Chapter IV

Chapter IV

High Powered Money-Money Supply Relationship & Tests of Causality.

IV.1 Survey of Money Supply Theories.

The supply of money is a stock at particular point of time , though it conveys the idea of flow over time[1]. The term the supply of money is synonymous with such term as 'Money stock ', ' Stock of Money 'and ' quantity of Money.' No doubt, the supply of Money , deserve important place in Macroeconomic theory. But, however, its analysis in economic found second place compare to money demand analysis, in terms of theories formulated to explain its behavior. One can say that theory of money supply is almost a newly discovered area in the field of macroeconomics. Money supply analysis was over looked owing to prevalent practice of treating money as given. This treatment based on mechanical process of determining the money supply was the result of availability of amount of gold. The second important reason of neglecting money supply analysis had been the experts in field of economics preoccupied themselves with aggregate demand analysis. But, since the growth of demand deposits, fractional reserve system and development of central banks, theories concerning the study of money supply were forthcoming. In the following paragraphs development of money supply theories have been discussed.

Money supply theories in pre-keynesian era are related with currency school, The Banking school, Fisherian Theory, Hypothesis

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1. See Gupta.S.B. 'Monetary Economics, Institutions, Theory and Policy pp.15-18.

given by Reifler - Burgers ,Phillips Rogers,Angell and Ficek Money Supply Theory and also Curries Money Supply Hypothesis .

Currency School consists of classical economists particularly, David Hume, Richard Cantillon and Henry Thornton who are the main proponents of money supply theory.Currency School theory of money supply states that money supply is directly concerned with quantity of gold and or silver.In a economy any individual who owns a gold and/or silver mine or imports gold from abroad, owns or possess a money machine .Money supply was thus treated as determined by availability of gold and/silver and not as demand determined.This is the reason so tha through the Ancient era, the mediteranean civilisations frequently experienced higher money supplies as result of discoveries of new mineral deposits and the invention of increasingly efficent techniques of mining and metallurgy.The discovery of gold reserves in California in 1948 and the the gold rushes in Australian Alaska,South Africa and the Yukon had raised tre money supply in these countries.The Banking School theory of money supply is known as commercial loan theory and it is based on real bills doctrine and Law of. Reflux.This theory holds that tne money supply is a function of discounting of commercial bills.Money supply will rise if the ratio of excess reserves to ceposits decreases in response to demand for credit.This type of process comes to stop when the level of excess reserves with banks reaches the fixed reserve level.In this process of money supply banks remain inactive.However,these,ideas putforward by Banking School have many interesting implications.They imply that supply of money is,in essence,infinitely elastic.Banking School Theory held the notion that needs of business control the volume

of notes issued but banks themselves are unable to force the notes into circulation.The legitimate needs of the business were reflected in the demand for short-term self liquidating loans for productive purposes meant for business,commerce and agriculture,In this approach it should be noted that there is no relation between money and prices as in Currency School Theory where prices are the result of money supply.Since money supply is demand determined,an over supply cannot develop to act on prices. This implies that the origin of the business cycle is non monetary in nature.Since the stock of money is demand determined,price level changes ought to precede and cause subsequent changes in the money supply.However,weakness of the real-bills doctrine was shown out by Henry Thornton[2].He was of the idea that if the needs of trade are governed by the real yield on capital and if money rate of interest held the below the yield on capital,the demand for loans would be insatiable and corresponding supply of banks notes infinite.Confining loans or discounts to sound commercial papers do not furnish a check to the over - issue of bank notes,even if they are convertible into gold.Inspite of all this, the doctrine of real bills was so strong that it was incorporated in the Federal Reserve Act of 1913 ,which limited Central Bank advances to commercial Banks to,short term commercial and agricultural paper.The real bills doctrine emphasized the idea about exogenous or endogenous controversy in the area of money supply despite its fallacy.It should be understood that for Currency School,the money supply

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2) See,Thornton,Henry (1965)"The paper credit of Great Britain",Hayek.F.A ed ,Kelly Augusts,New York.

was exogenous, whereas to the Banking School it was clearly endogenous. According to Banking School, central bank cannot control the stock of money for it is purely demand determined variable. Irving Fisher's theory of money supply is very much reflected in his business cycle model[3]. He has not given any explicit theory of money supply. In his money supply theory, portfolio choices of the commercial banks and public, monetary base and money multiplier are important.

In his business cycle model, cause of cycle is as result of rise in gold money, which leads rise in price level. As result, in turn increases the demand for loanable funds, which push up the money rate of interest. Increase in the money rate of interest offers incentive for commercial banks to provide loans and consequently deposit ratio goes down causing the multiplier to rise and supply of money to expand, which further aggravates the price rise. On the other hand, down-swing the portfolio behaviour of the public seeks to increase the part of its money holdings composed of gold which further aggravates the overall contraction of the money supply and consequently the economy enter in to recession. Thus, Irving Fisher viewed that, besides the rise in monetary base, the change in money multiplier alters the stock of money in economy. His views, obviously indicates that money stock is a purely endogenous variables determined by the portfolio choices of public and banks. But major break came

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3) See, Fisher Irving, The purchasing Power of Money In Determination and Relation to Credit, Interest and Crises. Macmillan Company, New York.

through,W.Randolph Burgess and Winfield.W. Riefler who set forth the money supply analysis,in 1927 and in 1930 respectively . It appears that W.R.Burgess was the first to use the phrase "high powered"money to describe the monetary base;and credit for explaning in detail,the implications of Federal Reserve open market operation goes to W.W.Riefler.They disclosed that,money supply depended upon the base of high powered money which could be influenced by open market operations or international gold flows.This study was supported with statistical data and based upon their observation that members banks maintain their total reserve holdings with the Federal Reserve System close to the Statutory requirements that is,they sought to avoid any net indebtedness to the central bank throughout the formative years of the 'Federal Reserve System' Due to this unique restraint on commercial banks portfolio behaviour, the money supply function depended upon the base of high powered money. Professor C.A.Phillips (1920) was concerned with the amount of demand deposits a bank could create given the various changes in its reserve base.He was among the very early contributors and his deposits multiplier is very elementary containing only the reserve to deposit ratio.James Harvey Rogers[4] and James.W. Angell[5] followed the contributions given by C.A.Phillips. Their

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4) See,Rogers. J.H. (1933)'The Absoprtion of Bank Cradit '"Econometrica,Vol.1

5) See,Angell,J.W.and Carl.F.Ficek (1933) 'The Expansion of Bank Credit "journal of political Economy.Vol.41.February.

idea in form of formula is as below;

$$\text{Demand Deposits} = \frac{\text{Monetary Base}}{\dfrac{(\text{Reserve} + \text{Currency})}{\text{Demand Deposit}}}$$

As per this formula, given changes in its reserves, the amount of demand deposits an individual bank and banking system as whole could create. The two ratios in denominator are the given values, based on past experience and not related to any behavioural determinants. However this approach is major step ahead in the formulation of supply function of money. The formula obviously shows the evidence that central bank is able to control the stock of money in economy. Lauchlin Currie hypothesis is extension of the ideas given by the Philips, Rogers and Angell. His work is related with an explanation of the stock of money and degree to which it could be controlled by the central bank. He gives many reasons for the ratio and numerator of formula (given by Rogers and Angell) which are subject to change over a time and thus includes an interesting analysis of cyclical variation in the stock of money. However, Lauchlin Currie rejects the commercial loan theory of money supply and also draws a clear distinction between supply of money and bank credit. He is of the opinion that Federal Reserve Failed to understand this very fact and as result it cause them to make very wrong decisions. He made, early attempt to formulate behavioural hypothesis about variables whose change affects the stock of money in economy. He is pessimistic about the ability of central bank to control the supply of money.

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6) See, Currie, Lauchlin (1935). The Supply and control of Money in the United States. Seconded Harward University Press, Camoridge.

After going through Pre-Keynesian era, thus, opened the doors towards well - known controversy about exogenity-endogenity of stock of money in economy.

