassical function of demand for money, which established a direct relationship between the demand for cash balances and the magnitude of money income; the exogeneous money supply; and the specific monetarist version of the mechanism underlying the dynamics of interest rate.

It is to be noted that Rational expectationists like Sargent, Lucas and N. Wallance do not support the Friedman - Phelps hypothesis of importance of money supply on output level in the short run. They, on the other hand, hold the view that changes in money supply, if it is already anticipated by the agents, affects only inflation but fails to affect real output or employment. They assert that any predictable part of money supply has no effect on output, employment or any other real variables in the economy. Only unpredictable part of money supply can have an effect on output.⁷⁹

79 Dornbush and Fischer, Macro Economies, fifth edition. McGraw Hill Publishing Company, 1990, P-530-531; William H. Branson Macro Economics Theory and policy Third edition Harper & row, pp - 205-216

2.4 Relevancy of the theory in Indian economy.

The effects of money supply on output level (GNP) have been studied by few economists in India.

Sinha (1971) shows money supply and national income relationship in an article⁸⁰ for the year 1951-1968 first without and then with a lag of one year. He calculates the co-efficient of correlation $r = 0.98$ and 0.97 respectively.

Money supply increased by 20% 30% and 58% respectively in the first, second and third plan and national income rose by 18%, 20% and 20% in the three plans respectively. From this, he concludes that money supply and national income correlated significantly in India.

Adhvarya calculated⁸¹ the coefficient of correlation between money supply and national income for the period 1948-67 based on IFS and IMF data as 0.97 in India .

The two studies, concerning the output money relation made in India recorded very high degree of positive correlation. However V.K.R.V. Rao⁸² had long ago theoretically argued that in a country like india continuously increasing money supply could not provide any significant inducement to productive activities and now extensive statistical evidence is available to lend support to his view point . In this context statement made by C. Rangarajan is note worthy, he states , “ Money has an impact on both out put and price. The process of money creation is a process of credit creation. Money comes into existence because credit is given either to the government or the private sector or foreign sector. Since credit facilitates the production process, it has a favourable impact on output. At the same time the increase money supply raises the demand with and upward pressure on prices” . He states⁸³ that in India price effect of money supply is greater⁸⁴ than the output effect. As regards the trade off between economic growth and inflation, he states⁸⁵ “ In the short run there is such a trade off . Some of the econometric models for india indicate the existence of a trade off but at a heavy cost. A higher growth rate can be achieved only at the cost of a fairly high inflation rate. Over a longer period, growth can not be bought with the aid of higher prices. On the other hand, it is price stability which provides a better invironment in which growth can occur and social justice can be ensured.

80. Sinha, Chakradhar, “Quantity Theory of Money and Developing Economy : the Inidan Expreience “. In Quantity Theory and Developing Economics, ed. by Ojha P.D. Popular Prakashan, Bombay, 1971.
81. Adhvarya, J.H. “Theory of Money in a Developingn Economy : Quantity Theory vs The Keynesian Approach”. In: Quantity theory and Developing Economic, ed. by Ojha P.D. Popular Prakashan, Bombay , 1971.
82. V.K.R.V. Rao “ Investment Income and the Multiplier in an Underdeveloped Economy” In A.N. Agarwal and S.P. Singh. (eds) The Economics of Underdevelopment, New York 1963.
83. C.Rangarajan, “ Issues in Monetary Policy “ In: P.R. Brahmananda and V.R. Panchmukhi (eds) The Development Process of the Indian Economy, Bombay 1987 , P - 842.
84. Misra & Puri, Indian Economy 8th Edition 1990, Himalaya Publishing House , P - 903
85. C.Rangajan “ Issue In Monetary Policy In: P.R. Brahmananda and V.R. Panchmukhi (eds) The Development Process Of the Indian Economy, Bombay - 1987 , P - 842

CHAPTER - III

DATA AND METHODOLOGY

3.1 Introduction : Nature and Period of Data Set.

In this study Gross National Product (GNP) with 1985 = 100) has been used to measure output level and M_2 for money supply in Indian economy. Wholesale Price Index (WPI) is used for price level with 1985 as the base year (1985 = 100).

We have used the historical data set in this study for estimation of the models. It is a yearly data set. The data set has been taken for the period 1950-92. This data set has been presented in the table 3.1.

3.2 Data for Money Supply :

We have used M_2^1 instead of M_1 , since M_2 very often shows greater stability when new kind of checking accounts is introduced. M_2 is free from this problems and, therefore, considered to be a better barometer of economic activity. Again, recent research works support the view that changes in the inflation rate over time can be predicted on the basis of actual M_2 money growth relative to the growth of potential output.²

3.3 Sources of Data :

The data for GNP, Money Supply (M_2) and wholesale Price Index(WPI) have been collected from International Financial Statistics (IFS). The IFS data set of the relevant variables have been collected for the period 1950-59 from the Year Book 1979 for the period 1960-85 from the Year Book 1988, and for the period 1986-92 from the IFS 1993 issue.

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1. Reserve Bank of India uses several concepts of Money Supply, viz. M_1 , M_2 , M_3 and M_4 following the recommendation of the 'Second Working Group on Money Supply. [Report of the Second Working Group "Money Supply in India". Concepts, Compilation and Analysis" Reserve Bank of India, 1977.
 2. Hallman, Jeffrey, Richard, Porter. and David, Small. " M_2 per unit of potential output as an Anchor for the price level". Board of Governors of Federal Reserve System, Staff papers no. 117, April 1989.

Table-3.1 : Price level , GNP and Money Supply (data)

Year	Price level base year 1985	GNP billion of Rs.	Money supply (billion of Rs.)
1950	20	66.0	21.64
1951	21.9	65.7	21.07
1952	19.2	68.3	20.60
1953	19.0	73.2	21.09
1954	18.2	67.8	22.66
1955	16.7	71.8	25.26
1956	18.8	82.7	27.12
1957	19.9	83.9	29.87
1958	20.3	94.1	32.90
1959	21.1	97.9	36.94
1960	15.3	104.7	38.92
1961	15.7	111.20	40.17
1962	16.2	118.9	44.03
1963	16.8	136.8	48.69
1964	18.6	160.3	53.27
1965	20.1	167.7	59.07
1966	22.5	192.0	65.69
1967	25.9	224.3	71.84
1968	25.8	231.1	78.68
1969	26.3	256.1	89.32
1970	27.9	279.9	100.05
1971	29.3	301.5	111.14
1972	31.9	332.9	135.17
1973	37.7	410.3	161.52
1974	47.7	485.1	181.27
1975	49.6	516.8	206.74
1976	48.7	559.8	257.35
1977	52.4	627.3	306.67
1978	52.2	683.1	371.54
1979	58.2	753.9	437.35
1980	70	953.1	506.88
1981	78.5	1116.2	595.33
1982	80.5	1238.7	697.75
1983	86.8	1444.3	815.58
1984	94.2	1596.8	962.26
1985	100.0	2608.1	1124.72
1986	105.6	2911.4	1326.35
1987	112.9	3305.8	1505.38
1988	122.7	3921.0	1825.00
1989	131.1	4482.6	2112.00
1990	142.9	5240.3	2430.30
1991	162.2	6026.7	2875.4
1992	181.4	**	3357.3

** The GNP data for 1992 was not available during the registration of the thesis. Consequently, this present study involves output money supply relationship until 1990-91. While the price money relationship has been studied until 1992.

3.4 Rationale Behind the use of IFS data set:

In this study IFS data set have been used in the presence of Reserve Bank of India data. This is done in view of the fact that several researchers observe that the Reserve Bank of India collects detailed data which it does not

release in India. It does, however, make these data set available to the World Bank and the International Monetary Fund so that the foreigners with access to these institutions can easily get hold of them. It is the common place for Indian researchers to realise³ for the correct data on the external and internal debt, on actual payments made on the total defence account, one has to turn to foreign publications which use data made available by India Government. This has motivated our choice of the IFS as the source of data set used in this study.

3.5 Methodology :

The study involves the use of econometric method of estimation. Ordinary Least Square (OLS) method is used for the estimation of the models. The General Least Square (GLS) method is applied, when the OLS estimation suffers from serial or auto-correlation. Due care is also taken for detecting the presence of the "Single Equation Problem" like auto-correlation and heteroscedasticity. The Durbin-Watson Test is performed in case of each regression estimation for detecting the presence of auto-correlation. D-W statistic is reported along with each estimated regression equation. The goodness of fit of the estimated relationship is measured through R^2 . It has further been corroborated by F-test. The significance of Regression constant and Regression Co-efficient have been determined through the standard error and test of 't' tests for structural changes. With this end in view "Standard Error" of each estimation is reported, along with the estimated regression equations. These t-tests are essentially one Tailed Tests.

Graphs depicting Time plots of relevant variables have been used in the study for explanatory exposition of the relationships among the variables concerned.

3. The Front Line : July 20 August (91 Vol.8 No.15, p. 11).

Again graphical method has been undertaken to supplement the quantitative method of identifying sub-periods in which structural changes have occurred in the relationship of macro-variables concerned.

'Window- Search' for structural changes has been carried through 'Chow Tests'. The basic methodology in this respect , has been explained in the appropriate text of the thesis.

Under the 'Chow Tests' a series of iterative regression equation have been estimated and the results have been subjected to battery of Tests. The relevant formulae and forms have been given in the appropriate text of the study.

3.6 Data Transformation :

In case of auto-correlation in the estimated regression equations , the data set is transformed with appropriate methods like the Cochrane - Orcutt Method⁴ and Generalised Least Square Method. Again, in some cases, logarithm of the original data set is used in order to avoid the problem of heteroscedasticity.

4. Cochrane, D. and G. H. Orcutt, " Application of Least Square Regressions to Relationships Containing Autocorrelated Errors" In : Journal of the American Statistical Association, Vol. 44, 1949, pp. 32-61.

Wallace T. Dudley & J. Lew Silver, Econometrics Addison-Wesley Publishing Company, 1988, p. 296.

CHAPTER - IV

MONEY SUPPLY AND PRICE LEVEL IN INDIA OVER THE PERIOD 1950 - 92.

4.1 INTRODUCTION :

Indian economy has been witnessing spate of rising prices over the last few decades. As a matter of fact, price rise is not a strange phenomenon in India. Spate of price rise can be traced as far back 1950 when the first five Year Plan formally came to play. Since then Indian economy has been experiencing such price rise and inflation, has been a house hold phenomenon.

4.1.1 Graphical presentation of the phenomenon :

An idea about the nature of price variation over the period 1950 - 92 can be obtained from the Figure(4.1) which presents the time plot of price level (P_t). It is observed from the time plot that —

- (i) Price level delineates an over all rising pattern since 1950 with occassional fall in some years. Almost an exponential price rise is noticed since the later part of 1970 till the end of the period of study. The time series P_t plotted in Figure 4.1 is, however, non-stationary¹; on the other hand, the Figure 4.2 presents the time plot of stationary² data set for P_t . This figure shows that —
- (i) a distinctive rise in price level (over the corresponding previous year price level) is visible over the period 1961 - 1966, 1968 - 74, 1977 - 80, 1982 - 84 and 1986 - 92.
- ii) a small declining trend and occasional respite exist between 1952-55, 1956-60, 1967, 1975-76 and 1981-85.
- (iii) price variation proceeded with occassional jumps. The fluctuations in price level became noticeable since 1970's.

1. Non - stationarity is identified from the coefficient in the AR(1) process of series. The coefficient exceeding 1 indicates non - stationarity in the dataset.

2. Stationarity is ensured through first order differencing of the data set.

Fig. 4.1 : Time Plot of Price level, P_t

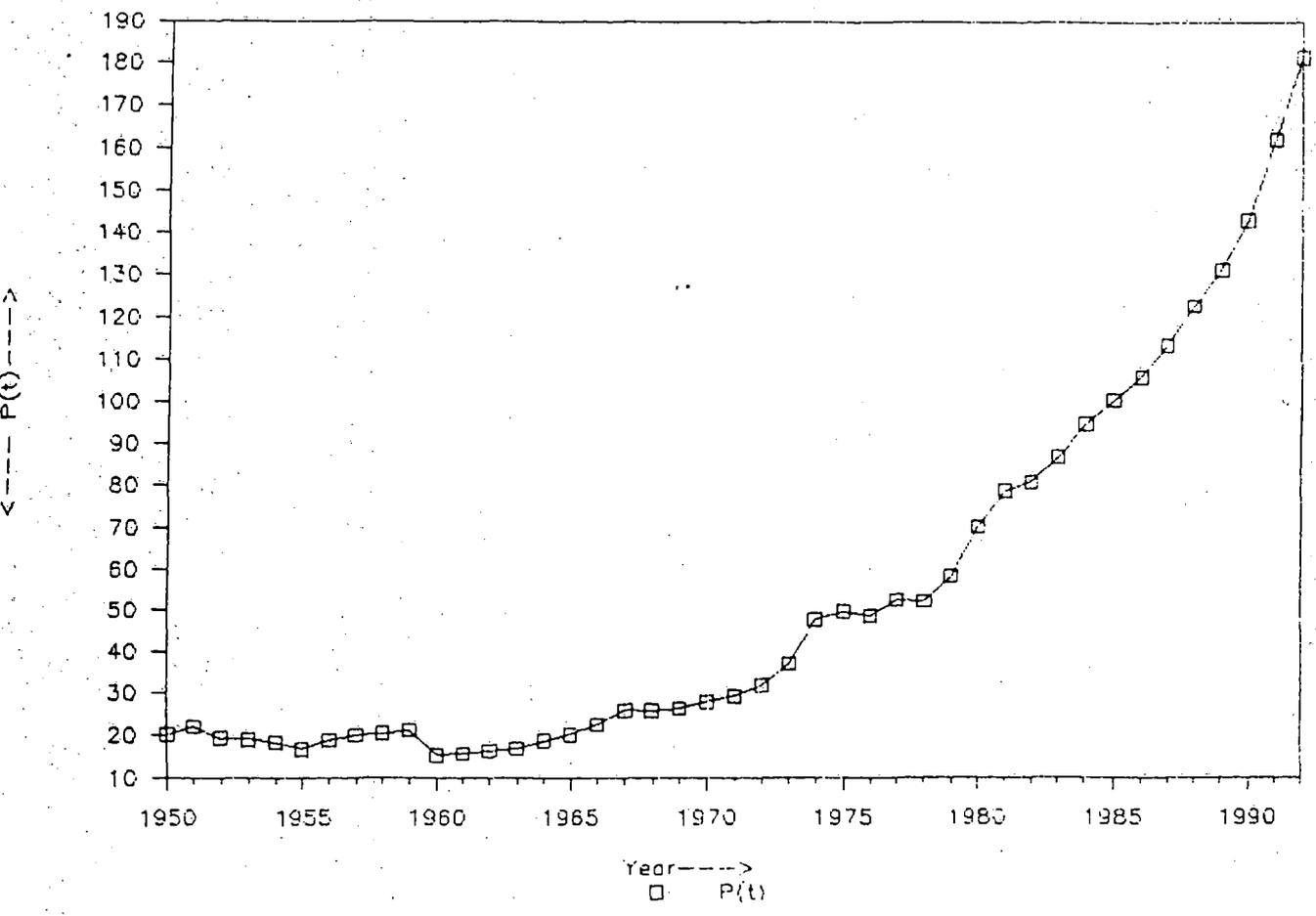
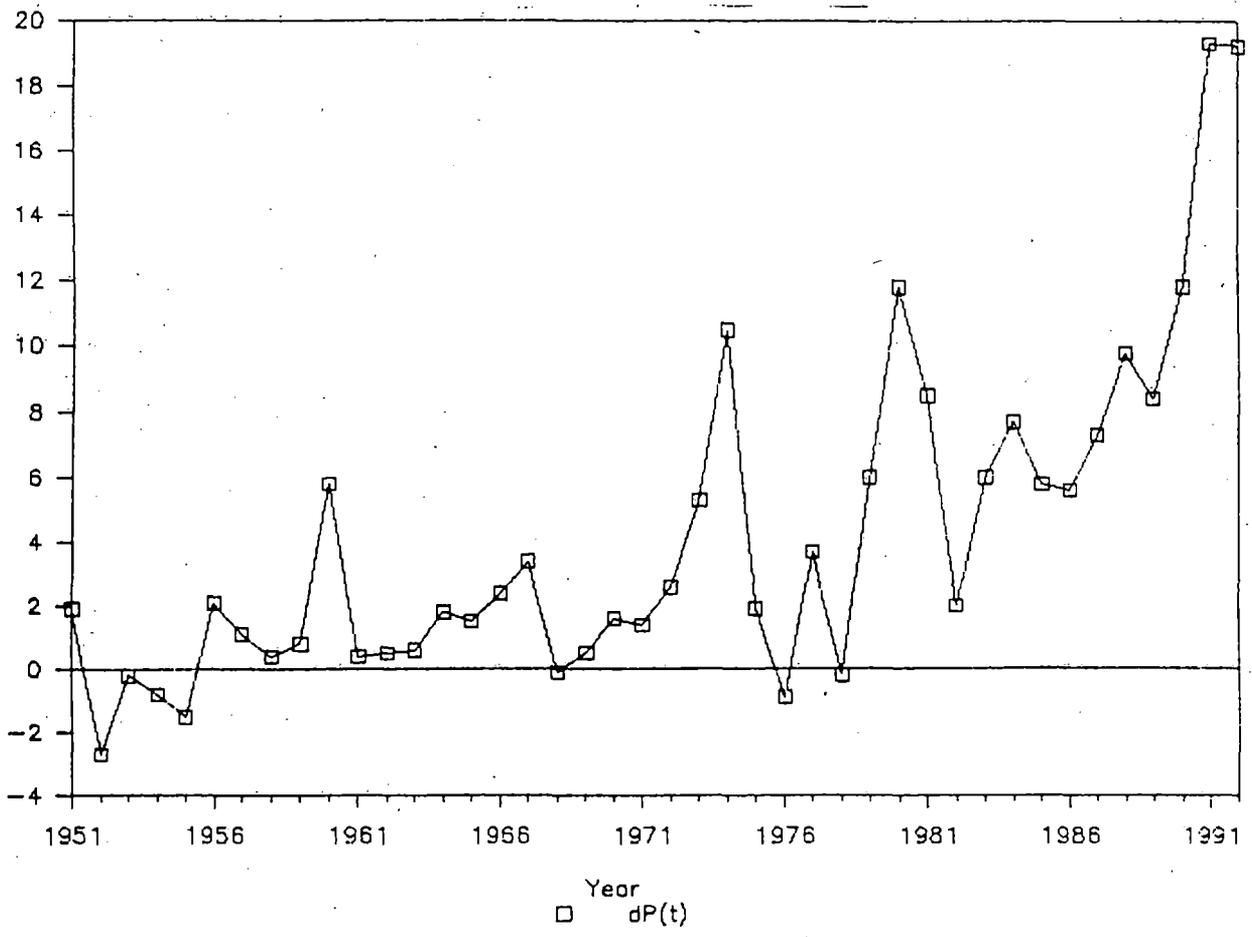