Post Keynes period consits of large many theories on money supply. The money supply studies started after long gap, during late 1950s, and beginning of 1960s. However, Post keynes studies can be separated into two main groups. First group includes economists representing the Quantity Theory Tradition. This group includes eminent economists namely, M. Friedman and A Schwartz, P. Cagan, K. Brunner and A. Meltzer 3, David Fand and the Research Staff of Federal Reserve Bank of St Louis under the direction of Leonall Andersen, J. Jordan and K. Carlson. The model developed and used by them is based on multiplier approach of money supply determination. The second group is represented mainly by James Tobin and other eminent economists namely Paul Samuelson, R Telgan , Ackley, W. Heller, A. Okum and L. Klien, Gramley, Chase, Kerekan, Cacy and Devis. All these economists are mainly influenced by the work of James Tobin , Gurley and Shaw and by the studies of staff social scientists of the Federal Reserve System. There are two important aspects of argument of this group. These are (A) the multiplier approach to stock of money determination is too simple (B) the banks do not have greater capacity for creating credit than non-bank financial institutions. Hence, model developed by Quantity Theory Tradition, based on multiplier approach (Money Market Theory) of money stock determination is gradually emerged, as the free reserve conception has been fading away for several years. However these two types of stands, on studies related with stock of money, are based on empirical evidences which gathered

momentum in U.S.A. in the 1950s and has given rise to lot many other models of money stock determination.Which could be conveniently be separated into (I) Multiplier Models (II) Structural Models and (III) Reduced form Models.

(I) **Multiplier Models :**

The main features of these money supply models are that they are based on an approach which makes the money supply some multiple of reserve based, defined by monetary authorities. Multiple depends upon reciprocals of reserve requirement ratio and currency deposit ratio maintained by banks and non-public respectively earlier economicsts considered it as mechanical process, based on costant ratio assumption. But, as a matter of fact reserve requirements ratio and currency reserve ratio both are not technically determined or legally fixed. This weakness has given opportunity to a behavioural theory of money supply determination, on line of theory of demand for money. Due to this rethinking various kinds of multiplier models have been developed in field of macroeconomic . Some of important approaches of money supply determination explained on the basis of multiplier models are M.Friedman and A.Schwartz Approach, P.Cagan Approach, Brunner -Meltzer Approach, Reserved Available Approach, Fand - Tower Approach , Alex Kellys Approach A.Burger, L.Kalish and C.Babb Approach

It is essential to know about these approaches of money stock determination.

Milton Friedman and Anna.J. Schwartz[7] pioneer; useful

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7. Friedman.M. and A. Schwartz (1963a).The monetary history of U.S.A. National Bureau of economic research pp 776-808.

approach to money supply determination relates money supply to High Powered Money (Monetary Base). High powered money consists of members bank balances at the Federal Reserve plus vault cash of commercial banks and currency held by the public.The factors which determine money supply (M 2) are high powered money (H), the banks's reserve ratio (r), and public currency to deposits ratio (c). These three determinants shows the behaviour of monetary authorities, banks and public respectively. These three determinants are regarded as proximate determinants and underlying each proximate determinant, there are large many economic and institutional factors which may be considered as ultimate determinants . M.Friedman and A.Schwartz are able to analyse separately the factors which affect each of the three proximate determinants. They investigated whether a change in any one of three proximate determinants could possible independently,without affecting other.In terms of these three proximate determinants, M.Friedman and A.Schwartz presented the money supply identity of the form, M = mH. In this identity money supply (M) is decomposed into the monetary base (B) which indicate the portion of the money supply controlled by the monetary authorities and the multiplier (m) indicating the uncontrolled portion of money supply. The money supply (M) is divided into currency component (C) and a deposit component (D). Monetary base (B) is divided into a reserve component (R) and a currency component. Thus,

M = C + D .....(I)

B = C + R OR H = C + R.....(II)

Dividing (I) and (II) gives :

$$\frac{M}{H} = \frac{C + D}{C + R}$$

OR

$$\frac{M}{H} = \frac{C/D + 1}{C/D + R/D}$$

OR

$$\frac{M}{H} = \frac{C + 1}{C + r} \qquad \ldots\ldots\ldots(III)$$

Hence $M = H \left[\frac{1 + C}{C + r} \right]$ ——

Money stock in terms of the above mentioned three determinants assists analysis of the underlying economic factors at work. The quantity in the bracket is the value of money multiplier : express the portion of money supply outside the control of the Federal Reserve and H expresses the portion of money supply said to be controlled by Federal Reserve (Jack.L.Rutner, 1973). High powered money (Monetary base) times this multiplier yields the broadly defined money supply. This simultaneous interaction of changes in high powered money and in the banks reserve ratio (r) and public's currency to deposit ratio (C) determines changes in the money supply. Obviously, in this approach important assumption is controllable monetary base by central bank and combined with a predictable money multiplier indicate that central bank must be able to control money supply in economy. Making use of this technique and utilising monetary data related to U.S.A. for the period of 1867 - 1960, M.Friedman and A.

Schwartz concluded that changes in high powered money were by far the dominant determinant of long term and major cyclical movements in the broadly defined money Stock. In this manner M.Friedman and A.Schwartz in the monumental monetary history of United States provided a "statistical account of the stock of money in United States since 1876 - 1960 [8]." After the appearance of M. Friedman and A.Schwartz work, there have been plenty of studies which have examined the relation between high powered money and the money supply.

Phillip Cagan examined the sources of changes in the supply of money and provided a statistical analysis of the cyclical and secular behaviuor of proximate determinants [9]. His money supply technique is similar to M.Friedman and A.Schwartz. But, he expressed currency as a ratio of money (C/M) and reserve as a ratio of deposits (R/D) :

$$M = \frac{H}{C/M + R/D - C/M, R/D}$$

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8. See National Bureau of Economic Research studies in Business Cycles No.12 (Princeton, Princeton University Press 1963)

9. See Cagan . Phillip , "Determinations and effects of changes in the stock of money, 1875 - 1960 chap.6.pp 234-76.

Phillip Cagan examined the underlying factors affecting movements in stock of money in greater detail, as compare to work done by M.Freidman and A.Schwartz. Cagan's conclusions were generally applied to two period 1875 to 1914 (When the Federal Reserve System was started) and 1914 to 1960. He detected that rise in high power money mainly came from two sources -- growth of gold stock in the first period and growth in credit extended by Reserve Bank during the later period. His analysis and data indcates clearly that dominant factor affecting growth in money supply (91%) has been the growth in high powered money.However,for the mild cycles, he finds obvious evidence of the influence of economic activity on the stock of money, because the dominant part in determining the stock of money is attributed to (C/M) and (R/D) two ratios and variations in these are explainable in terms of the portfolio decisions of individuals and commercial banks, both of which are determined by movements in the degree of economic activity. However , as per Phillip Cagan study, for the period of 1877 - 1954, the currency/money ratio itself accounted for roughly one half of the cyclical variation to the rate of change of stock of money (Cagan 1965).Since he found that the cyclical changes in money were influenced by changes in economic activity through the C/M ratio.He made conclusion that the transmission mechanism of monetary impulses runs from variations in the volume of money to variations in expenditures and income. He has strongly believed that central bank is able to control money stock over long period. In his monograph Phillip Cagan examines intensively the sources of changes in the stock of money and provides a detailed statistical analysis of the cyclical and

secular behaviour of each of the proximate determinants of the quantity of money, as we term them : high power money , the ratio of deposits at banks to their reserves and the ratio of the public's holding of deposits to its holdings of currency (Milton Friedman 1964)[10] .Now it is obvious that M.Friedman and A.Schwartz and Phillip Cagan, all three of them, sought changes in money stock either in the change of monetary base (High Powered Money) or in the multiplier. This was related to both, the cyclical and a secular behaviours. They, made efforts to relate the movement in the denominator ratio, for instance, to behaviour "Emerging from initial attempt by this group is the conclusion that they are making use of portfolio or capital theory to the stock of money there by putting it on the same ground as the theory underlying the demand for money[11] .

K. Brunner[12] and A.Meltzer[13] in their money supply models not only includes institutional facts but also covers similar

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10. See.Friedman.M."Post war trends in monetary theory and policy" National Banking Review 2. Sept.pp. 1-11

11. Makinen, Gail.E (1978) Money,the Price level and Interest Rates; An introduction to Monetary Theory, Prentice Hall of India,New Delhi.

12. Brunner Karl, A case study of U.S.A. monetary policy. "The Inflationary Gold flows of Middle Thirties"

13. Meltzer.Allan H. "The behaviour of French Money Supply : 1938-1954 JPE.June

elements like M.Freidman and A.Schwartz approach but they have work out it in different way. In their model, a useful concept for monetary analysis is provided by high powered money (Monetary Base) which is the variable restricting the maximum size of money supply and which is directly controlled by Federal Reserve System through open market operations, reserve requirements and administration of discount window. The high-powered money is measure on the basis of source method, other factors - which are behavioural in nature - included in money stock are the currency, reserve, time deposit and government deposit ratio. The variation in these ratios reflect the actions of treasury, banks and non-banks - public which influence the money supply. By and large K.Brunner and A. Meltzer work is related to the narrow definiton of money supply which is shown below (Leonall,C.Andersen 1967).

$M = m0 + m\,1\ (B + L) - m\,2\ CO - m\,3\ TO - m\,4\ ERo$

In this proposition M is money supply narrowly defined, C denots currency held by public, T denots time deposits at commercial banks, ER denots banks excess reserve, B denots monetary base (High Powered Money),L denots liberated reserves. B + L togather regarded as extended monetary base, m 1 denots money multiplier,m 2 CO denots portion of currency held by non-bank public,m 3 To is portion of time deposits at commercial banks, m 4 ERo is a portion of member bank demand for excess-reserves. The m's in these three expression are also multipliers, but they possess different values than m 1 .The first term in the money supply function (mo) is a constant. The term m 1 may be looked as the average response of money to a change in the extended base.K. Brunner and A.Meltzer investigated in depth the economic forces underlying the public demand for currency, time deposits and bank

demand for excess reserves. As K.Brunner pointd out ,"No doubt the monetary base is not the only determinant of money supply.The way public and bank behave also affect the money supply.But the relative orders of magnitude are of crucial importance in this context. The monetary base dominates all the major movements of money supply in all countries examined thus far". Karl Brunner (1958).In a independantly study conducted by A.Meltzer in 1958 related with French money stock behaviour a close as well as stable association was found between monetary base (high powered money) and money stock. He investigated through his study, that monetary base such a significant instrument that money supply in France could be predicted with an average error of just 1.5 percent. Allan H.Meltzer (1969) found that greater than 75 percent of the variance in the monthly changes in the monetary aggregate (Money Plus Time Deposit) can be controlled by adopting the base as a target and estimating Treasury deposits as accurately as in the past. In order to conformed the results that money supply is by large dominated by monetary base, Karl Brunner[14] computed rank correlations between changes in the monetary base and money supply. The coefficient of the correlation between changes in monetary base and money-stock comes to 0.537 and between changes in multiplier and money stock comes to 0.084 . This clearly shows importance of monetary base as tool to make analysis of money-stock. K.Brunner and A Meltzer formulated debatable proposition that monetary base also dominate

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14. Brunner Karl "The Role of money and Monetary Policy" Review, F.R Bank of St. Louis, July p.16

short-term monvements in money supply. They used narrow definition of money supply to formulate their short-term proposition. They investigated that greater then 85 percent of the variation in the monthly changes in narrowly defined money supply was accounted for by chnages in the monetary base and in treasury deposits at commercial banks. However, for the 1930's they found that money supply was slightly affected by interest rates behavior.[15] Obviously they emphasized that degree of accuracy that can be obtained by the monetary authorities in controlling money supply in function of their ability to determine the monetary base, and to predict the influence of the public's and bank's , on the basis of sufficient amount of theoretical as well as empirical research work K.Brunner and A. Meltzer explained that the Federal Reserve is able to control the money supply and that money supply is suitable indicator of the thrust of Federal Reserve actions on prices, employment and out-put. They pointed out that, it is the movements in the money variable and not the reasons for the movements in money variable which are important.Because Federal Reserve has the power to offset the effect of all non policy influences on the money supply (all monetary base). They have shown how and why Frederal Reserve should play key role in maintaining monetary stability in economy.

Federal Reserve Bank of St. Louis is related to reserve available approach .In most of countries commercial banks are abid by law and custom to hold as reserve an amount of equal to

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15. Jordan.Jerry L. (1969) 'Elements of Money Stock determination' Review FR Bank of St. Louis. October.

fraction of their total deposits earlier reserve requirements were intended for safety of depositors during the time of temporary drains created due to constant withdrawls. Over a period of time new methods have been developed for temporary accommodation to commercial banks in times of difficulties but at the same time reserve requirements also retained as a method of controlling the volume of bank credit and money supply. This approach is also known as "reserve available approach" to money supply determination. This approach is widely used by the economists working as Fedral Reserve Bank of St Louis. Leonall. C.Andersen[16] work needs to be mentioned in this regard/L.C.Andersen's article[17] "Federal Reserve Open Market Transactions and Money Supply" highlight the role of bank reserve and concerned in money supply determination. A important means through which the Federal Reserve System affects the supply of money is, changes in its holdings of assets which directly change the amount of member bank reserves "Bank reserves, in turn, have an important bearing on the movement in country's money stock.(demand deposits plus currency)." Bank reserves affect the quantity of bank credit, bank deposits and the stock of money in economy. With larger volume of bank reserves banks are in

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16. See. Andersen.L.C."A study of Factors Affecting the Money Stock .(1965a) :Phase I" Staff economic studies , Board of Governors of the FR System FR Bulletin october.

17. Federal Reserve Open Market Transactions and the Money Supply Rview (1965b) FR, Bank of St.Louis, April.

position to expand more credit and hence more money supply but lower volume of bank reserves result into opposite effect. Bank reserves are affected by Federal Reserve holdings of government securities, currency in the hands of non-bank public, the gold stock, Treasury operations,members bank borrowings from Reserve Banks, non-monetary deposits and reserve held in exces of reserve requirements. "In summary, five classes can be used to categorise the factors which influence the money stock. Obviously Federal Reserve open market of transactions is one of the important factor but over and above there are also other reserve factors, reserve utilization factors, expansion ratio factors and other components of money. System actions and other reserve factors affect the size of the reserve base. Reserves Utilization factors establish the portion of the base allocated to support member bank monetary deposits. The expansion ratio factors determine the volume of monetary deposits supported by this portion of reserves. Other components of money constituens the portion of money which is not directly related to the reserve base."Among the factors which is responsible for a lack of correspondence between changes in reserves and change in money supply are (A) movements of deposits between private accounts, (B) changes in excess reserves, (C) shifts in deposits between banks with different reserve requirements (D) shifts between time and demand deposits (E) changes in deposits of non-member banks,(F) changes in inter bank deposits, and (G) movement of currency between banks and the public". (Research Department 1962) . Leonall.c. Andersen (1967) in a study related with factors affecting the money supply, in which he includes many concepts of the reserves

concluded that "month-to-month changes in money (not seasonally adjusted) were dominated by changes in Federal Reserve holding of U.S.A. government securities. Changes in avilable variable consisting of the sum of the gold stock, Treasury accounts and minor Federal Reserve accounts and changes in currency hold by the non-bank public.At times other factors such as member bank borrowing from Reserve Bank , member bank excess reserves, Federal Reserve Float and Government demand deposits contributed significantly to changes in money stock". In totality, the reserve deposit ratio determines the total volume of bank deposits but doubt is expressed that this ratio is highly unstable and hence the amount of money stock remains unpredictable. The important reasons for highly unstable ratio are (I) different ratio for different banks and various type of deposits and (II) changes in banks demand for cash or excess reserves. The first source of variation was confirmed by Lauchlin Currie (1935) around forty five years ago. He commented in early thirties that shifts of deposits among banks and types of deposits would cause problems for money stock managers. However George Benston[18] found that the reasons which cause variation in 'reserves' are not such which cannot be predicted. Jerry.L.Jordon[19] supported George Benston view. He pointed out

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18. See. Beston.G.J. (1969)."An Analysis of Evaluation of Alternative Reserve Requirement Plans" journal of Finance Dec. American Finance Association pp. 849-70

19. See. Jordon.J.L. 'Elements of Money Stock Determination, (1969) Review, FR Bank of St.Louis.oct. pp 849-7

that ratio of total commercial bank deposits is the least unstable of all the ratio that determine over all multiplier. In a study conducted by the Research Department of Federal Reserve Bank of St Louis (1962) for the period from 1950 to 1962, shows that changes in money supply do not match exactly with changes in monetary reserves, however, factors responsible discrepancies do not prevent a rather high degree of correspondence between changes in reserves and changes in money supply. Of the most factors that account for difference in timing or degree, are relatively minor. Another study related to "Excess Reserves" (Research Department,)[20] indicates that"fluctuations in excess reserve do not appear to reduce significantly the System's Control of bank credit and the money stock. Trend and cyclical movements in excess reserves have been reasonable and related to items like movements in interest rates, variation in banker demands for liquidity, bank expansion and technological progress. Proper Federal Reserve System actions can balance these movements, as per the evidence available".