Fig. 4.2 : Time Plot of Price Level, dP_t



4.1.2 Economists' view behind the general price rise :

Economists have sought to identify factors behind such price variation in the period of study. Studies³ undertaken to this effect identify several factors responsible for price rise at different occasions. Fuel price-rise arising out of rise in import price for fuel, increasing indirect taxes in successive years and bad monsoons along with subsequent crops failure etc. have been considered to be the supporting factors behind such price rise in India.

However, it is largely believed that unwarranted rise in money stock has primarily manifested itself into price rise. Other factors have just accentuated such price rise occasionally.

4.2 Objective of Study :

The objective of the study, in this present chapter, is to examine whether price variation in India is related any way to that in money

supply⁴ over the period 1950-92. This study is devoted to explore the relationship if any, between price level and money supply. We are aware of the fact that money supply may, at times, be modified by the monetary authorities taking clue from price movement. In such case, price level enters into the argument vector for money. Consequently, the analysis involves system approach.

However, in the present study, we concentrate ourselves only on variational association between price level and money supply where our concern is to see, how far the variation in money supply could explain the variation in price level over the period under study. This is in conformity with Friedman, Phelps and other monetarist researchers. Consequently, in this approach money enters into the argument vector for price only. No independent equation for money figures in the analysis. This makes money supply an exogenous variable.

3. According to Ashok Mitra, Prabhat Patnaik and a few other economists, Agricultural Price Policy of the govt. has been a major contributory factor to the inflationary price rise in the past. Ashok Mitra Stabilisation and Growth : Some Preliminary Notes (Mimeo); Prabhat Patnaik, Current Inflation in India, social scientist, Jan.-Feb. 1977, pp 34-35.

4. We are aware of the fact that money supply may, at times, be modified by the monetary authorities taking signal from price movements. This present study is not concerned with such situation, but it only considers the variation in price level following variation in money supply and seek to ventilate underlying relationship over the period 1950-92.

4.3 Price level and money supply :

Graphical Examination :

Figure 4.3 presents the time plot of price level (P_t) and money supply (M_{2t}) simultaneously. It is observed from the time plot of two non-stationary series that —

- (i) Price level displayed positive variation following that in money supply until 1965. During this period (1950 - 65) both the series displayed rise over time with very little difference in fluctuation.
- (ii) Since 1965 both the series displayed overall rise over time. Money Supply exhibited almost exponential rise while price level displayed rise at a lower rate.
- (iii) In order to gain better insight into the joint movement of these variables we consider the figure 4.4. The stationarity of this figure is attained through first differencing of the series concerned. So each point in the series represents the variation of the variable over the last period concerned.

It is observed that —

- (i) Variation in both the series were largely positive over the period concerned.
- (ii) the differences in the rate of variations of these two series were very insignificant until 1968.
- (iii) the rate of variation in money supply exceeded that in price level since 1969. Since 1979 money supply displayed noticeable variation in glaring contrast with that in price level.

These Figures, therefore, seem to represent the presence of significant association between the variations in the variables concerned. However, these figures give us a tentative idea of the association between money supply and price rise in India over the period concerned.

Any conclusive and precise analysis in this direction needs a study with quantitative examination of the data set for the variables concerned. The present study in this chapter is an attempt in this direction.

Fig. 4.3: Time Plot of Price Level (P_t) and Money Supply (M_{2t})

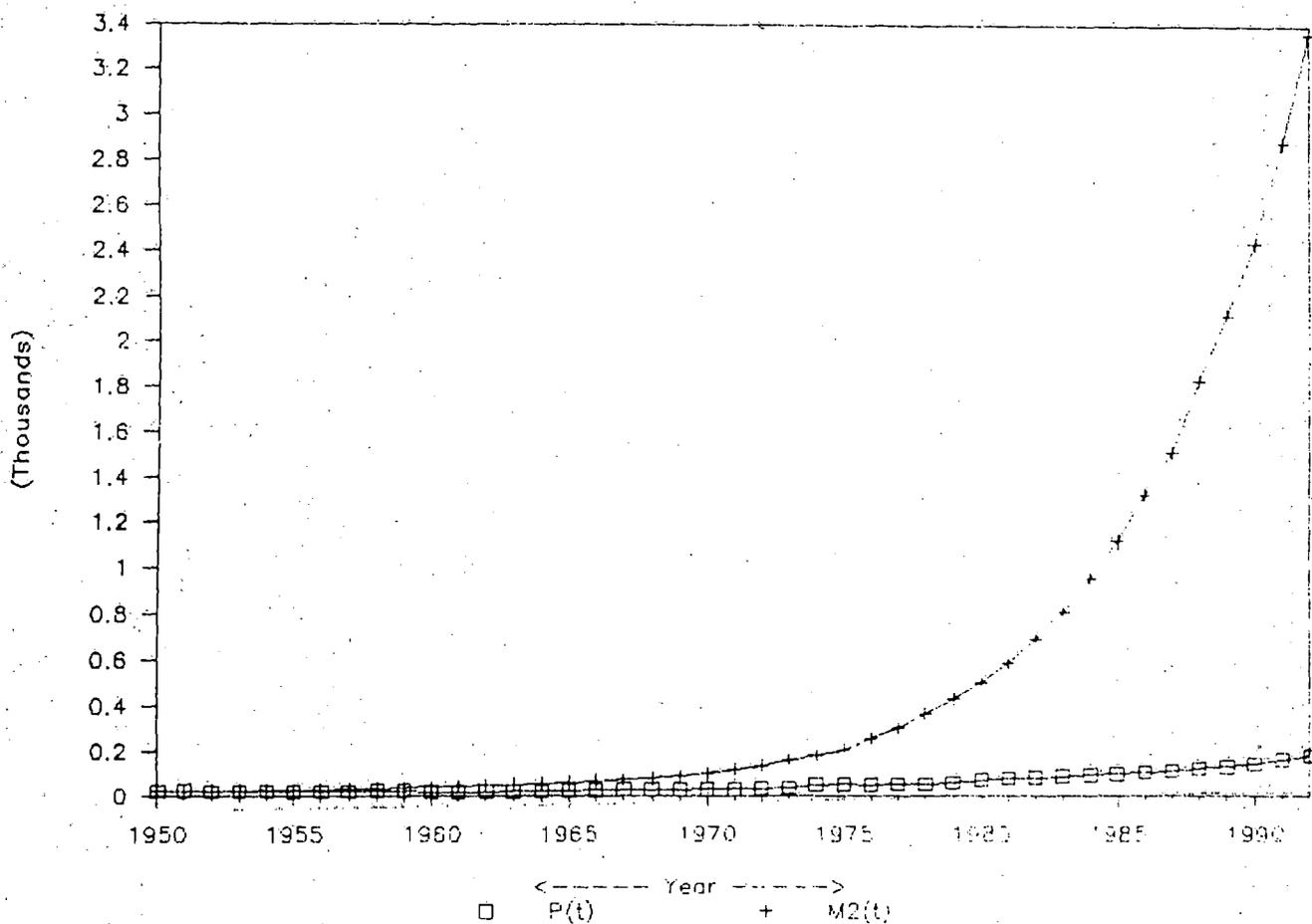
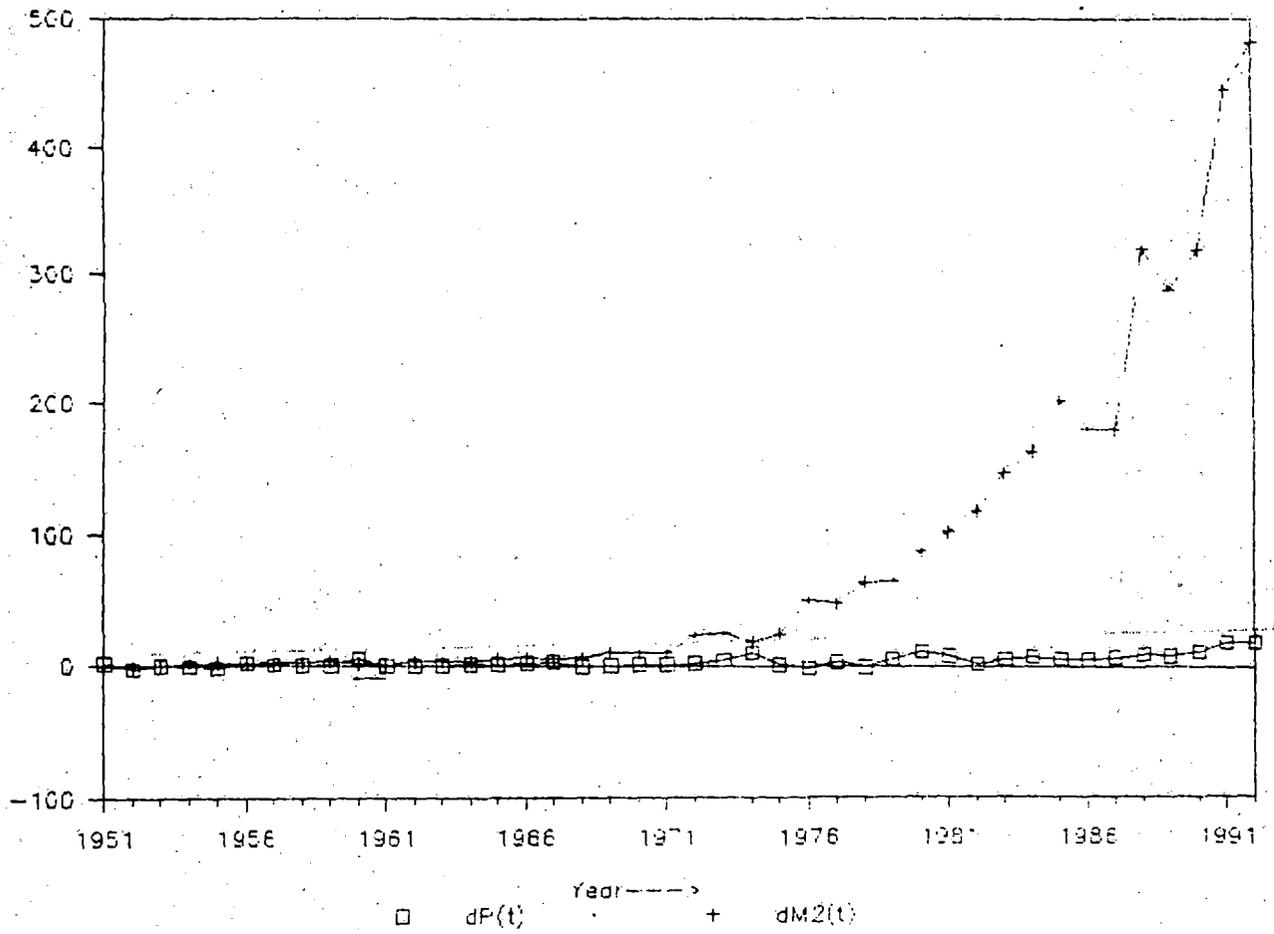


Fig. 4.4: Time Plot of Price Level (dP_t) and Money Supply (dM_{2t})



4.4 THE MODEL :

The quantitative analysis presupposes the existence of a theoretical model which is later subjected to estimation. In this case we, therefore, need a model where price level is expressed as a function of money supply.

Several⁵ mathematical models for price (as dependent variable) have been developed and estimated by economists for different purposes. In some models, price has been expressed as a function of excess demand. In other models, price has been shown to be related to cost of production. In monetarists' model, price is found to be related to money supply. In Rational Expectationists' model, price has been expressed as function of both anticipated and unanticipated part of money supply. The Rational Expectationists' started with aggregate demand function :

$$M_t + V = P_t + Y_t \quad \dots\dots\dots 4.1$$

Where M_t = log of money supply

V = log of constant velocity of money

P_t = log of price level

and Y_t = log of real output

With the Lucas' supply function

$$Y_t = Y_p + \beta (P_t - {}_{t-1}P_t) + \varepsilon_t \quad \dots\dots\dots 4.2$$

Where Y_p = Capacity / full employment output
and money supply rule

$$M_t = \alpha M_{t-1} + \varepsilon_t \quad \dots\dots\dots 4.3$$

Where $E(\varepsilon_t / I_{t-1}) = 0$ along with

$${}_{t-1}P_t = E(P_t / I_{t-1})$$

it is derived that

$$P_t = \alpha M_{t-1} + V - Y_p + \varepsilon_t / (1 + \beta) \quad \dots\dots\dots 4.4$$

Given Y_p and V constant, P_t becomes a function of both anticipated and unanticipated

(αM_{t-1}) and ε_t part of money supply respectively. More precisely, $P_t = f(M_t)$ i.e. price is a function of total money supply, M_t .

The model seems to be appropriate in our analysis where we are interested in estimating the variation in price level following variation in money supply over the period concerned.

Consequently, the model for our estimation is

$$P_t = \alpha + \beta M_{2t} + u_t \quad \dots\dots\dots 4.5$$

V. C. Shah, Unpublished Doctoral Dissertation submitted to Columbia University, New York, P - 265.

J. M. Keynes, The General Theory of Employment, Interest, and Money Macmillan & Co. Ltd. New York, St. Martin's Press, 1957, PP - 292 - 309.

4.5 Rationality behind the choice of the Model :

System approach has been set aside by the Keynesian and Monetarists on the ground that the model becomes "Under-identified" in most of the cases. Friedman points out that the essential problem of the Keynesian and the classical approach is the problem of a "Missing Equation". The "Missing Equation" problem notifies that in those models number of equations are fewer than number of variables. There are $n-1$ equations for n variables. Consequently, one variable must be taken as exogenous one, otherwise, the systems remain indeterminate.

Under these circumstances, system approach would indicate "Under-identification". However, "Rational Expectationists" proceeded with structural system, with more equations and fewer variables. Sometimes, the variables are "Instrumental Variables" without bearing any proper physical and economic explanations. Consequently, the models are "Over-identified". This problem is termed as the problem of "Observational Equivalence".

It may, however, be noted that classical structural model where number of equations being fewer than number of variables and the Neoclassical structural model (i.e Rational Expectationists) model where number of equations exceed number of variables establish "Neutrality of Money" where monetary shock falls on price level entirely.

Monetarists, therefore, stress upon single-equation approach without incorporating "Two Way Linkage" among the variables in order to look for any effect on output level of changes in money supply. This has been taken up by researchers like Dornbusch, Fischer and Johnson etc.. The model in this present study is being chosen following this practice.

4.6 Estimation and findings :

The model 4.5 has been estimated with GLS method⁶. The estimated model is ^{7,8}

$$\hat{P}_t = 1.3905 + 0.034355M_{2t} \dots\dots\dots 4.6.1$$

(0.5099) (0.0035023)
[2.7271] [9.8094]

$$R^2 = 0.7063668 \quad n = 42$$

$$F^* = 96.244 \quad D.W = 1.73$$

$$D.F = 1, 40$$

6. The OLS estimated model is

$$\hat{P}_t = 25.355 + 0.052095 M_{2t} \dots\dots\dots 4.6.2$$

(2.0192) (0.0020457)
[12.557] [25.466]

$$R^2 = 0.94, F^* = 648.52, D.W = 0.1007$$

$$n = 43, D.F = 1, 41.$$

The estimated model suffers from auto correlation, so the model has been estimated with GLS method.

7. The estimated model 4.6 is free from auto-correlation. For the test of auto-correlation, we have

$$H_0 : \rho = 0$$

$$\text{Against } \rho \neq 0$$

du at 1% level of significance with $K' = 1$ and $n_2 = 42$ is 1.36

$$du = 1.36 < d^* = 1.73$$

So the null hypothesis is accepted.

8. The overall significance test is conducted by F - test

where $H_0 : \alpha = \beta = 0$. Against H_1 not all parameters are zero.

$$\text{Here } F = \frac{R^2/(k-1)}{(1-R^2)/(N-k)}$$

Where $N = 42$, and $K = 2$

$$F^* > F_{1,40}^{1,40} \text{ and } F_{0,01}^{1,40}$$

So, the H_0 is rejected and the equation 4.5.1 is overall significant.

4.6.1 It is observed that $\beta > 0$ and significant at 5% level. It, therefore, appears that price level, over the period concerned, was related to money supply significantly. Price level displayed upward variation following increase in money supply. Thus, price level delineates a positive association with money supply. As money supply displayed noticeable increase during the period of study, so also price level registered and upward movement over time.

Again, $R^2 = 0.71$ indicates that 71% of variation in price level is explained by that in money. This indicates that about 30% of variation in price level remains unexplained by the estimated relationship. This further seems to indicate that besides money supply, there were some other non-monetary factors which could explain this unexplained part of variation in price level.

4.6.2 The extend of the variation in price level, following variation in money supply, may better be explained by the following log linear estimation^{9, 10, 11}

$$\ln P_t = 0.008021 + 0.5864 \ln M_{2t}$$

$$(0.014052) \quad (0.2462)$$

$$[0.57091] \quad [2.3821]$$

$$R^2 = 0.524 \quad | \quad D - W = 1.87$$

$$F^* = 5.67 \quad | \quad DF = 42$$

9. The log linear equation is presented as a supplement to the findings of the estimated model (4.6)

10. The estimated log linear equation with equal degree of freedom contains lower R^2 . So, we have used the model (4.6) initially for our study.

11. The log linear equation

$$\ln P_t = \alpha_1 + \beta_1 \ln M_{2t} + V_t$$

and the estimated equation is

$$\ln P_t = \alpha_1 + \beta_1 \ln M_{2t}$$

Here $\beta_1 = d \ln P_t / d \ln M_{2t}$ basically represents the elasticity of price level with respect to money supply. It is expected to show how price level displayed variation in response to small change in money supply over the period concerned.

It is observed from the estimation that the estimator $\hat{\beta} = 0.5864$ is significant at 5% level and it is less than unity. This indicates that variation in price level is less than proportional¹² following change in money supply.

4.7 Further verification of the findings :

The possible association of the variation in price level with that in money supply has further been verified in the line suggested by Sims¹³

The model for estimation is

$$P_t = Q_1 + \bar{\Lambda}_1 P_{t-1} + \bar{\Lambda}_2 M_{2t} + W_t$$

The GLS estimation of the model is

$$\hat{P}_t = 0.3322 + 0.04249 P_{t-1} + 0.1409 M_{2t}$$

(1.1978) (0.147925) (0.0700159)

[0.2774] [2.8724] [2.0124] (4.7)

$$R^2 = 0.7534, F^* = 662.0012, n = 42$$

$$DF = 40, \text{ and } D-w = 1.84$$

It is observed that the estimated equation that $\bar{\Lambda}_1 > 0$ and $\bar{\Lambda}_2 > 0$.

These estimators are significant at 5% level.

12. That $\beta < 1$ has been tested by t - test at $\alpha = 0.05$ where

$$H_0 : \beta = 1$$

Against $H_A : \beta < 1$

$$\text{Here } t^* = \frac{\hat{\beta} - \beta}{s_{\hat{\beta}}} = \frac{\hat{\beta} - 1}{s_{\hat{\beta}}}$$

13. Instead of taking infinite lag structure in the vector of explanatory variables, only one period lag P_{t-1} has been used in the model. The data set is stationary and it is a yearly data set. So the AR(1) process for P_t seems to be more relevant in view of the facts that ARIMA model used for price fore cast in exhibited random walk process in many economic studies.

Now'

- (i) $\bar{\Lambda}_1 > 0$ indicates that price level varied positively with variation in previous period (year) price level.
- (ii) $\bar{\Lambda}_2 > 0$ indicates that even in the presence of **one period lag** (P_{t-1}) price level in the argument vector for P_t , M_{2t} has a significant coefficient in the estimated equation. So price level **displayed** significant variation following change in current period money supply.
- (iii) $\bar{\Lambda}_2 > 0$ even in the presence of $\bar{\Lambda}_1 > 0$ is a pointer, though implicit, to the possibility that money supply might have "Granger Caused" Price level variation. This needs further confirmation through the inclusion of extended lags (in y_6)¹⁴ into the set of explanatory variables.

4.8 SUMMARY AND CONCLUSION :

It is observed from the findings in previous section (4.6 and 4.7 that

- (i) Price level, over the period of our study, displayed significant positive association with money supply. Price level was found to vary positively with changes in money supply.
- (ii) Variation in price level is less than proportionate to that in money supply.
- (iii) Price variation was not entirely a monetary phenomenon. Variation in money supply could at best explain 71% variation in price level.
- (iv) Money supply appears to be a very significant variable for explaining inflation in the presence of other significant variables. The estimated equation (4.7) shows that money supply affects price level significantly even in the presence P_{t-1} (One period lag price level) in the set of regressors. This seems to be a pointer to the possibility that money supply might have Granger Caused price level over the period concerned.
- (v) Money supply failed to affect price level to the fullest extent possible. Its effects might have been dissipated into an output effect. Output might have undergone a rise following rise in money supply.

14. Granger-Sims' causality Test in its stronger form, requires that leads and lags of price level be introduced along with money supply (Current and lagged into the set of explanatory variables).

Following Friedman, One can reasonably expect that a part of monetary shocks might have gone to explain variation in output level.

The findings tacitly indicates that money supply might have produced favourable impact in output level along with its favourable immediate effect on purchasing capacity of individuals in the economy. As money supply increases the purchasing capacity of the people as a whole, this might have manifested in the rise in price level $\beta > 0$. However, again it has failed to generate proportional rise in price level ($\beta < 1$) since, supply of output might have increased in response to rise in money supply.

These findings, therefore, tacitly hint at the possibility of simultaneous variations in output level following change in money supply. This possibility needs proper attention and verification. It becomes pertinent on our part to find if such a possibility really exists. Our study in the following chapter is devoted to this direction. The investigation on the relation between variation in output level and that in money supply constitutes the case of our study in the following chapter.

CHAPTER - V

MONEY SUPPLY AND OUTPUT LEVEL IN INDIA OVER THE PERIOD (1950 - 1991)

5.1 INTRODUCTION :

India, since independence, has been trying to achieve industrial development and self sufficiency in agriculture. In order to usher in a systematic development in different economic fronts, several economic plans have been undertaken since 1951. These plans have been executed with varying degrees of success. As a result thereof, at the end of the twentieth century, India has emerged as a noticeable economic power in the world with outstanding industrial infrastructures and spectacular achievement in agriculture. National Income (GNP) has been found to be growing over the last few decades, though at various rates.¹ An examination of the time plot of GNP is a pointer to this issue.

In figure 5.1 presents the time plot of output level (GNP) over the period 1951-91. The plot delineate a rising pattern of GNP though at a very lower rate since 1951 to 1972. With a sudden jump in 1985 GNP describes a pattern of steep rise in the following years.

It may, however, be noted that the figure 5.1 presents the time plot of non-stationary² series of GNP. Consequently, a better picture of the movement in GNP may be obtained from the time plot of stationary³ series of GNP as given in figure 5.2.

1. The actual growth rates were 3.6, 3.9, 2.3, 3.3, 4.9, 5.2 and 5 percent during the 1st to 7th plan period respectively.

Ref. Misra and Puri, Indian Economy ; Himalayan Publishing House,
8th Revised Edition, 1990. pp. 369-70 and 387.

2. Estimated AR(1) process for GNP shows that co-efficient α of lagged GNP (Y_{t-1}) exceeds 1. So, the process is non-stationary.

3. The non-stationary series in GNP (y_t) has been subject to first order differencing in order to ensure stationarity in the data set. The stationary series, therefore, indicates the data set for $(y_t - y_{t-1})$ i.e. the variation in y_t over the previous period.

Fig. 5.1: Time Plot of Output Level (Y_t)

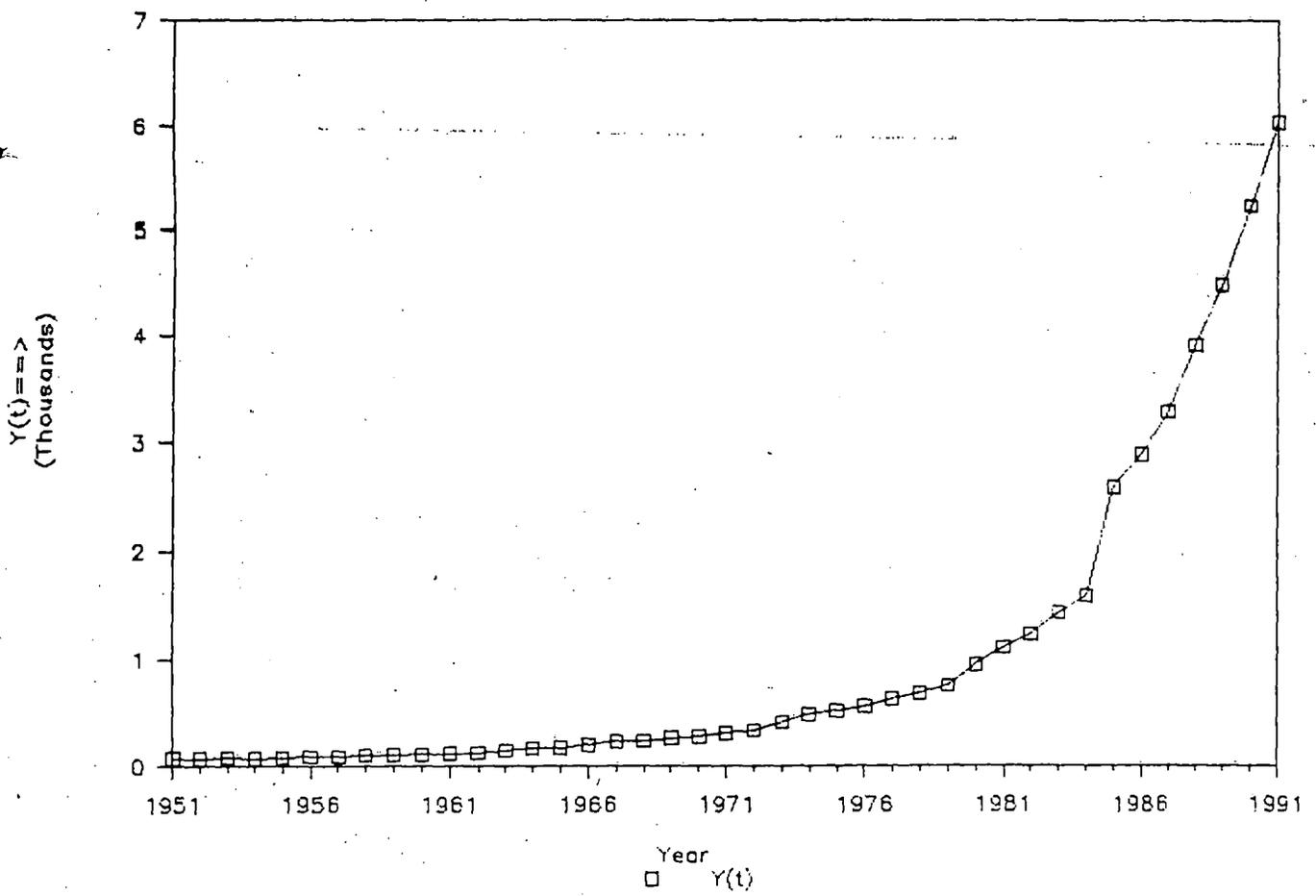
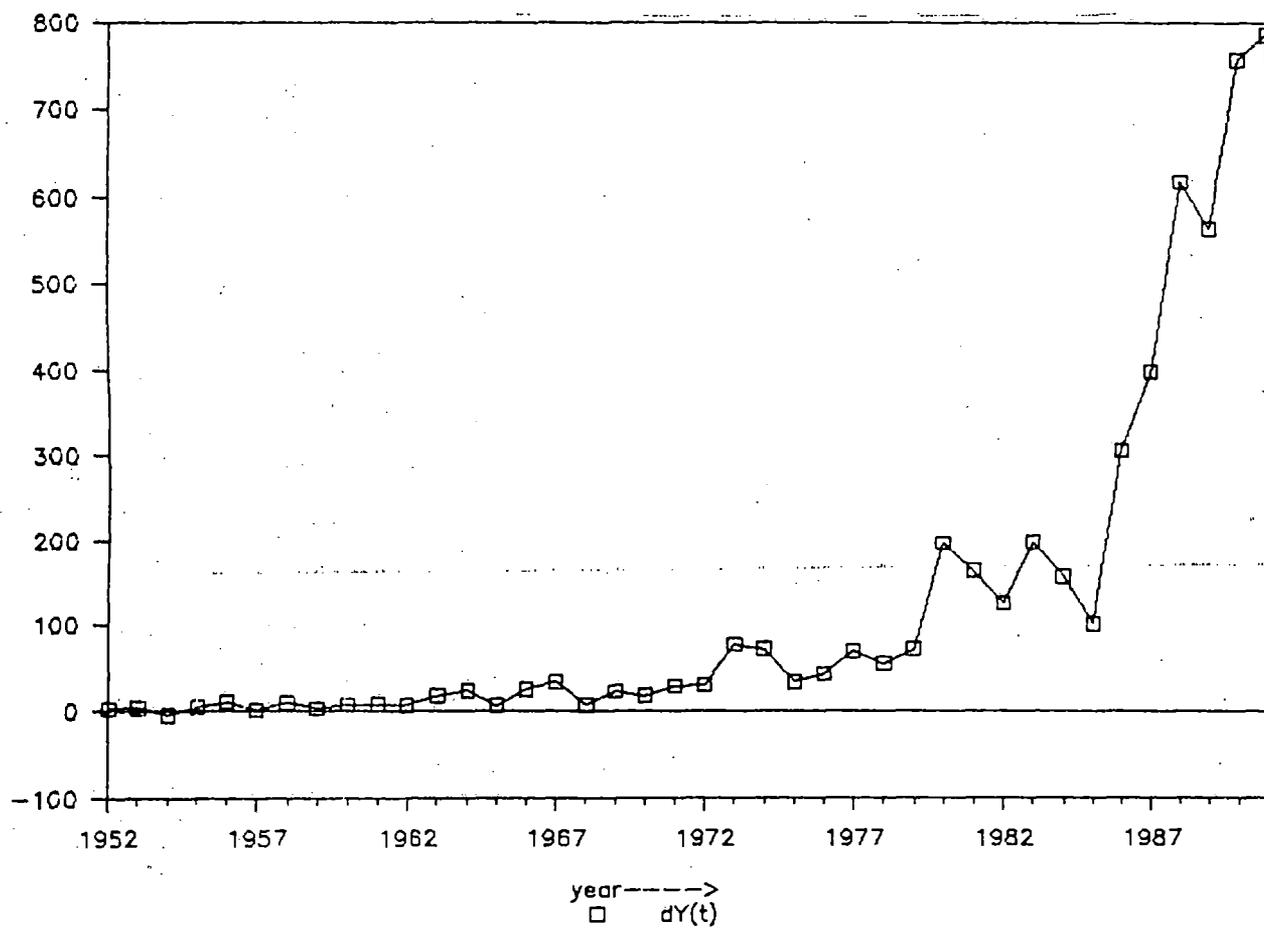


Fig. 5.2: Time Plot of Output level (dY_t)



It is observed from the figure 5.2 that variation in the GNP until 1962 was unnoticeable. Insignificant variation in GNP was visible until 1972. Since 1972 variation became spectacular. GNP displayed significant rise with some occasional ups and downs until 1985. Since then there was a steep rise in GNP for subsequent year (1987-1991) ⁴

5.1.1 Economists are of different opinions regarding GNP growth rate in an economy. While some relates output variation with the variation of capital labour and State of technology, others emphasise⁵ on the psychological factors such as expectation in the fluctuation of output. They agree on the point that the growth of the economy over the long period depends on the availability of resources, industrial organisation the growth of knowledge and skill, the growth of population, the accumulation of capital and so on⁶.