D.I. Fand. J.E.Tower[21] conducted a study a related to Canadian economy. They applied the free model to the Canadian monetary sector. They discovered that supply of money is the outcome of actions taken by the (A) Central bank which influence the monetary base by open market operations and also by through

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20. Research Department of Federal Reserve Bank of St Louis" Excess Reserve Review (1963) pp 11-15

21. See.Fand David.I and Tower John.E. "An Analysis of Money Supply Process in Canada" Canadian Journal of Economic,May 1968.

variation in banks rates and reserve requirements ; (B) through commercial bank which holds reserves and vault cash and (C) steps taken by the public which selects about the distribution of monetary wealth among currency deposits, intermediary claims and other financial assets. This is how, owing to these types of portfolio decisions determines the money stock. As pointed out by D.I.Fand and J.E.Tower (1968), "To define, construct and estimate a money supply function and to relate this function to central bank instruments we need to spell out ceteris-paribus conditions for both the bank and the public. Thus, if we work with M2 and develop a short-run money supply function, we need to consider how the public will adjust their holdings of currency. To develop long-run money supply function we need to specify the adjustment that the banks will choose with respect to all their assets and liabilities and the adustment that the public will undertake with respect to their financial assets. finally, we may go to a step further and construct a function giving the fully equilibrated money stock, taking into account associated changes in the real sector. Thus the money supply response to changes in reserves, to change in discount rate and to changes in other variables.""A number of experiments we performed indicate that a free reserve equation can be fitted to the Canadian data. The form of the equation the size and quality of the coefficients and R^2 that we obtained are very similar to those that we have for the US data".

A.K.Kelly[22] uses the money supply data for the period of ten

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22. See Kelly Alex.K."Sources of Change in the Canadian Money Stock 1955-65 " Banca Nazionale del Lavoro. (1969) pp 395-407.

years,1955-1965,a related to canadian monetary sector. His study reflects the short-term and long-term effectiveness of monetary policy of central bank. A.K.Kelly concluded that determination of nominal money supply is by and large affected by public and to little extent by banking system. Inspite of the central bank controls the monetary base, this does not provide to central bank complete control over the money supply. As a matter of fact, the central banks of the monetary base, togather with the legal reserve ratio, allows it just the strength to fix an upper limit to the money supply. The empirical evidences indicate that long run changes in money supply are mainly affected by changes in monetary base and variation in money multiplier creates changes in money supply in short period ." These finding cast doubt on the ability of the central bank to pursue an effective shor-term monetary policy.since," for short period much of the money stock (and interest rates) lies with banking system and the non-bank public." Thus , Kelly's work focused on inability of central bank to pursue an effective short-term monetary policy in Canada.

Regression Method expresses money multiplier as a function of variables that are known or under the policy control of the monetary authority. This relationship is estimated for every period by multiple regression analysis . This method is applied by Albert Burger, and Christopher Babb and further extended by Albert Burger personaly, in a subsequent article .In this technique the money supply is estimated using the lagged 3- month moving average of past values of the multiplier (mt-1 + mt-2 + mt-3)/ 3, the lagged percentage change in the market yield of some of the important bills like Treasury bills and seasonal

dummy variables.But A.Burger[23] pointed out "In essence,this is a very mechanical method that does not attempt to incorporate any information the Federal Reserve might have about expected movements of key factors such as Treasury deposits in forcast month.Therefore,the results of the procedure should not be viewed as an indication of the best control the Federal Reserve could attain. Instead, they provide a standard against which other procedures could be evaluated."

However all these multiplier models are regarded as important contribution in the field of macroeconomics.

(II) **Structural Models:**

This approach to money supply determination is represented by James Tobin,T.Thomson,J.Pierce and Robert Perry.There are also many other economist related with this approach; they are Samuelson,R.Teign,Ackley,W.Heller, A.Okun, L Kelin,Gramly,Chase, Karckan, Cacy and Devis. Most of them are largely influenced by the studies conducted by J.Tobin, Gurley an Shaw and by the work of staff economists of the Federal Reserve System. The purpose of structural relationships and to have a means of transmission for adjusting predictions for changes in structure.

J.Tobin's[24] survey of money stock considers the determination of interest rates togather with money stock.Like individual firm in microeconomics, commercial bank is considered

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23. See Burger.A.E."Money Stock Control"In Controlling Monetary Aggregate II. The Implementation, F.R.Boston (1972)pp 33-35

24.See. Tobin James. "Commercial Banks as Creators of Money" in Deane Carson (ed) Banking and Monetary Studies, Richard.D.Irwin Inc...Homewood. (1963)

as profit maximising unit.So, commercial bank expands credit to the level where the marginal cost of accepting deposits just becomes equal to the marginal gain from lending. However, this is not possible in practice. Because, reserve requirements imposes control over this rule and therefore banks are forced to cut down the expansion short of competitive - equilibrium. James Tobin's analysis opens the view that an individual bank is not constrained by any fixed amount of reserves. Individual bank can add to its reserves by borrowing from at the discount window or by selling off short-term securities i.e. reserves are available at the discount window and money market at a price. Tobin pointed out that, extent to which reserves are used or unused largely depends on existing economic structure.i.e. available lending opportunities as well as on interest rate structure. This shows. says Tobin, a weak linkage between reserves and deposits. From this argument emerges the conclusion that holding of reserves by bank related with profitability notion and therefore a given rise in excess reserves balances may not always lead to a multiple amount of deposists, Further, the changing interest rate leads to changes in the desired level of reserves held by banks. This indicates that demand for bank reserves is a function of interest rates.Given the monetary base, market fluctuations in demand for reserve creates large fulctuations in stock of money. James Tobin's opinion is in support of Keynesian view. James Tobin and Keynesian believes that cnetral bank may well be able to control the stock money if it desires, the actual stock of money in the result of actions of public, commercial banks and central bank because here also it is assumed that economy consists of above mentioned sectors.

D.Thomas,Thomson,James Pierce and Robert Perry[25] made attempt to study money stock determination by using monthly money market model. They used Federal funds rate as the control variable. The objective of this model is to specify the structural relationships.They have included three sectors in their model.These sectors are public,commercial bank and Government. In the model, interaction of these sectors determines values for currency,demand deposits, other time deposits, public and bank holdings of Treasury bills, excess reserves, borrowed reserves and some rates of interest. Monthly money market model solves for a Treasury bill rate which then, along with retail sales,wealth and seasonal variables, determines the public's demand for demand deposits and currency. "Because of its structural arrangement this model failed to provide the suitable and best technique for predicting the money stock".

(III) **Reduced Form Models:**

There are two important kinds of versions related to reduced form models: These versions are treats non borrowed reserves, busines sales, government deposits as policy variable.(Richard Davis Version)[26] .The reduced form model regard linear version of

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25. See, Thomson,Thomas D,James L Pierce and Robert Perry,"A monthly money market model",FR Bank of Boston, sept 1972. p 124

26. See.Davis.R.G."Estimating Changes in Deposits with Reduced Form Equations"F.R. Bank of New York in Controlling Monetary Aggregates.II F.R. Bank of Boston Conference Series No.9 (1972) p.124.

the money demand and money supply relationship. Further, money demand is assumed as a linear function of income, interest rate and an error term. On the other hand ,money supply is assumed as a linear function of reserves (either total or non-borrowed), interest rate and an error term.Richard Davis takes the demand deposits component of money supply as a variable to be explained. F.C.Schandrack and S.Skinner[27] model is an attempt to make extension of Davis's study. However, there model forecast M1t rather than demand deposits. Thus, after the Keyne's large many theories on stock of money have been developed mostly in western world in field of macroeconomics. However main contribution have been in form of various models like multiplier models, structural models and Reduced form models applied to money stock determination.

Survey of money stock studies conducted in India.After 1960, few non-econometric studies of money supply in India were undertaken.So far, econometric analysis of money supply is concerned Indian economists were no way close to western world. This poor performance was not because of lack of concern toward the econometric studies, but owing to difficulty in collection of money supply statistics and other related data pertaining to India. Another reason is, most of economic studies were revolving around theory of economic growth, because of India's

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27.See. Schandrack F.C.and skinner.S "A Reduced Form M1t equation" Unpublished Manuscript, FR Bank of New York in Controlling Monetary Aggregates II FR Bank of Boston 1972. p.125

preoccupation with economic planning. Further, in India, prior to 1962 money was treated as exogenous, so that no need was felt for money supply study, instead money demand study was felt important by Indian econoimists. However Indian economists revised their opinion after Indo-China (1962) and Indo-Pak (1965) wars and poor crops in 1970s.These wars and poor crops increased price level by around 10 per-cent per year by 1965 and it rose by 13 per cent in 1966 and 1967. Then, started recession period of 1967-69. All these jerks and shocks to Indian economy led to new-outlook among Indian economists. Therefore they started working on money supply after 1960.

(I) **Multiplier Models :**

Like western economists (Representing Quantity Theory Tradition),Indian economists were largely dominated by multiplier approach. Studies presented by D.V.Raman, G.S.Gupta, S.B.Gupta, S.Modhur and G.Swamy are based on multiplier approach. The first attempt in this direction of " money stock determinants" perhaps made by D.V.Raman[28] Raman's study covers the estimated data on India's money stock for the period of 1914-50.He has given equation of money supply determinants as M = D+C+R. Restating these components in a different manner result into following equation for analysis of variation in money stock.

$$M = \frac{(e + 1)}{1 + e\,(C + R)}\ H$$

$$\frac{}{M}$$

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28. See. Raman D.V.."Determinants of Money Supply in India 1944-45", IER, Vol.3.