Economists have also recognised the role played by money in the determination of output level. In the short run, the monetarists assign to money supply significant role in the variation of output level.⁷ The following (5.1.2) section is the graphical examination of the output variation and money supply variation considered together in the time plot graph of the concerned variables.

5.1.2 Another important feature of the Indian economy over the period 1951-1991 is that of its growing monetization. India which was largely a barter economy initially in 1951. Later on, this barter economy gave birth to an exchange economy with the growing monetization. During the process of transition, money assumed progressively very important role in economic activities. Cheap money policy⁸ followed by monetary authority in the very early phase of economic development reduced interest rates and stimulated investment. This helped the output level grow. On the other hand, with the rise in money supply, purchasing power grew.

4. A very little fall was observed in 1989.

5. J.M.Keynes, The General Theory of Employment Interest and Money, Macmillan & Co. Ltd., London, 1957, pp 46-51.

6. Friedman, The Optimum Quantity of Money and Other Essays, Macmillan Reprinted 1970, London Basingstoke, p.182.

7. M. Friedman, Studies in the Quantity Theory of Money, Chicago, University of Chicago Press, 1956, p.3.

8. Monetary authority followed cheap money policy in the first plan (1951-56) and controlled expansion policy in the second plan (1956-62).

This supported the growth of output level. Thus, expansion of money supply is usually considered to be stimulating output level over the past few decades. None the less, whether income growth has really been related to the growth of money supply still remains an issue of debate.

An idea about the nature of association between output level (Y_t) and money supply (M_{2t}) can be obtained from the examination of the time plots of GNP and lagged⁹ money supply (M_{2t-1}) as given in figure 5.3.

Figure 5.3 presents the time plots of non-stationary series of output level and lagged money supply. It appears that -

- (i) Lagged money supply (M_{2t-1}) and therefore, money supply (M_{2t}) describe an exponentially rising pattern over the period 1951-91.
- (ii) Exponential rise in output level over the period exhibits a positive association between Y_t and M_{2t-1} . It may, however, be noted that Y_t registered a steeper rise than M_{2t-1} since 1985.

Figure 5.4 presents the time plots of stationary series for Y_t and M_{2t-1} . Some interesting features of the association between these two variables are as follows

- i) there exists very high and positive degree of association between these variables until 1979.
- ii) since 1980 output level exhibits higher variation than that in lagged money supply until 1984.
- iii) since 1986, the variation in output level is far more spectacular than that in the lagged money supply.

It may also be noted that variation in these variables discern somewhat different pattern over time. Consequently, the association between Y_t and M_{2t-1} seems to be weak over the period 1986-91.

These graphical analysis give only a tentative idea about the relation between these macro-economic variables. For precise and conclusive idea about the relationship between output level and money supply, we need further investigation with bivariate data set. An attempt in this direction has been undertaken. The

9. Exertion of monetary influence on output level is a time-lag phenomenon. This issue has been fairly dealt with in section 5.4.

Fig - 5.3: Time Plot of Output Level (Y_t) and Money Supply ($M_{2,t-1}$)

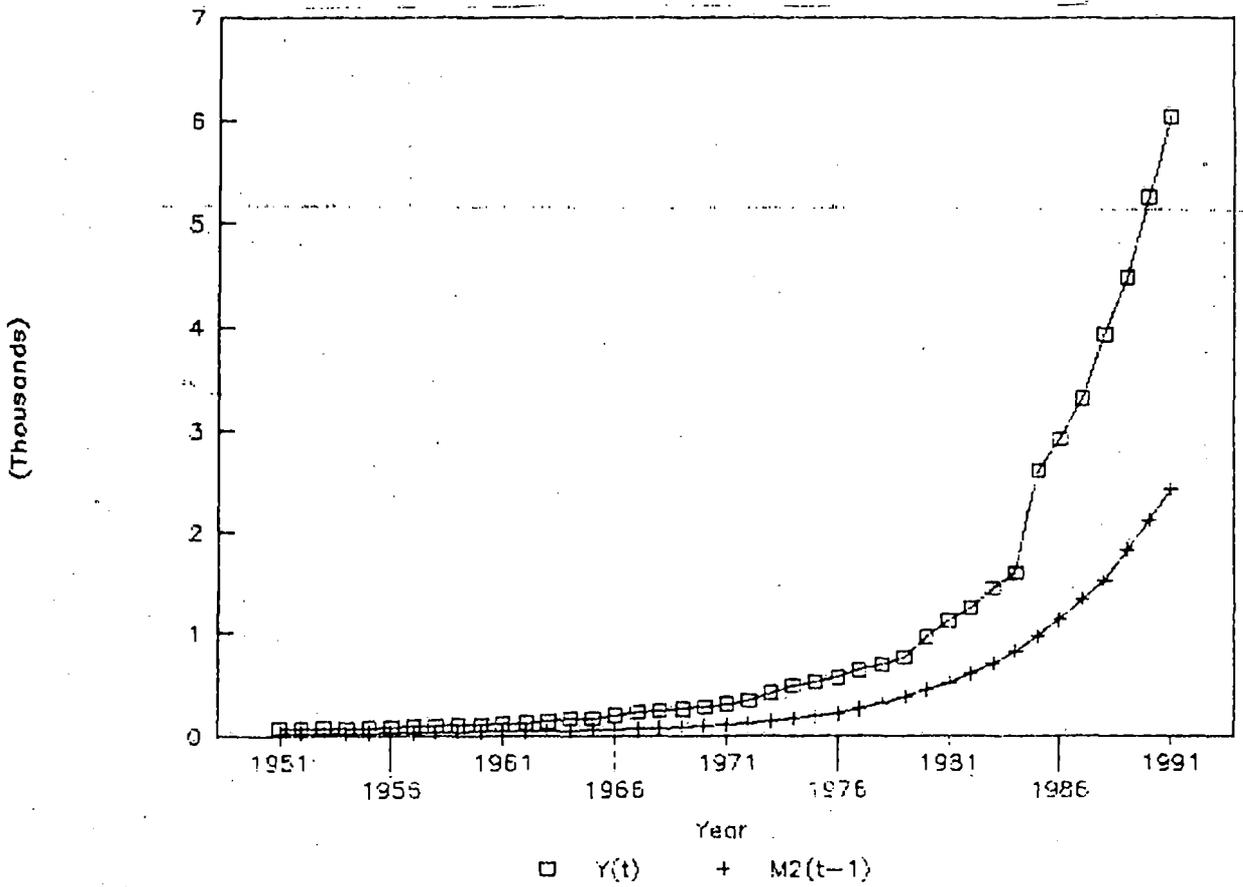
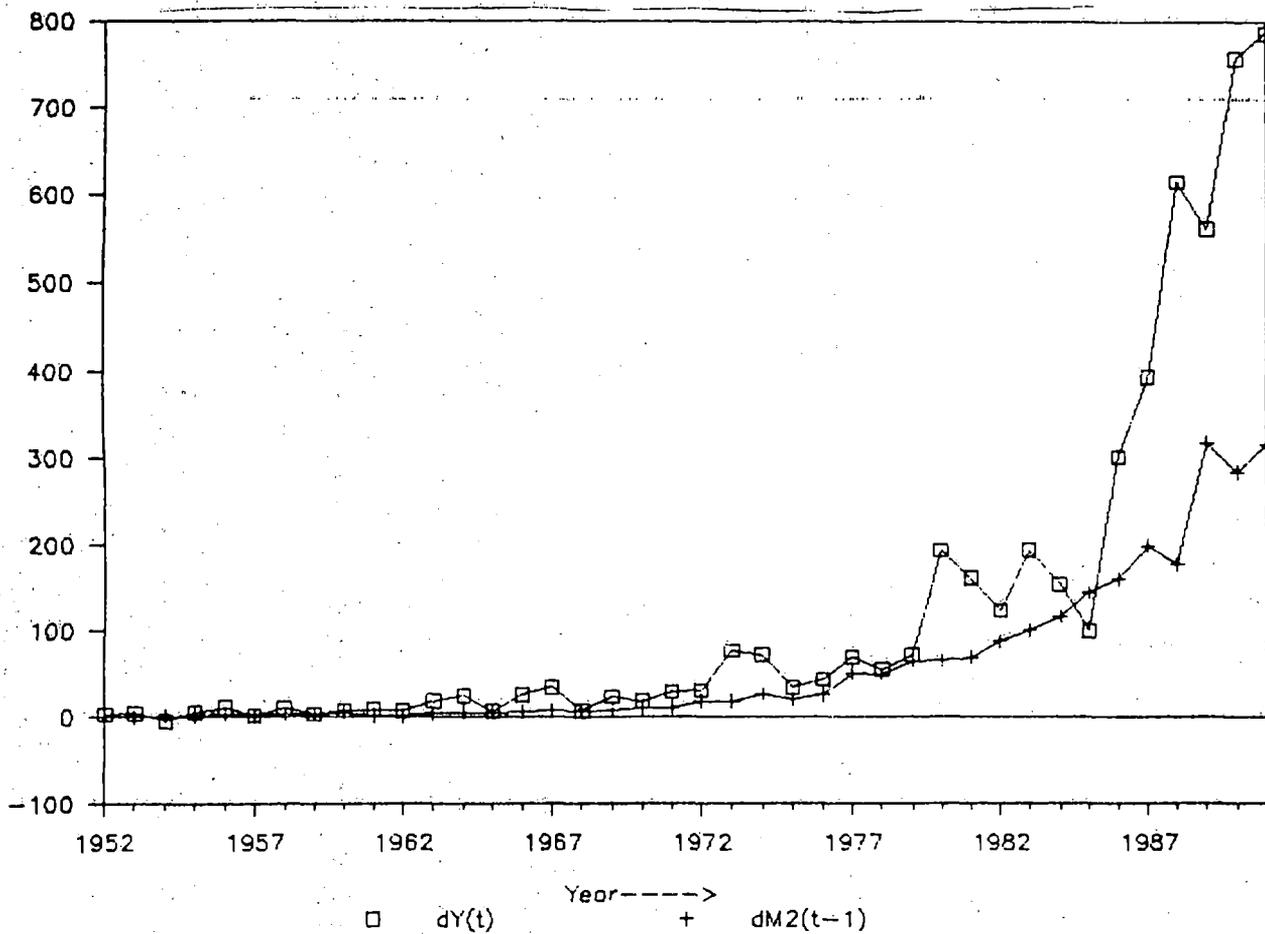


Fig. 5.4 : Time Plot of Output Level (dY_t) and Money Supply ($dM_{2,t-1}$)



model and the corresponding estimation together with findings are given below.

5.2 Objective of Study : The objective of the present chapter is to evaluate the effect of money supply on output level in India over the period 1950-91. The reflex and feedback effect of economic condition¹⁰ on money supply are ignored and the study takes into account only the variation in the output level following a variation in money supply.

5.3 The Model : Different economists use different models relating output level to money supply. Difference in the model originate from the differences in the basic approach to the problems. It may be noted that Friedman Phelp approach rests on the exogeneity of expectations while rational expectationists stress upon **endogeneity** of expectation. The basic difference leads to differences in the structure of the respective model.

It may, however, be noted that the basic theme underlying these various models, inspite of differences in their structures is to examine if variation in output level in any way is related to variation in money supply. Consequently, the approaches involves the determination of variational association between output level and money supply in the economy.

In these models money enters into the argument vector for output level indirectly. Initially, output level is associated with price level or expected inflation rate in the aggregate supply function. Again the aggregate demand function, related expected inflation rate to money supply. Consequently, an equilibrium equation related output level to money supply.

10. We know that money supply is affected by three proximate determinants high power money, the deposit reserve ratio and deposit currency ratio which are again influenced by contemporaneous cyclical fluctuation in economic activity that is output level.

M. Friedman, The Optimum Quantity of Money and Other Essays. Macmillan Reprinted 1970, London & Bisingstoke , pp. 267-268.

5.3.1 For example, rational expectationists take the Lucas' supply function to begin with ,

$$Y_t = Y_{t-1} + \beta (P_t - {}_{t-1}P_t) + \varepsilon_t \quad \dots\dots\dots(5.3.1)$$

Here, variation in output level over that in the previous period is a function of the variation in current price level over the expected price level.

The price equation, comes into the model, in the form of aggregate demand function.

$$\text{Where } P_t = -\alpha (Y_t - {}_{t-1}Y_t) + M_t + \mu_t \quad \dots\dots\dots(5.3.2)$$

The expected output level, ${}_{t-1}Y_t$ derived from the aggregate supply function is

$${}_{t-1}Y_t = Y_{t-1} + \beta ({}_{t-1}P_t - {}_{t-1}P_t) \quad \dots\dots\dots(5.3.3)$$

The rational expectationists assume expectation of the random error term i.e. ${}_{t-1}\varepsilon_t = 0$.

This leads to

$${}_{t-1}Y_t = Y_{t-1} \quad \dots\dots\dots(5.3.4)$$

Again, the expected price level, derived from the price equation is

$${}_{t-1}P_t = -\alpha ({}_{t-1}Y_t - {}_{t-1}Y_t) + {}_{t-1}M_t \quad \dots\dots\dots(5.3.5)$$

Which leads * (after cancellation of the terms within the bracket)

$${}_{t-1}P_t = {}_{t-1}M_t \quad \dots\dots\dots(5.3.6)$$

This means that, expected price level in period, t , viewed at the end of period t-1 depends on the expected money supply in period, t, viewed at the end of period, t-1.

Now, setting $P_t = -\alpha (Y_t - {}_{t-1}Y_t) + M_t + \mu_t$

and ${}_{t-1}P_t = {}_{t-1}M_t$ into the supply function gives

$$Y_t = Y_{t-1} + \beta / (1 + \alpha\beta) [M_t - {}_{t-1}M_t] + (\beta\mu_t + \varepsilon_t) / (1 + \alpha\beta) \quad \dots\dots(5.3.7)$$

Thus, equation (5.3.7), describes a relationship between output level and money supply.

5.3.2 It, therefore, appears that money supply usually enters in the output equation indirectly. We seek to follow this practice following Friedman-Phelp. Again, study in transmission mechanism usually indicates that money supply fails to affect real output level instantly. There exists a time lag within which money changes capital stock which implies variation in investment and so variation in output level as a result thereof.

* William H. Branson, Macroeconomic Theory and Policy, Third edition, Harper & Row Publishers, Singapore, pp-214-215.

Consequently, the relation¹¹ may be taken as

$$Y_t = \delta + \gamma \cdot M_{2t-1} + V_t \quad \dots\dots\dots (5.3.6)$$

where Y_t = output level at period t

t = time, ranging from 1950-91

δ = Regression constant

γ = Regression co-efficient of Y_t on M_{2t-1} .

M_{2t-1} = Money Supply at period $t-1$.

V_t = Effect of random variable on output level, where

$$V_t \sim \text{I.I.D } N(0, \sigma^2)$$

11. This model indicates no causal relation between output and money supply. More specifically, it shows that our study does not aim at finding if money supply 'Granger Caused' output level variation in India.