Where M stand for money supply

D stand for deposits

C stand for currency issued

R stand for rupee coins issued

E stand for expansion ratio

H stand for High powered money

$\frac{C+R}{M}$ stand for ratio of currency to money supply.

D. V. Raman in his study takes high powered money as an autonomus variable because of following two reasons: (I) the issue of high powered money is determined by government authority instead of by any rule. and (II) Since there is absence of fixed rule for determination of high powered money, the flexible quantity of high powered money disrupted what otherwise might have been a rather close association between high powered money, foreign trade balance and the exchange rate. According to D.V.Raman the volume of deposit-money generated by banks in India is governed by expansion-ratio of there deposit-generating banks as whole. There was too-much fluctuation in expansion ratio during period 1914-18 due to lack of any legal reserve requirements on the deposit liabilities of the commercial banks in India.D.V.Raman pointed out that the changes in the currency money ratio may cause fluctuations in the quantity of money stock, provided absence of off-setting autonomous changes occurs simultaneously in volume of high powered money.The currency money ratio indicates a downward behaviour, which means a increase in the ratio of deposits excluding inter-bank deposits to total money stock. This rise in deposits was possible because of

banking facilities and banking habits according to Raman.

One of the important study is presented by Gupta G.S.[29] His study is based on multiplier approach, for money supply determination. His study covered the period from 1948-49 to 1967-68. He has introduced the policy variable to examine the extent to which the money stock is exogenous and estimated their contribution to monetary growth. He put his hypothesis as "change in money supply as a function of the behaviour of all sectors of economy and hence the Keynesian notion that only the government and central bank determines the money stock is not justified".His analysis make an effort on the basis of simple model,which is extension of the P.Cagan's[30] money multiplier model.G.S.Gupta's model is as under,

$$M = K\ (URM)$$

Money Supply (M),at any point of time is a some multiple (K) of unborrowed reserve money, (URM).A change in money stock may, therefore, comes from a change in either K or URM.Since both,K and URM are positive, a partial elasticity of M with respect to K or URM is plus unity.This indicates that money stock varies positively and proportionately along with the money multiplier.He

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29. See.Gupta.G.S. "Money Supply Determinants and their Relative Contribution to Monetary Growth in India" Indian Economic Review, Vol.VII . p.35

30. See Cagan Phillip "Determinants and Effects of Changes in the Stock of Money: 1857-1960 NBER,New York. U.S.A.

expressed money-multiplier in terms of 14 ratios : 4 currency ratios, 2 bank-class ratios, 4 banking ratios and 4 reserve requirement ratios. All these ratios are referred to as the direct determinants of money stock. However all these ratios are not under complete control of monetary authorities in India. On the basis of data related to time period from 1948-49 to 1967-68 G.S.Gupta[31] computed the value of money multiplier for India: which varied between 1.33 to 1.50 . This shows the value of money multipliers in India is lower than money mulitpliers in U.S.A. (2.52 to 2.89) the U.K.(2.05 to 2.76) and in the Japan (3.08 to 3.54) during the time period from 1951 to 1961. G.S.Gupta pointed that lower money-multiplier in India is, as result of relatively high currency ratio. Further, G.S.Gupta (1972) makes a analysis of the contribution of various determinants of money stock to the rate of changes of money stock over the period as whole .The rise in URM accounted for 85 per-cent of the growth of the quantity of money. He found, its contribution was 72, 133 and 82 percent in the First Plan,Second Plan and Third Plan periods respectively. Out of 19 years of period under observation in year 1952-53, contribution of URM was negative,i.e. (it changed in the opposite direction of the stock of money). During 19 years of period, the contributions of free reserve ratio accounted hardly 2 per cent of the rate of change in stock of money. Contribution of free reserve ratio was 35 per cent in First Plan, 3 per cent in Second Plan period. However, during first and Second Plan periods currency ratio rose and hence exercised a

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31. Money Supply Determinants and their Relative Contribution to Monetary Growth in India," ,Indian Economic Review, Vol VII p.41

downward impact on the money supply. Thereafter, it has been falling down steadily. Its relative contribution in money stock growth was 8.4 percent in first plan and 10.6 in Second Plan. However, in the Third Plan it was 14.4 per cent and in Fourth Plan it was 3.1 per cent of the rate of change of money supply. G.S.Gupta's study shows that contribution of time deposits on the rate of change in money stock was hardly 3 per cent which indicates its insignificant role in the money stock determination. However, the contribution of money multiplier was 6 per cent, in the money supply determination. Its relatively low contribution, pointed out by Gupta " is partly due to its poor role in the money supply determination and partly because of currency and free reserves ratio whose rate of change was in the offsetting direction 9 out of 19 years". His result supported the hypothesis that money stock is not determined by government sector alone and it is also not under its full control.

Then came the by suggestion S.B.Gupta related to factors affecting money supply. His article "Factors Affecting Money Supply : Critical Evaluation of Reserve Bank's is non-econometric study of Money Supply." However his article initiated the controversy about money supply in India, Gupta attacked the method which money supply statistics is published in India. He also pointed out that the Reserve Bank's analysis of the factors affecting money supply is empirically meaningless and misleads to

faulty analytical and policy conclusions. Therefore , an alternative approach based on the money multiplier theory of money supply should be evolved . According to S.B.Gupta, this

approach would be "empirically highly meaningful and very much useful for purpose of monetary planning. However, S.B.Gupta[32] while explaning the money supplier theory does " not enter into a theoretical sophisticated discussion of money supply determination," He made an attempt to present "money supply theory on the basis of high-powered money named as " money multiplier theory of money supply or "monetarist theory of money supply". He used the following equations of money stock determination,

$M_s = mH$ _____ (1)

$M_s = a + bH$ (m,a and b are positive constants) _____ (2)

Obviously in the first equation money supply (m) is a proportional function ot high powered money,(H). In second equation it is non-proportional. In first equation m is the money multiplier and H is the multiplicant. In the second equation b is also multiplier, but it is only a marginal multiplier. In first equation m is both the average and marginal multiplier. However, S.B.Gupta finds the second equation is relatively more reliable and useful for short-term forcasting and monetary planning in India. He also presents a sophisticated version of money multiplier in which value of multiplier is treated as endogenous,i.e. behaviourably stable parameter, whereas factors governing high-powered money and changes in high-powered money are largely policy controlled. He pointed out that the main drawback of Reserve Bank of India (RBI) is that it does not differentiate between money supply (M) and high powered money (H). Thus 'money multiplier theory of money supply' is important contribution by

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32. See. Gupta S.B. "Factors Affecting Money Supply : Critical Evaluation of Reserve Bank's Analysis," EPW,Jan 24 p.48 S.B.Gupta.

G.Swamy[33] conducted study related to money supply determinants covering data for the period 1951-52 to 1970-71. Her study covers almost 19 years. Obviously she too wanted to investigate the factors which determine stock of money in India G.Swamy used M 2 definition of money stock and money multiplier approach of money supply determination . She makes a analysis of year to year changes in money stock and concludes that high-powered money is most significant factor as 81 per cent of the variations are explained by high powered money. The remaing contribution in money stock is of the money multiplier. Further she finds that money multiplier has increased at the rate of 1.5 per cent only whereas high-powered money increaseed at the compound rate of 6.5 per cent per year. She pointed out "the nature and extent of the control that the RBI has on the major determinant of changes in the money stock i.e. high powered money is tenous . This is because if (RBI) has little control over major sources of change in high powered money i.e. over the passive changes brought about by the decisions of the government"."Out of all factors which cause variation in high-powerd money, RBIs credit to government is the only the most important factor explaining, on the average 55 per cent and in several years 70 per cent of the change in high-powered money. Thus she highlights significant role of high-powered money as determinant of stock of money in India.

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33. See. Swamy (1976) pp 819.20

S.Madhur[34] emphasises the adjusted high powered money, as the stationary reserves are not available for expansion of money stock. The adjusted high-powered money, H is expressed as,

$$H^* = H - RR\ (AD)$$

In this equation,

H^* is the adjusted high-powered money,

H is total high powered money ,

RR is required reserve-ratio, and

AD is the aggregate deposits of the commercial banks.

The equation shows that even if high powered money is assumed constant, but required reserve ratio is increased, the money stock would decrease. S.Madhur rejected the allegation by Majumdar[35] and Shetty[36] of internal inconsistency and superficiality of money multiplier theory. Thus, S.Madhur cameout as a supporter of multiplier appfoach.

(II) **Structural Models**

B.B. Bhattacharya's[37] study aims at finding out the hypothesis that money supply may be treated as exogenous in policy models. His model includes nine equations in which following are nine endogenous variables (1) money supply (2)

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34. See Madhur, Srinivas. (1976) "Money Supply Analysis". EPW. June 5

35. Majumdar.N.A. (1976) " Money Supply Analysis : EPW ,June 5 pp 371.- 7

36. Shetty.S.L. Avdhani and Menon. (1978) "Money Supply Analysis: Further Comments", EPW,April 10 pp 571.-74.

money demand (3) monetised consumption expenditure,(4) monetised investment expenditure (5) monetised GDP , (6) monetised disposable income ,(7) tax revenue (8) long term interest rates and (9) interest rate differential. The data covered by him is related to the period 1959-60 to 1967-68. He used narrow and broader definitions of money supply measures in his study. He finds that stock of money is sensitive to market rate of interest which is almost determined by the supply of money and demand for money. Hence he came to conclusion that money supply cannot be treated as exogenous in policy model. He firmly believed that money supply is endogenously determined through process of market adjustment . He infers on the basis of his observations that practice of treating money supply and interest rates as policy variables for regulating prices and income seems to be invalid. Thus, B.B.Bhattacharya's study expressed the faith in process of market adjustment which ultimately determined stock of money in India.

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On similar line D.S.Pathak conducted study which deals with the problem and nature of money supply in India.However, his study concerns with , exogenity and indogenity of money supply in India. He comes to the conclusion that the entire behaviour of the central bank is itself endogenous in India.

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37. Bhattacharya.B.B. (1972) "The Demand and Supply of Money in Developing Economy : Some Structural Estimates", Memio.

38. See. Pathak D.S. (1972) Central Monetary Authority and Money Supply A-Post Keynesian Analysis IEJ, Vol 25.No.3 pp 129-37

(I.2) **High Powered Money (H) in India.**

All kinds of money issued by a monetary authority in a country is termed as high powered money. Mainly this powered lies with a central bank and therfore central bank is known as "Bank of note Issue". In past, need of central bank arose out of issuing notes. High powered money to some extent, is issued by "Treasury" which has been the sole incharge in almost all countries, before the existance of central bank. The "term" the "high powered money" is synonymous with such terms as "source-base","extended base","base money" or "monetary base". The reserve bank of India (RBI Bulletin,1971) termed it as "reserve money".High powered money is very important as it helps to build the pyramid of total money stock in an economy.Almost all monetary economist around the world accepted the base that the single most important and dominant factor that determines money supply is high powered money (H). Asamatter of fact, money stock is the product of fundamental two variables : higher powered money and money multiplier. However, these are few major reasons for singling out high powered money : They are

(1) Large number of monetary economists support the view that monetary aggregate such as M1 or M 3 exert important causal effects upon the level of economic activity and one of the theoretical merits of high powered money is that it can easily be structured to control considerably the movements of any single aggregate. (2) In assessing amount of high-powered money there is no information-lag problem (3) Even if the central bank may not decide explicity which monetary is aggregate is to control, yet all of their actions can be subsumed into the changes in the high-

powered money. The high powered money therefore, serves well as a summary measure of monetary actions of the central bank.(4) It constrains the size of stock of money by its total quantity which is fully absorbed by bank's and non-bank public's demand for monetary funds. The high powered money held by banks is known as "reserves" and serves as the base while high powered money held by non-bank public is termed as "currency" which also is a potential source of becoming reserves. Therefore, increases or decreases in the high powered money tend to add to or substract from the reserves of banks. With higher or lower reserves, banks acquire larger or smaller portfolios of loans and investments thereby causing fluctuations in the money stock.(5) "control of monetary base money and the money stock through manipulation of interest rates by the authorities influencing the demand for money in the desired direction is, in any case, ultimately dependent up on control of the supply of monetary base .

Through lender of last resort facilities, the authorities can raise the rate at which they would supply funds to the market by the rates will not hold for long unless the quantity of money is curbed correspondingly. The extent to which it is curbed would presumably be the large level for the monetary base that was object of the change in interest rates in the first place [39] .Thus. high-powered money target as policy variable is based on operational rather than ideological grounds. This would help a superior decision making framework to formulate policy and increase the effectiveness of monetary policy in economic

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39. Fair Donald "Money Control" The Three Banks Review, London, March.

stabilisation attempt.

High-powered money in India is produced largely by the Reserve Bank of India and, to some extent, by the Central Government and held by non-bank public and banks in the form of currency. Currency consists of notes and coins. The Reserve Bank of India, under section 22 of the RBI Act 1934, has the sole right to issue notes in India. Notes in circulation comprise the notes issued by the Government of India up to April, 1935 and by the Bank itself since then, less the notes held in the Banking Department of the RBI, and Rs, 43 crores of India notes retired from circulation in Pakistan. Included in the coins are one rupee coin and upto one paise coins. Besides, one rupee notes issued since July 1940 by the Government of India in lieu of rupee coins, are also included under this head. Similarly, Mahatma Gandhi Centenary Ten Rupee silver coins issued in October 1970 and the Independence Day silver Jubilee Ten Rupee coins issued in August, 1962 are also treated as rupee coins and as such are included in the term coins. Figures are also net of an estimate amount of about Rs. 15 crores of India rupee coins in circulation in Pakistan.

Currently the mintage and issue of coins in India are governed by the provisions on the Indian Coinage Act 1906 and the RBI Act 1934 respectively. Thus, while the Central Government is responsible for the mintage of coins of various denominations, the business of issuing them to the public is entrusted to the Reserve Bank of India. Since one rupee note is included in the "coins" hence notes of the denomination of rupees two and above are included in the definition of notes.

Currency held by banks can be divided into two parts(I) a part is kept by banks in their vaults and known as "cash in hand with the banks" or "cash with banks" or "vault cash" or "till money" and (II) another part is kept with the Reserve Bank of India and with any notified authority either because of a statutory obligation or on a voluntary basis and known as bank's Deposit with the Reserve Bank of India. Combined together these are known as "Bank Reserves" and included in the high-powered money. However, the current account balances with other banks are not a part of high-powered money . We have divided these bank reserves into two parts; (I) Statutory reserves, and (II) excess reserves. Whereas statutory reserves are legal obligation on the banking companies, the excess reserves are held for (a) encashing cheques largely issued by current-account holders and (b) for earning higher returns in near future.

A small portion of currency is also held in the form of "other deposits" with the Reserve Bank of India. This is a peculiarity only in our country Before 1961 these "other deposits" with the RBI were not included in the definition of high-powered money but after 1961 in consultation with the International Monetary Fund, these deposits were included since the disbursal of these amounts necessarily entails expansion of the RBI's liabilities to the public.

The cash balances of the Central and state Governments held with the RBI and in Treasuries is also excluded on the ground that these balances arise mostly from administrative operation and not from commercial operations. However, a part of the government balances arises out of commercial activities of the government but since it is not possible to exclude them from the

total balances and hence these are treated as part of government balances.

The Structural composition of high-powered money for the year 1987-88 is given below

Table no IV.1 Rs in Crore

composition of HPM			percentage of Total HM powered money
(1)	currency with public	33629	63.12
(2)	other deposits with RBI	297	0.56
(3)	cash with Banks	1542	2.90
(4)	Banks deposits with RBI	17808	33.42
	Total HM	53276	100.00

Source-Data Base Indian Economic By Pronoy Roy and Chondhok 89-90

From the structural composition of high-powered money it is evident that most of high powered money 63.12 per cent is held by the non-bank-public in the form of currency. The remaining balance is with the R.B.I. in form of banks deposits with RBI. which is 33.42 per cent. However, other deposits with RBI and cash with banks are not significant.