However, implicit causal relation underlies the relation in view of the fact that the study seeks to examine if variation in money supply explains variation in output level over that in the previous period. Thus, the relation becomes

$$Y_t = \delta + \beta y_{t-1} + \gamma M_{2t-1} + V_t \quad \dots\dots\dots (5.3.7)$$

Here, significance of γ is studied in the presence of the lag in Y_t (i.e Y_{t-1})

Again, in GLS estimation β is pegged to 1 such that the model becomes

$$(Y_t - Y_{t-1}) = \delta + \gamma M_{2t-1} + V_t \quad \dots\dots\dots (5.3.8)$$

The data set $(Y_t - Y_{t-1})$ actually represents the stationary data set for y_t where stationarity is ensured through First differencing.

5.4 Estimation and Findings :

The model 5.3.6 has been estimated with GLS method.¹² The estimated model is ^{13,14}

$$\hat{Y}_t = 2.1794 + 2.4385M_{2t-1} \dots\dots\dots (5.4.1)$$

(23.529) (0.2194)
[0.092624] [11.12]

R² = 0.7646762, F* = 123.48
D.F. = 38, and D.W. = 2.16.

5.4.1 The positive and significant γ indicates that output was positively and significantly related to money supply. Output level exhibited upward trend following an increase in money supply. In other words, increased money supply influenced output level favourably over the period concerned. With the increase in money supply, output level registered a rise over the period 1950-1990:

5.5 Implication of the Findings :

The findings have the following implication :

5.5.1 γ implies that output level displayed positive response following in money supply variation in the previous period. If money supply increases in period t, output level rises in the following period t + 1 [t = 1950.... 1991].

12. The OLS estimation of the model entails auto-correlation at 5% level of significance.

The OLS estimation is

$$Y_t = 4.3143 + 2.4509 M_{2t-1} \dots\dots\dots (5.4.2)$$

(22.242) (0.030121)
[0.194] [81.37]

R² = 0.9941441 ; F* = 6621
DF = 39, D.W. = 1.3928

So, the GLS method has been applied for the estimation.

13. The estimation is free from auto-correlation at 5% level and significant since d* = 2.16 and F* = 123.48 respectively.

14. The estimation of the log linear model has also been done.

5.5.2 $R^2 = 0.76$ indicates that only 76% variation in income is explained by the variation in lagged money supply. Thus, almost 24% variation in income still be remained unexplained by variation in money supply. This unexplained part of the variation in income may be explained by some non-monetary factors.

5.5.3 This 5.5.2 tacitly implies that the variation in income following variation in money supply is less than proportional.¹⁵ This becomes explicit when the results of the log linear estimation is considered.

The estimated log linear equation is

$$\ln Y_t = \alpha + \beta \ln M_{2t-1}$$

$$\text{where } \ln Y_t = 0.019105 + 0.6157 \ln M_{2t-1}$$

$$\begin{array}{cc} (0.01178) & (0.2091) \\ [1.6218] & [2.9449] \end{array}$$

$$R^2 = 0.6858 \quad F^* = 18.6724$$

$$DF = 38 \quad D.W. = 2.23$$

Here $\hat{\beta} = d \ln Y_t / (d \ln M_{2t-1})$ indicates elasticity of output level with respect to lagged money supply. $\hat{\beta} < 1$ implies that output level changed less than proportionately¹⁶ following change in money supply.

15. In macro economic studies with output level and money supply, usually log linear estimations are presented. Y_t and M_{t-1} data sets are usually replaced with $\log Y_t$ and $\log M_{t-1}$ data sets. This is done with a specific objectives.

First, such log transformation of the data set ensures homoscedasticity error term in the estimation.

Second, the coefficient represents elasticity of output with respect to money supply variation. So, the estimator has understandable meaning.

Third, log linear estimation is usually supposed to help avoid any non-linear relationship between the variables concerned. The idea of non-linearity flows from the Fisherian equation -

$$MV = PT$$

$$\text{Such that } \ln T = \ln M + \ln V - \ln P.$$

This shows that when the argument vector for Y includes both Money supply and price level, non-linearity may arise. However, such non-linearity may not arise if price level is kept out of the argument vector for Y .

16. That output varied less than proportionately following change in money supply (M_{t-1}) be tested at $\alpha = 0.05$ where

$$H_0 : \beta = 1 \text{ against}$$

$$H_A : \beta < 1$$

$$t^* = \frac{\hat{\beta} - 1}{s_{\hat{\beta}}}, \text{ suggests the rejection of } H_0 \text{ at } \alpha = 0.05.$$

5.6 Further Verification of the Findings :

The positive association of the variation in output level with that in money supply has further been verified in the line suggested by Sims.¹⁷ The model is

$$Y_t = \theta + \gamma_1 Y_{t-1} + \gamma_2 M_{2t-1} + V_t \dots\dots\dots (5.3.8)$$

The GLS estimation of the model is¹⁸

$$\hat{Y}_t = 1.356 + 0.5145Y_{t-1} + 1.3303 M_{2t-1}$$

(19.123)	(0.1361)	(0.2881)
[0.07091]	[3.7793]	[4.7902]

$R^2 = 0.7758$

$F^* = 412.63$

$D.F = 37$

$D.W = 2.12$

It is observed from the estimated equation that

$\hat{\gamma}_1 > 0$ and $\hat{\gamma}_2 > 0$ and both are significant at 5% level.

- (ii) Now, $\hat{\gamma}_1 > 0$ indicates that output level varied positively with variation in previous period output level (Y_{t-1})
- (iii) $\hat{\gamma}_2 > 0$ indicates that even in the presence of one period lag (Y_{t-1}) in the argument vector for Y_t , M_{2t-1} has a significant co-efficient in the estimated equation. So, output level displayed significant variation following change in money supply in the previous period.
- (iv) $\hat{\gamma}_2 > 0$ even in the presence of $\hat{\gamma}_1 > 0$ is a pointer though implicit, to the possibility that money supply might have Granger Caused output variation. This needs further confirmation through the inclusion of extended lags in (Y_t) into the set of explanatory variables¹⁹.

17. Instead of taking infinite lag structure in the vector of explanatory variables only one period lag (Y_{t-1}) has used in the model. The data set is stationary and it is a yearly data set. So AR(1) process for Y_t seems to be more relevant.

18. The estimated equation is free from auto correlation.

19. Granger - Sim's Causality tests in its stronger form requires that lead and lags of the output level be introduced along with Money supply to the set of explanatory variables.

5.7 Summary & Conclusion

Findings presented in the previous section of the chapter indicate that

- (i) Output level displayed significant variation following changes in previous period money supply over the period 1950-1991.
- (ii) Output and money supply variation was found to be positive ($\hat{\gamma} > 0$).
- (iii) Output variation, though positive, was less than proportional to changes in money supply. Elasticity of output level in respect to money supply variation was found to be less than unity.
- (iv) Money supply could explain only 76% of the variation in output level. Consequently, output variation was found to be not completely a monetary phenomenon.
- (v) Money supply was found to explain output variation significantly $\hat{\gamma}_2 > 0$ even in the presence of lagged output level in the vector of explanatory variables. This tacitly, implies that money might have Granger Caused output variation over the period concerned.

It, therefore, appears that output variation over the period of study was associated with that in money supply in a positive and non-proportional manner. Moreover, output variation was not found to be completely monetary phenomenon. Effect of money supply over the period concerned, might have gone dissipated. A part of money supply might have gone to affect price level.

CHAPTER - VI

WINDOW FINDING OF STRUCTURAL CHANGES IN PRICE LEVEL AND MONEY SUPPLY RELATION - SUB PERIOD ANALYSIS

6.1 INTRODUCTION :

The price money relationship studied in chapter IV, presents an overall relationship over the entire period 1950-92. However, the relationship cannot be expected to be static over such a long period. Lucas¹ has pointed out that econometric relationship undergoes changes over time. Lucas arrives at this dramatic conclusion by examining the nature of the equations used in typical econometric relationship. Current practices he argues, is to estimate an econometric relationship and then use this relationship to predict economic behaviour under alternative scenerios. An explicit assumption in this type of exercise is that the econometric relationship will remain stable under different scenerios. Lucas argues that dynamics of economic theory suggests that this assumption is false. The behavioural equation in this model undergoes changes as the scenerios change.

Changes in this behavioural relations in the equations of an econometric model arise because agents change their schemes to adapt themselves with changes in economic environment. If the environment can be characterized in some schematic manners, econometricians can hopefully use economic theory and estimate economic models to explain behaviour of economic agents.

However, if the agents find the economic environment to be random and chaotic, econometricians will not be able to say much about agents' behaviour. As the time proceeds, new shocks come into the economy. Economic environment become fluid. Economic relationship undergoes changes. No estimated relationship can therefore be taken as stable over time. Relationship obtained through the use of historical data set may, therefore, be expected to summarise such changes over time. Consequently, the price money relationship may be expected to undergo changes in different sub-periods over the past few decades (1950-92).

1. Lucas, Robert E, Jr. 1976, "Econometric Policy Evaluation - A Critique" in *The Phillips Curve and Labor Markets* edited by Karl Brunner and Allan H. Meltzer, Amsterdam, North Holland.

6.1.1 This expectation is based on two economic observations. First, monetary policies regarding monetary expansion exhibit various degrees over this period. While money was let loose in the early sixties, controlled expansion policies were followed in the last part of the second Five Year Plan and subsequent plan periods. Second, prices reflected varying patterns of changes over the period concerned. Under these circumstances, price money relationship cannot be expected to exhibit uniform relationship over the historical data set used for the analysis in Chapter-IV.

Herein comes the problem of identifying such variation in price money relationship along with the sub-periods occurred in. These changes in relationship are 'Structural' by nature. It becomes, therefore, pertinent to identify such 'structural changes' alongwith the 'window' (the particular year) in which such a changed relationship remained undisturbed. Alternatively, it is our task to identify the particular year in which such a change in relationship occurred and the period in which such a new relationship persisted.

6.2 Objective of Study :

The objective of study in the present chapter is to identify various sub-periods over which the price money relationship underwent changes. However, for the analytical purposes the task become difficult in view of the fact that the choice of sub-periods needs identification of the periods when the structural changes have just occurred. The study in this chapter further involves an analytical discussion of the relation over various sub-periods identified.

6.3 Identification of Sub-Periods :

Identification of sub-periods basically implies the finding of Windows where structural changes occurred. Usually two methods are used for this purpose.

First, the choice of sub-periods may be done with the help of graphical method. It involves the choice of sub-periods on the basis of graphical relationship of the variables concerned. The only periods where distinct changes in the association of concerned variable are discernible, may be taken as turning point of relationship.

The alternative method used for the identification of structural change is based on econometric technique which involves "Window Findings". Such Window Finding involves recursive estimation.

However, both the methods have some advantages and drawbacks of their own. Graphical method being subjective may entail bias on the part of researcher, on the other hand, though the econometric technique more objective and viable too, it is rather difficult to formulate and work with.

6.4 Graphical Method :

In order to identify the sub-periods we examine the time plots of stationary series of price level and money supply respectively. The rationality behind such choice lies in the fact that we seek to find the nature of the association of price changes with those of money supply.

It is observed that

- (i) the price level exhibits discernible fluctuation over the period 1950-59. On the other hand, money supply series exhibit almost equal variation over the period. Consequently price level variation seems to be in a very feeble association with that in money supply.
- (ii) the price level series exhibit an overall rising pattern (with singular exception at 1969) over the period 1960-1974. The rate of rise at different years, though different, does not exhibit big fluctuations.

Money supply series, on the other hand, display a rising trend since 1960 until 1974. The rate of rise over the period is very insignificant.

It, therefore, appears that both the series delineate positive variation over the period and their association seems to be positive.

- (iii) the price level series display a downward movement (with singular exception at 1977) over the period 1975-78. On the other hand, money supply proceeds with ups and downs between 1975-78. Over this period, there is overall declining trend is discernible. Consequently, the association between the variations of variables seems to be positive.
- (iv) the price level again displays an overall upward inclination over the period 1978-92. With some occasional fall. As a result, this period is marked by spectacular fluctuation.

Money supply, on the other hand, displays an overall exponential rise since 1975 until 1985. Since then money supply grew at a greater rate with some jumps. Thus, the period 1986-92 is marked by some fluctuations.

It, therefore, appears that both the series exhibit upward movement implying positive association. However, the difference in the rates of growth and the nature of fluctuations make it difficult to assess the extent of such positive association.

The graphical approach for the identification of sub-periods, though simple has some limitations. First, the method is highly subjective in view of the fact that sub-periods may vary depending on the skill and choice of researchers. Second, the graphical method at best indicates the nature of the association between variables over any time period. However, it cannot give quantitative measure of such association. This calls for the use of alternative method which is objective by nature and can provide measured values of the association between variables concerned. The following section is an attempt in this direction.

6.5 "Window Finding" of Structural Changes : Methodology :

The choice of sub-periods objectively involves the identification of structural changes through "Window Finding" the basic procedure is described below.

6.5.1 Methodology :

Sometimes researcher seeks to investigate the stability of the co-efficient estimates as the sample size increase. Sometimes researcher also wants to find out whether the estimates will be different in enlarged samples and whether these will remain stable over time working with a sample, a researcher may produce a regression which is too closely tailored to his sample by experimenting with too many formulations of his model. In this case, if it is not contain that the estimated function will perform equally outside the sample of data which has been used for the estimation of co-efficients. Furthermore, there may have occurred events which change the structure of the relationship like changes in taxation laws introduction of birth control measures and so on. If such structural changes occur, the co-efficients may not be stable. They may be sensitive to the changes in the sample compositions.

Testing for structural stability calls for the use of additional observation besides the sample that is used to estimate a given model. Procedures for testing structural stability are treated in a work by Rao (1960)² and in Chow (1952)³.

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2. Rao, C.R.(1952) "Advanced Statistical Methods in Biometric Research". New York, Wiley & Sons.
 3. Chow, G. (1960) - "Test for Equality Between Sets of Co-efficients in two Linear Regressions". *Econometrica*, 28, 591-605 (July, 1960).
Huang | Regression and Econometric Method, 1970 Wiley Series in Probability and Mathematics Statistics.
A. Koutsoyiannis, Theory of Economics ; The Macmillan Press Ltd. 2nd Edition; Reprinted 1979, London and Basingstoke ; pp 164-168.
Adrian C. Darnell (EE) A Dictionary of Econometrics, Edward Elgar Publishing Ltd., Old Post Road, Brookfield Vermont 05036, U.S.A., 1994, pp. 49-54.