Althouth, the further money creation depends up on the reserves of the banks (Which is a portion of high powered money) yet the whole of the high-powered money is treated as base. The reason is, the currency in the hands of non-banks-public and other deposits are a potential source of becoming reserves. However, in money-stock, the total high-powered money is not included, the reserves with banks are excluded as these remain out of circulation. The cash in hand with treasuries is also excluded on the same grounds. High powered money is totally the liability of the Reserve Banks of India. In spite of the fact that the right to mintage lies with central government . It is because wherever these coins are put into circulation, these are offset to an equivalent extent by the withdrawal of bank-notes in circulation. Changes in the high powered money occurs as result of changes in assets of the Reserve Bank of India. The assets side is important because any change in the Money stock is reflected in a change in the financial assets or in net non-monetary liabilities of the banking system, as total assets are -always matched with total liabilities.[40] Thus, Money supply in a

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40. RBI Bulletin "Analysis of Money Supply Variation",July 1961, pp. 6-7

modern economy is simply a reflection of assets held by banks.[41] The size of high-powered money can be calculated by using the two methods. First method is related with the "sources" of high powered money and second method is related with "use" of high powered money. The "sources" of high powered money are the asset holding of a central bank mainly in the form of government securities, stock of gold and foreign securities. Looked from other way round it is the total of central bank's credit, the gold stock and treasury currency outstanding less treasury deposits at central bank, treasury cash-balance and other deposits at central bank. The "uses" of the high powered money is the currency holdings by banks and non-bank-public which constitute the liability of central bank. Looked in terms of demand and supply, the "uses" is the demand for high-powered money and "sources" is the supply of high powered money. The "sourcebase" is always in balance to "usebase" because banks and non-bank public always compete for use of high powered money and hence entire pool is always claimed. An example to this effect is given in (Table IV.2)

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41. International Financial Statistics, Vol. 1948.

"Sources" and "Uses" of High Powered Money

Table IV.2

Year 1987-88 Rs. in Crore

(As on Last Friday)

Sources of hpm		Uses of the hpm	
Reserve Bank's claim on			
(1) Government Net	52793	(1) Currency with Public	33629
(2) Commercial and co-operative Banks	2158	(2) Other deposits with RBI	297
(3) National Bank for Agriculture and Rural Development	1771	(3) Cash with Banks	1542
(4) Commercial Sector	3806	(4) Bankers deposits with RBI	17808
(5) Net Foreign Exchange Assets of RBI	5267		
(6) Govt's Currency Liabilities to the Public	1360		
(-7)Net Monetary Liabilities of RBI	(-)13879		
	53276		53276

Source-Data Base Indian Economy by,Pronoy Roy and Chondhok 89-90. p.875

The high powered money by the uses to which it is put consists of currency in circulation and bankers deposit with RBI. These are held by public in the form of "currency" by banks in the form of "reserves" of cash and the by the RBI in the form of "other deposits". As a matter of fact, the uses of high powered money are primarily the monetary assets of commercial banks and the non-bank public. Further, the size of high powered money is determined by the monetary authorities, the allocation of its use in determined by commercial banks and the non-bank public.

The most important source of high powered money is reserve Bank's claim on government . When the Reserve Bank of India purchases government securities, it pays for them by creating a bank reserves or currency, either item representing a net increase in the high powered money. the other important sources of high powered money are "net" foreign exchange asset's and claim on commercial and co-operative banks and the another source is government is currency. liabilities, commercial sector and national bank for agriculture are also important sources of high powered money.

The empirical evidence does suggest that the reserve bank of India can control money stock by controlling the reserve money. (S.B.Gupta, 1976 and Kulkarni V.C.and Miller S.M. (1986)[42] . It is found that the value of money multiplier in India does not show marked fluctuations over the period of 4-5 years which means that it can safely be assumed to be stable for the policy

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42. Gupta S.B.(1976) "Money supply analysis - A reply " Economic and Political weekly. November 20, 1934-44.

purposes over the same time horizon (Table :IV.3):[43] This also means that variations in money stock could easily be ascribed to variations in high powered money, a policy variable. The existing empirical evidence supports the use of money multiplier models a guide to monetary policy. On a long-run basis, there exists a strong link between base-money growth and money-stock growth; it is also found that short run movements in the money stock are primarily explained by short run movements in base money. In short, the bulk of evidence suggests that the money multiplier model has operational significance in the Indian economy. Gupta G.S.(1972), while examining money supply determinants and their relative contribution to monetary growth in India, has furnished the evidence which suggests that over the first three plan periods, the reserve money growth had accounted for on average,85 percent of the growth of quantity of money: and contribution of money multiplier to the growth of the quantity of money was found to be only 6 percent over the sample period[44]

In Tabel IV.4 an attempt is made to analyse the relative contribution of reserve money and money multiplier to monetary

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43. Kulkarni V.C. and Miller S.M. (1986) "The money supply process in India : Does it have operational significance?" Indian Economic Journal, Vol.34, No. 1 July-Sept, pp.1-22.

44. Gupta G.S. (1972) - Money supply determinants and their relative contribution to monetary growth in India - The Indian Economic Review, Vol-VII, No.1, p.33-52.

expansion during the time periods shown. The exercise throws light on the sources of monetary expansion during different periods in a money multiplier framework. In the period 1960-65, of the total money supply expansion, reserve money accounted for 93-04 per cent and money multiplier for 7 per cent (columns 6 and 7) ; in the second quinquennium the relative contribution of reserve money marginally rose to 93.74 percent while that of multiplier dropped to 6.26 percent. In the subsequent period, i.e., there was considerable improvement in the contribution of reserve money to 94.22 percent and that of money multiplier got substantially reduced to 5.78 percent. With respect to the contribution of reserve money and money multiplier to M3 growth the picture is somewhat at variance. In 1960-65 reserve mone variations explained 91 per cent of change in M 3 and mo multiplier 9 percent (column 8 9). The contribution of RM go reduced to 88.00 percent in 1979-88, however, the role of reserve money improved accounting for over 90 percent of M 3 expansion.

Table : IV.3 : MONEY MULTIPLIER

Last Friday of the Year	Value of m.1	Value of m.3
50-51	1.32	1.53
55-56	1.32	1.60
60-61	1.20	1.78
65-66	1.40	1.90
66-67	1.43	1.97
67-68	1.46	2.04
68-69	1.42	2.04
69-70	1.46	2.13
70-71	1.52	2.28
71-72	1.55	2.36
72-73	1.61	2.50
73-74	1.54	2.42
74-75	1.61	2.63
75-76	1.70	2.88
76-77	1.60	2.79
77=78	1.32	3.01
78-79	1.22	2.83
79-80	1.20	2.82
80-81	1.23	2.95
81-82	1.21	3.05
82-83	1.23	3.15
83-84	1.15	2.95
84-85	1.26	3.24
85-86	1.15	3.13
86-87	1.14	3.14
87-88	1.08	3.05

m.1 = Narrow3 money multiplier = M1 + Reserve money
m.3 = Broad money multiplier = M 3 + Reserve money
Source : Reserve Bank of India Bulletin, Various issues.

Table : IV.4 : Relative contribution of reserve money (RM) and money multiplier (m) to increase in M1 and M 3 [45]

	d log RM	d log M1	d log M 3	d log m 1	d log m 3	d log RM / d log M1	d log RM / d log M1	d log m 1 / d log M 3	d log RM / d log M 3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1960-65	6.55	7.04	7.22	0.49	0.67	93.04	6.96	90.72	9.28
1965-70	7.19	7.67	8.17	0.48	0.98	93.74	6.26	88.00	12.00
1971-78	8.64	9.17	9.90	0.53	1.26	94.22	5.78	87.27	12.73
1979-88	10.53	10.55	11.66	0.02	1.13	99.81	0.19	90.31	9.69

Note : d log refers to variations of the natural log of the respective variables between the periods.

45. The role of reserve money and money multiplier in determining the money stock variation has been assessed in the following manner: M = RM. m..... (1) In logarithmic form this could be transformed as: InM = lmRM + In m...(2)

This specification is worked with the natural logarithmic in order to capture the exponential growth between to chosen periods. the relative contribution of RM is estimated by dividing natural Logarithm value of RM with natural logarithm value of M1 and M 3 differentiated with respect to time. Similarly the contribution of money multiplier is estimated by dividing the values of m with values M1 and M 3 .

Empirical Tests of Causality between High Powered Money (HM) and Money Stock both (M1 and M 3) in India.

In this chapter our main task is to investigate empirically causal relationship between high powered money and money stock. In preceding chapters II.2 and III.2 , W.J. Granger and Sims tests are used in order to investigate causal link between money stock (M1 and M 3) and GNP; money stock (M1 and M 3) and WPI. On similar line in this chapter same tests are to be utilized in order to investigate empirically causal relationship between above mentioned important macroeconomic variables, for this purpose we have estimated, first regressions on the basis of Granger test and then equations are estimated on the basis of Sims test.

Here we report estimated regression equations.