6.5.2 The econometric method which involves "Window Finding" uses Chow test to identify the sub-periods. Here equality between two regression co-efficients concerning the relationship over two different periods is tested. This is done by F. test. Let us consider the two samples with n_1 and n_2 observations respectively and the general model for the pooled data set be -

$$\begin{aligned} \text{where } Y &= X\beta + u && \dots\dots\dots 6.1 \\ Y &\rightarrow n \times 1 \\ X &\rightarrow n \times k \\ \beta &\rightarrow K \times 1 \\ n &\rightarrow n_1 + n_2 \end{aligned}$$

Let us rewrite the models for these two individual samples such as

$$Y_1 = \begin{pmatrix} Z_1 & W_1 \end{pmatrix} \begin{pmatrix} \gamma_1 \\ \delta_1 \end{pmatrix} + u_1 \dots\dots\dots (6.2)$$

$$Y_2 = \begin{pmatrix} Z_2 & W_2 \end{pmatrix} \begin{pmatrix} \gamma_2 \\ \delta_2 \end{pmatrix} + u_2 \dots\dots\dots (6.3)$$

$$\begin{aligned} \text{where } Y_1 &\rightarrow n_1 \times 1 \\ Y_2 &\rightarrow n_2 \times 1 \\ Z_1 &\rightarrow n_1 \times 1 \\ Z_2 &\rightarrow n_2 \times 1 \\ W_1 &\rightarrow n_1 \times m \\ W_2 &\rightarrow n_2 \times m \\ \gamma_1 &\rightarrow 1 \times 1 \\ \gamma_2 &\rightarrow 1 \times 1 \\ \delta_1 &\rightarrow m \times 1 \\ \delta_2 &\rightarrow m \times 1 \end{aligned}$$

By combining (6.2) and (6.3) we have

$$\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{bmatrix} Z_1 & W_1 & 0 \\ 0 & Z_2 & W_2 \end{bmatrix} \begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \delta_1 \\ \delta_2 \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} \dots\dots\dots 6.4$$

and the null hypothesis of interest is

$$H_0 : \gamma_1 = \gamma_2 \quad (= B \text{ say})$$

Under the null hypothesis, the model is

$$\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{bmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{bmatrix} \begin{bmatrix} \beta \\ \delta_1 \\ \delta_2 \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} \dots\dots\dots 6.5$$

The L.S estimate of the coefficient vector in (6.5) is

$$\begin{pmatrix} \hat{\beta} \\ \hat{\delta}_1 \\ \hat{\delta}_2 \end{pmatrix} = \left[\begin{pmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{pmatrix}' \begin{pmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{pmatrix} \right]^{-1} \begin{bmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{bmatrix}' \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} \dots\dots\dots 6.6$$

If we fit 6.2 and 6.3 individually their LS estimates of the coefficients will be

$$\begin{pmatrix} c_1 \\ d_1 \end{pmatrix} = \left[\begin{matrix} (z_1 w_1)' & (z_1 w_1) \end{matrix} \right]^{-1} \begin{pmatrix} (z_1 w_1)' y_1 \\ y_1 \end{pmatrix} \dots\dots\dots(6.7)$$

$$\begin{pmatrix} c_2 \\ d_2 \end{pmatrix} = \left[\begin{matrix} (z_2 w_2)' & (z_2 w_2) \end{matrix} \right]^{-1} \begin{pmatrix} (z_2 w_2)' y_2 \\ y_2 \end{pmatrix} \dots\dots\dots(6.8)$$

where C_i is the estimate of γ_i . The sum of squares necessary for computing test statistics can then be obtained by using the results in (6.6) (6.7) and (6.8) The sum of squares that measures the distance of individual observations from the common regression plane is

$$Q_1 = \left[\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} - \begin{pmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{pmatrix} \begin{pmatrix} b \\ \hat{\delta}_1 \\ \hat{\delta}_2 \end{pmatrix} \right]' \dots\dots\dots(7.9)$$

$$\left[\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} - \begin{pmatrix} Z_1 & W_1 & 0 \\ Z_2 & 0 & W_2 \end{pmatrix} \begin{pmatrix} b \\ \hat{\delta}_1 \\ \hat{\delta}_2 \end{pmatrix} \right]'$$

Here Q_1 / δ^2 has χ^2 distribution with $(n - 2m - 1)$ degrees of freedom where we assume that u_1 and u_2 have a common variance δ^2 . Now Q_1 can be decomposed into two sums of squares Q_2 and Q_3 . Q_2 will measure the distances of observations from the individual estimated regression planes, and Q_3 measures the distance of the individual estimated plane from the common regression plane. Thus,

$$Q_2 = \left[y_1 - (z_1 w_1) \begin{pmatrix} c_1 \\ \delta_1 \end{pmatrix} \right] y_1 - (z_1 w_1) \begin{bmatrix} c_1 \\ \delta_1 \end{bmatrix} + \left[y_2 - (z_2 w_2) \begin{pmatrix} c_2 \\ \delta_2 \end{pmatrix} \right] y_2 - (z_2 w_2) \begin{bmatrix} c_2 \\ \delta_2 \end{bmatrix} \dots\dots\dots(6.10)$$

and $Q_3 = Q_1 - Q_2$. Here Q_2 / δ^2 has a χ^2 distribution with $(n-2m-2)$ degrees of freedom.

It may be noted that C_1 is the estimate of γ_1 obtained from the first regression and that \bar{d}_2 is the estimate of δ_2 , obtained from pooled regression plane. So the ratio is

$$F = \frac{Q_3 / 1}{Q_2 / (n-2m-2l)} \dots\dots\dots (6.11)$$

So, we have an F distribution with $(1, n-2m-2l)$ degrees of freedom. Here Q_3 is the restricted sum of squares and that Q_2 is the unrestricted sum of squares.

If, however, the new observations n_2 are fewer than the number of parameters in the function we may proceed as follows. Firstly, from the augmented sample we obtain the regression equation.

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 + \dots\dots\dots \hat{\beta}_k x_k \dots\dots\dots (6.12)$$

from which we calculate the residual sum of squares

$$\Sigma e^2 = \Sigma y^2 - \Sigma \hat{y}^2 \dots\dots\dots (6.13)$$

with $(n_1 + n_2 - k)$ degrees of freedom. Second from the original sample of size n_1 we have

$$\hat{y}_1 = \hat{\beta}_0 + \hat{\beta}_1 + \dots\dots\dots \hat{\beta}_k x_k \dots\dots\dots (6.14)$$

from which the unexplained sum of square is

$$\Sigma e_1^2 = \Sigma y_1^2 - \Sigma \hat{y}_1^2 \dots\dots\dots (6.15)$$

With $n_1 - k$ degrees of freedom.

Third, subtracting the two sum of the residuals we find

$$\Sigma e^2 = \Sigma e_1^2 \dots\dots\dots (6.16)$$

with $(n_1 + n_2 - k) - (n - k) = n_2$ degrees of freedom, where n_2 are the additional observations. Further, we form F' ratio where

$$F' = \frac{(\Sigma e^2 - \Sigma e_1^2) / n^2}{\Sigma e_1^2 / (n_1 - k)} \dots\dots\dots (6.17)$$

The null hypotheses are

$$H_0 : b_i = \beta_i \quad (i = 0, 1, 2, \dots, k)$$

$$H_0 : b_i \neq \beta_i$$

The F^* ratio is compared with the theoretical value of F obtained from the F table with $v_1 = n_2$ and $v_2 = (n-k)$ degrees of freedom.

If $F^* > F$, we reject the null hypothesis i.e. we accept that the structural coefficients are unstable. This indicates that their values are changing in extended sample period.

6.6 Identification of sub-periods & structural changes :

Results of chow test :

We have started with a sample of five years (1950 - 54). This sample has been pooled with another sample of five years (1955-59). The estimated equations for each individual sample period have been estimated. Consequently the F^* (estimated chow F value) have been obtained which is used for "Chow Test". Thus, we have proceeded with several samples. Each of these sample consists of five years observation on price level and money supply. We have thus eight sub - samples for the period 1950 - 54 1955 - 59, 1960 - 64, 1965 - 69, 1970 - 74, 1975 - 79, 1980 - 84, 1985 - 89. The 9th sample consists of three year observations viz. 1990 - 92. The results of the chow Tests are given in the Table 6.1

Table 6.1

RECURSIVE ESTIMATION RESULTS (CHOW TEST)
SUB - PERIOD IDENTIFICATION

Sl. No	Sample A with data for the years	Sample B with data for the years	F* (chow)	DF	Change / No change in the across two sample considered.	sub - period identified
1	1950 - 54	1955 - 1959	3.51	2,6	No change	1950 - 59
2	1955 - 59	1960 - 64	43.37	2,6	change	.
3	1960 - 64	1965 - 69	0.96	2,6	No change	1960 - 74
4	1965 - 69	1970 - 74	1.41	2,6	No change	
5	1960 - 64	1970 - 74	2.32	2,6	No change	.
6	1950 - 59	1960 - 74	47.78	2,16	change	1960 - 74 Sub- period confirmed
7	1970 - 1974	1975 - 1979	15.06	2,6	change	
8	1975 - 1979	1980 - 1984	13.7	2,6	change	1975 - 79.
9	1960 - 1974	1975 - 1979	12.67	2,16	change	
10.	1980 - 1989	1985 - 1989	2.61	2,6	No change	
11.	1985 - 1989	1990 - 1992	1.89	2,4	No change	.
12.	1980 - 1984	1985 - 1992	2.97	2,7	No change	
13.	1975 - 1979	1980 - 1992	2.5	2,14	change	Sub-period 1980-92 confirmed.

6.7 Analysis of the Table-6.1 and identification of sub-periods.

It is observed from the Table 6.1 that the estimated relationship between price level and money supply.

- (i) Over the period 1950 - 54 and 1955 - 59 do not differ significantly and the relationship estimated for the pooled data set (over the period 1950 - 59) represents a stable relationship over the period concerned.
- (ii) Over the period 1955 - 59 and 1960 - 64 differ significantly. The estimated relationship over the period 1955 - 64 exhibit instability (since $F^* > F_{0.05}^{2,6}$) in the sense that the relationship between the variation in price level and that in money supply was not found to be prevailing in the period 1960 - 64. This finding has two implications First, it indicates that one stable sub - period ends in 1959, second, it further indicates that another sub - period begins with the end of the period 1950 - 59. Consequently, we have identified the first sub period 1950 - 59.
- (iii) Over the period 1960 - 64 and 1965 - 69 and 1970 - 74 do not differ significantly and the relationship estimated over the pooled data sets (over the period 1960 - 74) represents a stable relationship over the period concerned (since $F^* < F_{0.05}^{2,6}$)

It, therefore, appears that the relationship estimated over the period 1960 - 74 is stable and it is sharply different from the one estimated over the period 1950 - 59. Consequently, the second sub - period identified in our study. consists of the period 1960 - 1974.

- (iv) Over the period 1950 - 59 and 1960 - 74 differ significantly. Again the estimated relationship estimated over the period 1950 - 74 indicate instability in the estimation (Since $F^* > F_{0.05}^{2,16}$).
- (v) Over the period 1970 - 1974 and 1975 - 1979 differ significantly. Again the estimated relationship over the pooled period 1970 - 1979 exhibit instability since $F^* > F_{0.05}^{2,6}$. It, therefore, appears that a change in the relationship Occurred in the period beginning with 1975.

- (vi) Over the period 1975 - 79 and 1980 - 1984 are different and the relationship estimated over the pooled period 1975 - 84 exhibit instability since $F^* > F_{0.05}^{2,6}$

It, therefore indicates that further change in the relation occurred in the period beginning with 1980.

Moreover, the findings in V and VI confirm that the relationship estimated over the period 1975 - 79 is stable and sharply different from that of the period 1960 - 74 and 1980 - 1984.

- (vii) Over the period 1960 - 74 and 1975 - 79 are significantly different and the relation estimated over the pooled data set period 1960 - 1979 exhibit instability since $F^* > F_{0.05}^{2,16}$

It, therefore, appears from (V), (VI) & (VII) that the estimated relationship over the period 1975 - 79 is stable and it is sharply distinct from those estimated over the period 1960 - 74 and 1980 - 84. Consequently, the third sub-period identified covers the period 1975-79.

- (viii) Over the period 1980 - 84 and 1985 - 89 are not different since $F^* < F_{0.05}^{2,6}$.

- (ix) Over the period 1985-89 and 1990 - 92 are not significantly different since $F^* < F_{0.05}^{2,4}$.

- (x) Over the period 1980 - 89 and 1985 - 92 are not significantly different. Again the relationship estimated over the period 1980 - 92 exhibit stability since $F^* < F_{0.05}^{2,9}$.

- (xi) Over the period 1975 - 79 and 1980 - 1992 are significantly different. Again the relationship estimated over the period 1975 - 1992 exhibit instability since $F^* > F_{0.05}^{2,14}$. It, therefore, follows from (viii) (ix) (x) and (xi) that the last sub - period identified covers the period 1980 - 1992. The relationship estimated over the period is stable and it is in sharp contrast with that estimated over the period 1975 - 79.

Thus, four sub-periods with distinct and stable relationship between price level and money supply in each individual period have been identified. These sub- periods are 1950 - 59, 1960 - 74, 1975 - 79 and 1980 - 92 respectively.

6.8 Price - money Relationship over different sub- periods :

The estimated⁴ relationships in different sub - periods have been presented in the Table 6.2.

Table 6.2

No.of Sub-periods	Sub-periods (Year covered)	\hat{L}_i (i= 1,2,3,4)	\hat{B}_i (i= 1,2,3,4)	R ²	F ²	DW
1.	1950-59	-0.2453 (0.8303) [-0.2954]	0.00162 (0.00273) [0.5921]	0.0477	0.4007	1.72
2.	1960-74	0.8509 (1.0617) [0.8014]	0.1762 (0.086914) [2.0273]	0.3403	6.7059	1.67
3.	1975-79	4.0679 (3.3687) [12.075]	0.036532 (0.00324) [35.385]	0.6556	5.71	1.83
4.	1980-92	5.5663 (0.12884) [43.202]	0.039996 (0.0072359) [55.273]	0.7258	29.1167	1.715

It is observed from the Table 6.2 that (i) $\hat{\beta}_1 = 0.00162$ is not statistically significant at 5% level. This indicates that variation in money supply over the period 1950 - 59 fails to explain the variation in price-level significantly. This indicates that variation in price level over the period 1950 - 59 is not found to bear any association with that in money supply.

4. The equations have been estimated through the GLS method.

(ii) $\hat{\beta}_2$, $\hat{\beta}_3$ and $\hat{\beta}_4$ are found to be statistically significant at 5% level. It, therefore, appears that variation in , money supply could explain variation in price level over the sub-period 1960 - 74, 1975 - 79 and 1980 - 92. However, extent of the variations in pricelevel explained by variation in money supply varied across different sub- periods . An idea about such differing extent could better be understood from the Transition t.- matrix, presented in Table 6.3

TABLE 6.3

Transition t - matrix for β_s

	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$
$\hat{\beta}_1$	-	1.7998	11.486	13.56
$\hat{\beta}_2$	1.7998	-	2.15	2.66
$\hat{\beta}_3$	11.486	2.15	-	2.096
$\hat{\beta}_4$	13.56	2.66	2.296	-

6.9 Price Miney Relation ship over different sub - period - Further Explanation:

The transition t-matrix in the Table 6.3 represents the dynamic change of β_i^5 where differences between β_s are tested through t-test at 5% level⁶.

It appears from the Table 6.3 that (i) there exist significant difference between $\hat{\beta}_1$ and $\hat{\beta}_2$, $\hat{\beta}_2$ and $\hat{\beta}_3$, and $\hat{\beta}_3$ and $\hat{\beta}_4$. & (ii)

$$\hat{\beta}_1 < \hat{\beta}_2 < \hat{\beta}_3 < \hat{\beta}_4$$

5. Any entry in the ith row and jth column of the t- Matrix represents the estimated t statistic for the difference between β_i , β_j .

6. In the t- test at $I = 0.05$

Ho, $\beta_i = \beta_j$ Against HA $\beta_i > \beta_j$ or $\beta_i < \beta_j$

The actual form of HA depends on the respective absolute values of β_i and β_j .

$$\text{Here } t^* = \frac{\hat{\beta}_i - \hat{\beta}_j}{\sqrt{s(\hat{\beta}_i + \hat{\beta}_j)}} = \frac{\hat{\beta}_i - \hat{\beta}_j}{\sqrt{(s\hat{\beta}_i)^2 + (s\hat{\beta}_j)^2}}$$

†This is a one tail test.

It, therefore, appears that associations of the price level variation with money supply variation (though not significant in the sub - period 1950 - 59) appears to be positive and growing across higher sub-periods. A variation in price level have been found to be in growing association with that in money supply. This findings tacitly indicate that money supply affected price level more and more with the passage of time.

6.9.1 : Price Money Relationship in the Sub-Period 1950-59.

This period covers almost the entire First Five Year Plan period alongwith a significant part of the Second Five Year Plan period. There was a spurt of development expenditure followed by cheap money policy in the First Five Year Plan followed by a policy of controlled Expansion of money supply in the Second Five Year Plan period.

This period is also marked by a process of transition of a vast non-monetized part of the economy into monetization. This growing monetization was made possible through large scale financing for development purposes and thereby through large scale money supply. Consequently, the barter economy was growing into the monetized economy. Money supply, therefore, might have gone to affect income. Price variation, therefore seem to be less related to that in money supply. It seems to be supported by insignificant (at 5% level of significance) Bi in the period 1950-59.

Statistically insignificant (at 5%) Bi indicates that variation in price level is not related to that in money supply. There might be other non-monetary factors explaining the variation in price level.

6.9.2 Price Money Relationship in the sub-period 1960-74.

This period covers a very large period which is marked by several notable events like Indo-Pak War, Nationalization of Banks and the launching of 12 point Economic Programme for quick economic development by the then Union Govt. All these events involve introduction of large scale money supply into the economy in order to cope with developmental and emergency needs.

The large scale introduction of money supply and the cheap money policy followed by the Reserve Bank of India during this period immediately stimulates the nominal income of the people more than the real income. Consequently, there was large variation in price level. This variation is, therefore, concomitant with the variation in money supply in the period. Consequently, variation of price level is being observed to be in significant association with that in money supply. This is being indicated by the observed value of $\hat{\beta}_2$ which is significant stastically (at 5% level).

6.9.3 Price Money Supply Relationship in the Sub-period 1975-79.

This sub-period 1975-79, though small, is marked with several important national events like proclamation of Emergency and introduction of various 'Poverty Alleviation Schemes. All these schemes involve large scale expenditure for the uplift of the poor people. The initiation of the schemes opened the flood gate of several other schemes in the following years in different names. These schemes have later become the instrument of the govt. to pour in money into the rural economy for the outright rise in nominal income of the poor mass of the country.

Consequently, these schemes and the proclamation of emergency brought in a structural change in the eco-political environment of the country. Price control was not the main objective of the measure while the prime concern was to insure quick rise in the nominal income of the people.

This led to further variation in price level. As a result thereof, price variation was found to be in stronger association with that in money supply. This is exhibited through significant value of $\hat{\beta}_3$ while the transit t-matrix indicates that $\hat{\beta}_3 > \hat{\beta}_2 > \hat{\beta}_1$.

6.9.4 Price Money Relationship in the sub-period 1980-92.

This sub period also covers a very long period which is marked with several changes in economic policy programmes followed by different union govts. The country during this period, saw political changes just after the end of emergency. This was further marked by the comeback of the eartwhile political party (Congress) to power. Again, this party lost the marginality and political instability followed alongwith the govt. of erstwhile opposition parties. All these govt. by and large, aimed at poverty alleviation and quick generation of income opportunities for the

poor mass of the country. The economic policies which have been followed for the last few decades were on the wane. The economy saw growing money supply with variation in price level. Consequently, price variations exhibit even stronger association with variations in money supply. Thus, $\hat{\beta}_4$ appeared significant along with $\hat{\beta}_4 > \hat{\beta}_3 > \hat{\beta}_2 > \hat{\beta}_1$.

6.10 Summary and Conclusion :

We have sought to verify the association of the variation of price level and that of money supply through the evaluation of time plots of price level, 1950-92. Thus, an idea though tentative (Section 6.4) about the sub-period was formed.

A search for windows of structural changes was carried through the chow tests. Consequently, four sub - periods were identified. These periods cover 1950-59, 1960-74, 1975-79 and 1980-92 (Section 6.6).

The price money relationship over different sub-periods have been estimated. The results are being presented in the Table 6.2. Moreover, the transition t-matrix of $\hat{\beta}_s$ has been presented in the Table 6.3.

It has been observed that price variations failed to exhibit any association with that in money supply over the sub period 1950-59.

However, variation in price level has been found to be in association with that in money supply in other sub periods. This association has been found to be greater in subsequent sub periods (since $\hat{\beta}_4 > \hat{\beta}_3 > \hat{\beta}_2 > \hat{\beta}_1$).

This dynamic movement of the price money relationship in different sub periods also tacitly implies the possibility of existence of dynamic movement of relationship between income and money supply over different sub-periods. We seek to enquire into such possibility. Our study in the next chapter is devoted to this direction.

CHAPTER-VII

7.1 INTRODUCTION :

The study of output money supply relationship in chapter-V presents an overall relationship between the two macro-economic variables over the period 1950-91 as a whole. The relationship obtained over such a long period can not be expected to remain constant all over the period concerned. Government took various steps to augment output during various plan period. Top priority was accorded to agricultural sector during the 1st Five Year Plan period. New agricultural strategy was initiated in 1966-67 to boost output level. Besides, Govt. fixed various growth target¹ over different plan periods. As a result, production varied over time and this variation in output level can be seen from the Table 3.1 and also in graph 5.1.

Money supply also varied in different periods. RBI adapted varying policies regarding growth of money supply. All these might have some affect on output money relationship over different period of time. All these tacitly imply that there have been varying rate of growth in income and money supply over the period of study. Output level grew at different rates. Several structural changes occurred in these period bringing forth notable changes in output level. This historical data set therefore embodies several sub-periods. Output money supply relationship across these sub-periods may be notably different.

It, therefore, becomes pertinent on our part to look into the dynamic movement in the relationship between output level and money supply over the period 1950-91. This present chapter seeks to address this issue.

7.2 Identification of sub-periods : Graphical Study

Figure 5.4 presents the time plots of stationary series for Y_t and M_{2t-1}

It appears from the visual inspection of the two time plots jointly that -

- (i) there exists high and positive association between the variations in output level and lagged money supply until 1970. However, the association is not uniform in all the years over this period.

1. Govt. fixed 2.1, 4.5, 5.6, 5.6, 5.5, 5.3 and 5 percent per annum growth of real output over 1st, to 7th plan period respectively.

(ii) both the series exhibit high variability since 1971 until 1980 than in the period 1952-1970. It is, further observed that output level exhibits variations in consonance with those in lagged money supply. The association seems to be higher over that in the previous period.

(iii) Output level exhibits higher variations than those in money supply since 1981 until 1984. The association seems to be weaker.

(iv) Since 1986, the variation in output level is far more spectacular than that in the lagged money supply. Moreover, the variations in these variables discern almost different pattern over time. Consequently, the association between Y_t (output level) and lagged money supply (M_{2t-1}) seems to be very weak over the period 1986-1991.

It may, however, be noted that the idea of association between these two variables obtained from the examination of graph is tentative. Moreover, such idea suffers from subjective bias. For an objective evaluation of the association of the variation of the variables "Window Finding" of the structural changes become necessary. This is done in the next section.

(7.3) Identification of sub-periods and Structural changes: Results of Chow Test.

We have started with a sample of 5 years (1950-1955). This sample has been pooled with another sample of 5 years (1956-60). The estimated equations for each individual sample period and for the pooled sample period have been estimated. Consequently, the F^* (estimated Chow F - value) has been obtained which is used for "Chow Test".

Thus, we have proceeded with several samples. Each of the sample consists of five year observations of output level and money supply. We have thus eight sub-sample for the periods 1950-55, 1956-60, 1961-65, 1966-70, 1971-75, 1976-80, 1981-85, 1986-91.² The results of the Chow Tests are given in the Table 7.1.

2. The last sub sample covers the period 1986-91. Thus, the last sample covers the period of 6 years. This is mainly due to some practical needs. If the sub-sample covers 5 years viz. 1986-90, then there would have been another sub-sample of 1 year (1991). No individual equation could be estimated for the period. So, this 1 year has been included in the last sub-sample which thus covers period 1986-91.

Table-7.1
Recursive Estimation Results (Chow Test) sub-period Identification.

Sl. No.	Sample A with data for the yr.	Sample B with data for the year	F*	D.F.	Change/No change in relation across two sample.	Sub-period identified.
1.	1950-55	1956-60	2.28	2,6	No change	1950-60
2.	1956-60	1961-65	12.11	2,6	Change	1961-70
3.	1950-60	1961-65	19.23	2,11	Change	
4.	1961-65	1966-70	1.67	2, 6	No hange	
5.	1950-60	1961-70	12.68	2,6	Change	
6.	1966-70	1971-75	13.63	2,6	Change	
7.	1961-70	1971-75	17.35	2,11	Change	
8.	1971-75	1976-80	0.538	2,6	No change	1971-80
9.	1976-80	1981-85	11.44	2,6	Change	
10.	1971-80	1981-85	16.24	2,11	Change	
11.	1981-85	1986-91	1.368	2,7	No change	
12.	1971-80	1981-91	23.24	2,17	Change	1981-91

7.4: Analysis of the table 7.1 sub-periods Identified :

It is observed from the table-7.1 that estimated relationship between output level and money supply

- (i) Over the period 1950-55 and 1956-60 does not differ significantly and the relationship estimated for the pooled data set (over the period 1950-60) represents a stable relationship over the period concerned.
- (ii) 1961-65 differs significantly from that in 1950-60. The estimated relationship over the period 1961-65 exhibit instability in the sense that the relationship between variation in output level and that in money supply over the period 1950-60 was not found to be prevailing in the period 1961-65 since $F^* > F_{0.05}^{2,6}$

This finding has two implications.

First, it indicates that one stable sub-period ends in 1960.

Second, it further indicates that another sub-period begins with the end of the period 1950-60. Consequently, the first sub-period 1950-60 is identified.

(iii) Over the period 1961-65 and 1966-70 does not differ significantly and the relationship estimated over the pooled data set (for the period 1961-70) represents stable relationship over the period concerned (since $F^* < F_{0.05}^{2,6}$).

(iv) Over the period 1961-70 differs significantly from that over the period 1971-75 since $F^* > F_{0.05}^{2,6}$. Consequently, the relationship between output level variation and variation in money supply over the period 1961-70 does not appear to be remained in the period 1971-75. This indicates that the structural change which was observed to take place at the end of 1960 could not be maintained beyond the period 1961-70. This indicates that a structural change in the relationship occurred at the end of 1970. This confirm the identification of the sub-period 1961-70.

(v) Over the periods 1950-60 and 1961-70 differs significantly since $F^* > F_{0.05}^{2,16}$. This further confirms the identification of the sub-period 1961-70. Structural change further occurred at the end of the period 1961-70.

(vi) Over the period 1976-80 does not differ significantly from that in the period 1971-75 since $F^* < F_{0.05}^{2,6}$. This indicates that the relationship between output level and money supply remained stable over the period 1971-80.

(vii) Over the period 1971-80 and 1981-85 differs significantly since $F^* > F_{0.05}^{2,6}$. This indicates the identification of another sub-period 1971-80. Again the relationship estimated over the sub-period 1961-70 and 1971-80 are found to be statistically different (since $F^* > F_{0.05}^{2,16}$). This further confirms the identification of the sub-period 1971-80.

(viii) Over the sample period 1981-85 is not different from that in the sub-sample period 1986-91. This indicates that the relationship between the variation in money supply and that in income level remained stable over the period 1981-91 thus, the sub-period 1981-91 is identified as depicting a stable relationship between the variables concerned.

(ix) Over the period 1971-80 and 1981-91 are significantly different (since $F^* > F_{0.05}^{2,16}$). This confirms the identification of the sub-period 1981-91. The relationship estimated over the period 1981-91 is stable and it is sharply different from the stable relationship persisting over the sub-period 1971-80.

Thus, four sub-periods with distinct and stable relationship between output level and money supply in each individual period have been identified. These sub-periods are 1950-60, 1961-70, 1971-80 and 1981-91 respectively.

7.5. Study of Output lagged money supply relationship over different sub-periods.

Having identified various sub-periods in the study of output money relationship in India over the period 1950-91, it is pertinent to study the relationship of the variation in lagged money supply over these various sub-periods. The general form of output money relation is

$$Y_{it} = \delta_{it} + \gamma_{it} M_{2it-1} + \theta_t \dots\dots\dots (7.1)$$

where i = sub period specification ($i = 1$ to 4)

t = time.

The association of variation in the variation of the two variables is achieved through the estimation of the model. The results of the estimation are presented in the Table 7.2. The Table 7.2 presents different values of $\hat{\delta}_{is}$ ($i = 1$ to 4) and $\hat{\gamma}_{is}$ ($i = 1$ to 4) through the columns 2 and 3 respectively. Any through review of these estimates is expected to provide dynamic changes in $\hat{\delta}_{is}$ and $\hat{\gamma}_{is}$ which occurred over different sub-periods.

TABLE-7.2

Sub Periods	$\hat{\delta}_i$	$\hat{\gamma}_i$	R ²	F	D-W
(1) 1950-60	19.415 (4.9918) [3.8895]	1.0783 (0.5356) [2.0132]	0.52	3.79	1.72
(2) 1961-70	-11.95 (9.2033) [-1.2984]	2.3879 (0.3042) [7.8498]	0.63	5.96	1.63
(3) 1971-80	167.67 (27.864) [6.0174]	3.2846 (0.1103) [29.6821]	0.78	12.41	1.33
(4) 1981-91	-273.82 (154.14) [-1.7765]	1.0285 (0.7334) [1.4023]	0.43	2.64	1.91

The Figures () are standard errors and [] are t - values.

The estimated relationship in different sub-periods have been presented in the Table 7.2. It is observed from the Table 7.2 that

(i) $\hat{\gamma}_1 = 1.0783$ is statistically significant at 5% level. This indicates that variations in output level in the sub-period 1950-60 are explained significantly by those in money supply. This further indicates that output was found to vary in the sub-period 1950-60 in significant association with money supply.

(ii) $\hat{\gamma}_2$ and $\hat{\gamma}_3$ are also found to be statistically significant at 5% level. However, $\hat{\gamma}_4$ is not statistically significant. It, therefore, appears that variation in money supply could explain variation in output level over the sub-periods 1961-70 and 1971-80. However, variation in money supply in the sub-period 1981-91 failed to explain the variation in output level.

(iii) The extent of variation in output level explained by the variations in money supply varied across different sub-periods can better be explained and understood from the Transition t-matrix³ for $\hat{\gamma}$ and it is presented in the Table 7.3.

TABLE-7.3

Year of sub periods	1950-60 $\hat{\gamma}_1$	1961-70 $\hat{\gamma}_2$	1971-80 $\hat{\gamma}_3$	1981-90 $\hat{\gamma}_4$
1950-60 $\hat{\gamma}_1$	-	2.216	7.3739	0.0604
1961-70 $\hat{\gamma}_2$	2.216	-	2.7681	2.0773
1971-80 $\hat{\gamma}_3$	7.3739	2.7681	-	4.0996
1981-91 $\hat{\gamma}_4$	0.0604	2.0773	4.0996	-

3. Any entry in the i th row and j th column of the t-Matrix represents the estimated t-statistic for the difference between $\hat{\gamma}_i$ and $\hat{\gamma}_j$.

7.6 Output Money Supply Relationships in different sub-periods - Further explanations:

The Transition t - Matrix presented in the Table 7.3 represents the dynamic change of $\hat{\gamma}_{is}$ where differences between γ_{is} are tested through t -Tests at 5% level⁴.

It appears from the Table 7.3 that $\hat{\gamma}_4$ is not statistically significant while $\hat{\gamma}_1$, $\hat{\gamma}_2$ and $\hat{\gamma}_3$ are statistically significant and there exists significant differences between $\hat{\gamma}_1$ and $\hat{\gamma}_2$, $\hat{\gamma}_2$ and $\hat{\gamma}_3$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ and $\hat{\gamma}_3 > \hat{\gamma}_2 > \hat{\gamma}_1$.

It, therefore, appears that (i) association of the output level variation with that in money supply (though not significant in the sub-period 1981-91) appears to be positive (since $\hat{\gamma}_1$, $\hat{\gamma}_2$ and $\hat{\gamma}_3$ are positive and statistically significant).

(iii) the extent of association of the variation of output level with that in money supply was found to be the highest in the sub-period 1971-80.

Since $\hat{\gamma}_3 > \hat{\gamma}_2 > \hat{\gamma}_1$.

All these findings indicate that output level exhibited variation in response to that in money supply in 1950-60. This response further improved significantly in the next sub-period 1961-70. Again, in the period 1971-80, association between the variation in output level following that in money supply appears to be the most.

However, this association declined sharply and stood statistically very insignificant in the next sub-period 1981-91. Output level exhibited very high degree of variability and this variability was far more than that in money supply. Consequently, $\hat{\gamma}_4$ appeared very insignificant.

4. In the 't' test at $\alpha = 0.05$

Ho : $\gamma_i = \gamma_j$ against

HA $\gamma_i > \gamma_j$

or $\gamma_i < \gamma_j$

The actual form of HA depends on the respective absolute values of γ_i and γ_j .

$$\text{Here } t^* = \frac{\hat{\gamma}_i - \hat{\gamma}_j}{\sqrt{S(\hat{\gamma}_i + \hat{\gamma}_j)}} = \frac{\hat{\gamma}_i - \hat{\gamma}_j}{\sqrt{(s\hat{\gamma}_i)^2 + (s\hat{\gamma}_j)^2}}$$

7.7 Overview of the relationship between output money supply in different sub-period.

The relationship between money supply and output level over different sub-periods needs further review. An idea about this varying nature of relationship may be obtained once the nature of economic conditions across different sub-periods are considered.

7.7.1 Sub-Period 1950-60 : This period ranges from the early independence years to almost the end of second five year plan period. This period marks the growing monetization of the Indian economy. Barter economy was giving into the exchange economy following large scale investments during the First and Second Five Year Plan periods. Money supply added to capital formation and investment. Output level grew. Consequently, output level exhibits positive variation in response to variation in money supply.

7.7.2 Sub-period 1961-70: This period is marked by two exigencies in Indian Eco-Political history. India has to counter Chinese aggression in 1962 and Pakistan's aggression thereafter. Large scale and massive monetary spending followed. These two aggressions compelled the govt. to transfer resources from the productive ventures to the production and purchase of military goods like arms and ammunition etc. India had to modernize her military set up. However, the govt. initiated New Agricultural Strategy to boost production for self sufficiency. As a result, output level, exhibited positive response to variations in money supply. Economic and political exigencies along with the widespread national attempts to reach economic self sufficiency led to the growth in output level. This response is higher than that in the previous sub-period.

7.7.3 Sub-period 1971-80: This period is marked by the occurrence of some important and colourful events like involvement of India in the liberation of Bangladesh, Indo-Pak War, nationalization of several commercial banks proclamation of emergency and launching of ambitious Economic Programmes by the then Prime Minister Mrs. Indira Gandhi. All these events culminated in large scale financing of ambitious economic programmes. Emphasis on mass production both

in agriculture and industry along with bringing in economic justice across different strata of the society led to higher growth in output level. Consequently, output level variation in response to those in money supply was higher than those in the previous two sub-periods.

7.7.4 Sub-period 1981-91: This period is marked by overall instability in the country. Several changes in the government occurred at the centre. These governments had varying and sometimes contradictory economic programmes. This instability worsened the industrial programme severely. A significant part of money supply was used to meet the economic programmes which had very little productive bearings. Nationalized banks were found to suffer from losses accruing to non-repayment of priority sector loans. Consequently, productive ventures suffered from paucity of funds and non-variability of money from banks. There was large scale money supply and little of this money was converted to capital. Consequently, output level failed to show any significant positive variation in response to that in money supply.

CHAPTER - VIII

JOINT STUDY OF OUTPUT PRICE AND MONEY SUPPLY RELATIONSHIP OVER DIFFERENT SUB-PERIODS :

8.1 Introduction :

Friedman and Anna Schwartz (1963) hold that money supply in the short run may affect output level or price level or both at the same time. A part of money supply usually in the short run goes to stimulate output level. Price level is affected by the rest of money supply. Thus, effect of money supply is dissipated into 'Output effect' and 'Inflation effect'¹. The extent of 'Output effect' depends on the extent of money supply directed to stimulate capital asset for production and the extent of money supply left to add the inflationary pressure in the economy. Greater the part of money supply that goes to affect price level, the less is the strength of it on 'Output effect'.

In the last two chapter we have observed that both the price level and output level exhibited perceptible association with money. Such associations, however were found to be varying across different sub-periods. It, therefore, becomes pertinent to consider the findings simultaneously in order to examine them in the light of the observations of Friedman and Anna Schwartz (1963). This will enable us to understand the dynamic nature of the price level and output level with money supply. This is expected to give us a feel about how variations in output level and price level underwent changes following variation in money supply. The study in this chapter seeks to address this issue.

8.2.1 Sub-periods observations from price money and output money supply relations : Decade of 1950:

It is observed² that (1) Output level exhibited positive variations in response to variation in money supply over the period 1950-60 and (ii) price

1. They also point out that money supply may affect 'interest rate'. This is 'liquidity effect'.

2. From Table 6.2 and 7.2.

level seems to be unrelated to money supply over the period concerned.

It may be noted that this period ranges from the early independence years to almost the end of the second five year plan period. This period is marked by a process of transition of vast non-monetized part of the economy into monetization. Barter economy was giving into the exchange economy following large scale investments for financing development scheme undertaken in the first and Second Five Year Plan. Money supply added to capital formation and investment. Consequently, output level registered a spectacular rise over the period 1950-60.

Increased supply of money raised purchasing capacity of the people. However, growing output level matched the growing demand for goods. As a result, thereof, price level exhibited insignificant variation following variation in money supply. Variation in money supply added more to 'income' than to 'price level over this period.

8.2.2 Decades of 1960 and 1970 :

Output level is found to exhibit distinct patterns of variation following variation in money supply over the following two successive decades (1961-70), 1971-80). The relationship seems to remain stable for a short ten years at a time for two consecutive periods.

However, price money relationship seems to exhibit a stable relation for about fifteen years (1960-74) followed by a stable relationship for a very short period 1975-79.

It is observed that output level exhibited

(i) higher response to variation in money supply than that in the previous sub-period(1950-60);

again (ii) Increasingly higher response in the following sub-period 1971-80.

Thus, output level variation is found to be positively related at a progressively higher rate to the variation in money supply over the sub-periods 1950-60, 1961-70 and 1971-80.

It is, therefore, observed that money supply affects the output level favourably, over the period 1961-1980. Such favourable effect of money supply on output level is discernible over these two sub-periods. Such favourable effect on output level was the outcome of the economic and political situations prevailing in India over this period. Economic and political exigencies along with the widespread national attempts to reach economic self sufficiency led to the growth of output level in 1961-70. Nationalization of commercial banks, proclamation of emergency, and launching of ambitious economic programmes emphasise on mass production in both agriculture and industry led to higher growth in output level in the following sub-period (1971-80).

Consequently, output variation in response to those in money supply was higher than those in previous two sub-periods.

It is further observed that price level exhibited increasingly positive response to variation in money supply. Variation of price level is for the first time found to be in significant association with that in money supply over the sub-period 1960-74.

Price level variation is further found to display higher rate of response than that in the previous period in response to that in money supply in the sub-period 1975-79.

These observations indicate that money supply also went to affect price level progressively over the period 1960-74 and 1975-79.

It is, therefore, observed that effects of money supply got dissipated into two streams - one affected 'Income level' and the other affected 'Price level' simultaneously over the period 1960-80. A part of money supply added to the productive capacity and led to generation of income while another part just affected price level.

8.2.3 Decades of 80' and early 90' :

Again, we observed that money supply played an insignificant role in the variation of output level. This indicates that money supply failed to explain

observed variations in output level. This further seems to imply that variation in output level exhibiting insignificant association with those in money supply. Output variations, therefore, seems to be primarily due to some non-monetary factors over the period concerned.

On the contrary, price level responded significantly following the variation in money supply and the response is found to be more and more than those of the previous two sub-periods 1960-74 and 1975-79.

It is pertinent at this juncture to gauge the relative strength of these two effects of money supply. This can be felt from two observations from the table 8.1³.

Table-8.1

Output money supply relation Price money supply relation

Period	Variation in output level explained by variation in money supply.	Additional variation explained over the previous sub-period.	Variation in price level explained by variation in money supply.	Additional Variation in price level explained by money supply over previous sub periods.	Variation in money affects.
1950-60	Significant	-	Insignificant		Out level only.
1961-70	Significant	+ 11%	Significant	+ 30% between (1960-74)*	both output level and price level.
1971-80	Significant	+ 15%	Significant	+ 32% between (1975-79)*	both output level and price level.
1981-and	Insignificant	- 35%	Significant	+ 6% between (1981-92).	Price level only.

3. This table is drawn from the two tables - Table 7.2 and Table 6.2 taken together.

8.3. Further Study : Analysis of the Table 8.1-

It is observed from the table 8.1 that

(i) variation in money supply accounted for additional 11% variation in output level in the sub-period 1961-70 over that in the sub-period 1950-60. Again such variation accounted for additional variational 15% variation in income level in the sub-period 1971-80 over the previous sub-period. consequently, variation in money supply accounted for 26% variation in output level over 20 year period (1961-80) over the sub-period 1950-60.

In contrast, variation in money supply accounted for additional 30% variation in price level during the period 1960-74 over the previous sub-period 1950-54. Again, it accounted for further additional variation of 32% in the following sub-period 1975-79. Consequently, variation in money supply accounted for 62% variation in the price level over 20 year period (1959-79).

It, therefore, appears that, variation in money supply explained variation in price level more than those output level over the 20 year period covering 60s and 70s in Indian economy. This further indicates that price level had been affected by variation in money supply progressively higher rate than that in output level.

This particular pattern of income and price changes following variations in money supply becomes further perceptible when the next sub-period is studied closely.

Variation in output level in the sub-period 1981-91 is found to be unrelated to those in money supply. Variation in money supply fails to explain those in out put level.

On the contrary, variation in price level is found to be related positively at a progressive rate to those in money supply. In 1980's including 2 years of 1990's variation in money supply accounted for additional 6% variation in price level. Money supply had 3.5% less effect on output level during the sub-period 1981-91 over its previous sub-period 1971-80 in Indian economy.

It, therefore, appears that effects of money supply got more and more dissipated into price effect over the period 1960-1992. Price level variations become more and more a monetary phenomenon. Money supply progressively was divested away from building up capital asset for the generation of out put level.

CHAPTER-IX

SUMMARY AND CONCLUSION

9.1 Introduction :

This chapter deals with the summary of findings of the thesis paper. "MONEY SUPPLY AND ITS EFFECTS ON OUTPUT AND PRICE LEVEL" with special reference to India (1950-87-90). The study is made in the line of Friedman who states that the effects of money supply dissipates into 'Price effect' and 'Output effect' in an economy.

9.2 It is observed from section 4.8 that

- i) Price level, over the period of our study displayed significant positive association with money supply. Price level was found to vary positively with changes in money supply.
- (ii) Variation in price level is less than proportionate to that in money supply.
- (iii) Price variation was not entirely a monetary phenomenon. Variation in money supply could at best explain 71% variation in price level.
- (iv) Money supply appears to be a very significant variable for explaining inflation in the presence of other significant variables. The estimated equation 4.7 shows that money supply affects price level significantly even in the presence P_{t-1} (One period lag price level) in the set of regressors. This seems to be a pointer to the possibility that money supply might have Granger Caused price level over the period concerned.
- (v) Money supply failed to affect price level to the fullest extent possible. Its effects might have been dissipated into output effect. Output might have undergone a rise following rise in money supply.

Following Friedman, One can reasonably expect that a part of monetary shocks might have gone to explain variation in output level.

These findings, therefore, tacitly hint us the possibility of simultaneous variations in output level following change in money supply. An investigation on the relation between the output level and that in money supply has been undertaken in Chapter-V.

9.3 It has been observed from 5.7 that

- (i) Output level displayed significant variation following changes in previous period money supply over the period 1950-1991.
- (ii) Output and money supply variation was found to be positive ($\gamma > 0$).
- (iii) Output variation, though positive, was less than proportional to changes in money supply. Elasticity of output level in respect to money supply variation was found to be less than unity.
- (iv) Money supply could explain only 76% of the variation in output level. Consequently, output variation was found to be not completely monetary phenomenon.
- (v) Money supply was found to explain output variation significantly $\gamma_2 > 0$ even in the presence of lagged output level in the vector of explanatory variables. This tacitly, implies that money might have Granger Caused output variation over the period concerned.

It, therefore, appears that output variation over the period of study was associated with that in money supply in a positive and non-proportional manner. Moreover, output variation was not found to be completely monetary phenomenon. Effect of money supply over the period concerned, might have gone dissipated. Apart of money supply might have gone to affect price level.

9.4 The price money relationship and output money relationship studied in Chapter-IV and V present overall relationship over the entire period of study. (1950-91-92). However, the relationship might have undergone change over the period (1950-91-92).

It, therefore, becomes pertinent to identify such structural changes along with the Windows in which such a change relationship remained undisturbed.

9.5 In Chapter-VI, historical (1950-1992) data set has been used for recursive estimation and chow test. In order to identify sub-periods over which stable structural relation persists. These sub-periods thus identified for price money relationship consists in 1950-1959, 1960-1974, 1975-1979 and 1980-1992. Consequently, four sub-periods have been identified. This period covers 1950-1959, 1960-1974, 1975-1979 and 1980-1992. (Section 6.6).

9.6 The price money relationship over different sub-periods have been estimated. The results have been presented in the Table 6.2. It has been observed that

- i) price variation failed to exhibit any significant association with that in money supply over the sub-period 1950-1959.
- ii) variation in price level exhibits significant association with that in money supply in the following sub-periods.
- iii) price variations exhibit continuously stronger and growing association with variation in money supply in subsequent sub-periods.

9.7 Four sub-periods for output money relationship have been identified through recursive estimations and Chow test. These sub-periods cover 1950-1960, 1961-70, 1971-80 and 1981-91. Each sub-period exhibits stable output level money supply relationship while the relationship vary across different sub-periods.

9.8 Output money relations have been estimated for each sub-periods. Table(7.2) presents this estimated equation along with several estimated test statistics. It has been observed that -

- i) variation in output level displayed significant associations in three consecutive sub-periods viz 1950-60, 1961-70 and 1971-80.
- ii) output level failed to exhibit any significant association with money supply in the last sub-periods 1981-1991.

It has further been observed (**vide 7.6**) that

- i) Association of the output level variation with that in money supply (though not significant in the sub-periods 1981-1991) appears to be positive and statistically significant.
- ii) the extent of association of the variation of output level with that in money supply was found to be the highest in the sub-periods 1971-1980.
- iii) the association declined sharply and showed statistically insignificant in the last sub-periods 1981-1991.

9.9 It, therefore, appears that variational relationship between output level and money supply has not been uniform or homogenous over the periods of study. The relationship underwent several changes over time. Consequently, four sub-periods have broadly been identified. Each sub-period depicts a stable relationship while relationship underwent changes across sub-periods.

Again, association of the variations in output level to those in money supply was found to be dynamically more progressive over time until 1980. This might have been for the structural changes taking place in the economic and institutional set up in India over the period concerned. This might have led to the conversion of money into capital assets which, on the other hand, led to the generation of output level.

It may, again, be noted that very shaky approaches to planning became noticeable since 1980 along with fluid economic principles following political unrestness in the economy over the period concerned. This may be the possible cause behind the loose money policy and non-conversion of money into capital assets. Consequently, variation in output level was found to be maintaining insignificant relation with those in money supply over the period 1981-91.

9.10. It has also been observed that price money relationship has not been uniform either over the period of study (1950-92). Four sub-periods have been identified in each of which price money relationship remained stable though

these relationship varied across sub-periods.

It is noted that variations in price level in the period 1950-1959 exhibited insignificant association with those in money supply. However, the association got stronger and stronger over subsequent sub-periods.

9.11 From these findings, it may be noted that -

- (a) In 1950's (1950-60) output level responded significantly with changes in money supply, while price level failed to respond to money supply significantly. Moreover, price level in this period exhibited very little volatility.

This observation seems to support (i) Friedman's view that money affects output level to the extent it fails to affect price level, (ii) Lucas' view that money may affect price level under fairly stable price situation.

- (b) In 1980's (1980-1991) output level failed to respond significantly with changes in money supply while price level exhibited highest positive level of association with that in money supply over the period 1980-1992.

This is also in conformity with

- (i) Friedman's view that money supply fails to affect output level in the long run. In the long run money supply affects price level only.
- (ii) Friedman's view that greater the price level is affected by money supply, the less is the effect on output level.
- (iii) Lucas' view that money supply fails to affect output level greater the volatility of price level in view of the fact that price level in the period 1980-1992 exhibit very high volatility and volatility is the highest observed over the period 1980-1992.

9.12 Public Policy Implications

These findings seem to have important public policy implication. It appears from these observations that since the last decade (since 1980) there have been some impediments in the way of the conversion of money supply into capital assets. Consequently, money supply has been failing to add

to the supply side of the economy. It is on the other hand, has been more and more adding to the demand side of the economy. Purchasing capacity of the people are in spate following massive doses of money supply over the last two decades. Consequently, excess demand has been the regular feature of the economy adding more to the existing inflationary process.

These findings, therefore, seem to indicate that

(i) prudent and cautious steps must be taken to determine the extent of money supply in the economy. In the event of absence of any structural change in the economy allowing conversion of money supply into capital assets, money supply may only add to inflationary pressure. Reduction of the extent of budget deficit and subsidies may be taken as beginning steps in this direction.

As a matter of fact, IMF has, over the recent past, been emphasizing on curbing money supply in India through reduction in subsidies and budget deficit. These policy prescriptions may be taken as an attempt to ease the economy out of the excess demand situation.

(ii) easy money policy cannot be practised for the entire economy but can be undertaken for selective areas of the economy. It may be noted at this point that even at the far end of the twentieth century Indian economy consists of some regions which are not entirely monetised. Some regions exist which are no better than barter economy. Easy money policy practised from these regions/sectors of the economy may result in capital asset formation leading to output growth.

(iii) volatility in the price level need to be reduced considerably. Stable price level opens up a scope for the efficacy of monetary policy in affecting output level. Stable price level persisted for a considerable period of time reduces the extent of expected inflation rate. Consequently, occasional rise in money supply may not add to nominal interest rate. Consequently, there remains a scope for fix level of investment and capital formation.

9.13 However, we are aware that our study over the period 1950-1991/92 has been restricted to only a few Recursive Equations. So, the picture obtained here does not enable us to draw firm conclusions about the effectiveness of monetary policies for the years to come. There is, therefore, a need for further research with extension of data set for drawing firm conclusion over this issue.

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