(Estimated equations in the context of Granger Test:)

(1) M1t = f (3 past M1t,HMt and 3 past HMt)

M1t = f (M1t-1,M1t-2,M1t-3,Ht,HMt-1,HMt-2,HMt-3A

M1t = f (214.16+0.473M1t-1+0.338M1t-2-0.295M1t-3+0.978HMt+0.335HMt-1

(2.11) (0.522) (0.291) (-3.18) (4.25) (1.82)

+0.307HMt-2-0.316HMt-3)

(1.74) (-1.46)

$R = 0.951$

$R^2 = 0.904$

$\bar{R} = 0.873$

D.W. = 0.938

(II)

$M1t = f$ (3 past M1t)

$M1t = f$ (M1t, M1t-2, M1t-3)

$M1t = f$ (291.17+0.299M1t-1+0.601M1t-2+0.555M1t-3)

(1.70) (2.31) (5.81) (0.465)

$R = 0.818$

$R^2 = 0.669$

$\bar{R} = 0.629$

D.W. = 1.22

(III)

HMt = f (M1t, 3 past M1t and 3 past HMt)

HMt = f (M1t, M1t-1, M1t-2, M1t-3, HMt-1, HMt-2, HMt-3)

HMt = f (-110.03+0.473M1t+0.448M1t-1+0.184M1t-2+0.195M1t

(-1.49) (4.25) (0.714) (2.63) (2.96)

-3-0.141HMt-1- 0.146HMt-2+0.431HMt-3)

(-1.05) (-1.14) (3.42)

$R = 0.965$

$R^2 = 0.932$

$\bar{R} = 0.910$

D.W. = 1.51

(IV)

HMt = t (3 past HMt)

HMt = t (HMt-1, HMt-2, HMt-3)

HMt = t (141.31+0.435HMt-1+0.213HMt-2+0.369HMt-3)

(1.10) (2.21) (0.977) (1.75)

$R = 0.832$

$R^2 = 0.693$

$\bar{R} = 0.657$

D.W. = 1.95

(V)

M3t = f (3 past M3t, HMt and 3 past HMt)

M3t = f (M3t-1, M3t-2, M3t-3, HMt, HMt-1, HMt-2, HMt-3)

M3t = f (233.82+0.409M3t-1+0.952M3t-2+1.80M3t-3, +0.599HMt-1.24HMt

(3.28) (3.08) (6.17) (6.12) (3.86) (-5.47)

-1-2.19HMt-2-2.84HMt-3)

(-7.92) (-7.70)

$R = 0.996$

$R^2 = 0.993$

$\bar{R} = 0.991$

D.W. = 1.39

(VI)

M3t = f (3 past M3t)

M3t = f (M3t-1, M3t-2,M3t-3)

M3t = f (157.95+0.47M3t-1+0.998M3t-2-0.350M3t-3)

(0.908) (2.26) (3.19) (1.07)

R = 0.973

R^2 = 0.974

$\bar{R}$ = 0.941

D.W. = 1.76

(VII)

HMt = f (M3t, 3 past M3t, 3 past HMt)

HMt = f (M3t,M3t-1,M3t-2,M3t-3,HMt-1,HMt-2,HMt3)

HMt = f (-83.33+0.691M3t -0,121M3t -1-0.417M3t -2-1.22M t -3

(-0.903) (3.86) (-0.709) (-1.59) (-2.66)

+0.468HMt-1+1.02HMt -2+1.69HMt -3)

(1.27) (1.87) (2.49)

R = 0.959

R^2 = 0.920

$\bar{R}$ = 0.894

D.W. = 1.82

(VIII)

HMt = f (3 past HMt)

HMt = f (HMt-1,HMt-2,HMt-3)

HMt = f (141.31+0.435 HMt-1+0.213 HMt-2+0.369 HMt-3)

(1.10) (2.21) (0.977) (1.75)

$R = 0.832$

$R^2 = 0.693$

$\bar{R} = 0.657$

D.W. = 1.95

(Estimated equations in the context of Sims test)

(I)

M1t = f (HMt ,3 past HMt and 3 Future HMt)

H1t = f (HMt ,HMt -1,HMt -2,HMt -3,HMt +1,HMt +2,HMt +3)

H1t = f (127.25+0.726HMt -0.648HMt -1-0.100HMt -2-0.769HMt

(2.48) (8.58) (-0.73) (-1.05) (-7.83)

-3+0.320HMt +1+0.230HMt +2+0.275HMt +3)

(5.40) (4.09) (5.44)

$R = 0.987$

$R^2 = 0.974$

$\bar{R} = 0.965$

D.W. = 1.25

(II)

M1t = f (HMt , 3 past HMt)

M1t = f (HMt , HMt -2, HMt -3)

M1t = f (206.46+1.04HMt +0.587HMt -1+0.308HMt -2-0.312HMPVtPV-3)

(1.79) (5.96) (0.313) (1.58) (-1.60)

R = 0.919

R^2 = 0.846

$\bar{R}$ = 0.820

D.W. = 1.53

(III)

HMt = f (M1t , 3Past M1t and 3Future M1t)

HMt = f (M1t , M1t-1 , M1t-2 , M1t-3 , M1t+1 , M1t+2 , M1t+3)

HMt = f (-115.08 + 0.516M1t + 0.135M1t-1 + 0.824M1t-2 + 0.215M1t-3

(-1.43) (4.29) (2.13) (1.00)

- 0.653M1t+1 + 0.111M1t+2 - 0.935 M1t+3)

(0.101) (2.40) (-1.91)

R = 0.960

R^2 = 0.922

$\bar{R}$ = 0.896

D.W = 1.25

(IV)

HMt = f (M1t ,3 past M1t)

HMt = f (M1t ,M1t -1,M1t -2,M1t -3)

HMt = f (-121.45+0.565M1t +0.107M1t -1+0.911M1t -2+0.172M1t -3)

(-1.40) (5.89) (1.56) (1.19) (3.00)

R = 0.945

R^2 = 0.893

$\bar{R}$ = 0.875

D.W. = 1.94

(V)

M3t = f (HMt ,3 past HMt and 3 Future HMt)

M3t = f (HMt ,HMt -1,HMt -2,HMt -3,HMt +1,HMt +2,HMt +3)

M3t = f (-139.61+1.17HMt +0.496HMt -1+0.195HMt -2-0.283HMt -

(2.63) (13.42) (5.45) (1.97) (-2.79)

3+0.594HMt +1+0.298HMt +2+0.425HMt +3)

(9.71) (5.11) (8.13)

R = 0.998

R^2 = 0.996

$\bar{R}$ = 0.994

D.W. = 2.37

(VI)

M3t = f (HMt , 3 past HMt)

M3t = f (HMt ,HMt -1,HMt -2,HMt -3)

M3t = f (-19.25+1.72HMt +0.649HMt1 +0.840HMt -2+0.438HMt -3)

(-0.106) (6.30) (2.20) (2.75) (1.43)

R = 0.973

R^2 = 0.948

$\bar{R}$ = 0.939

D.W. = 1.79

(VII)

HMt = f (M3t ,3 past M3t and 3 future M3t)

HMt = f (M3t ,M3t -1,M3t -2,M3t ,M3t -3,M3t +1,M3t +2,M3t +3)

HMt = f (83.81+0.527M3t +0.161M3t -1-0.252M3t -2+0.343M3t -3+0.109M3t

(1.31) (5.90) (1.68) (-1.72) (2.14) (0.134)

0.335M3t +2-0.228M3t +3)

(-0.404) (-2.82)

R = 0.970

R^2 = 0.941

$\bar{R}$ = 0.922

D.W. = 2.58

(VIII)

HMt = f (M3t and 3 past M3t)

HMt = f (M3t ,M3t -1,M3t -2,M3t -3)

HMt = f (30.27+0.399M3t +0.818M3t -1-0.168M3t -2-0.752M3t -1)

(0.378) (4.41) (0.790) (-1.00) (-0.498)

R = 0.943

R^2 = 0.889

$\bar{R}$ = 0.871

D.W. = 1.94

Table IV.5

Regression results for causality Test-Granger

Eqn.no.	Sample period	Dependet variable	Independent variables	Ess	Rss
1		M1t	3 past M1t ,HM 3 past HMt	30649700	3226240
2		M1t	3 past M1t	22684000	11192000
3		HMt	M1t, 3 past M1t, 3 past HMt	21601100	1562540
4		HMt	3 past HM	16072400	7091190
5		M3t	3 past M3t HMt 3 past HMt	244715000	1592140
6		M3t	3 past M3t	23339000	12963500
7		HMt	M3t,3past M3t, 3past HMt	21327300	1836300
8		HMt	3 past HMt	16072400	7091190

Table IV.6

Regression Results For Causality - Sims test

Equation. No	Sample Period	Dependent Variable	Independent Variables	Ess	Rss
1	1956-57 to 1984-85	M1t	HMt,3 past Hmt,3 Future HMt	33003700	872286
2	1956-57 to 1984-85	M1t	HMt,3 past HMt,	28670600	5205350
3	1956-57 to 1984-85	HMt	M1t,3 past M1t,3 Future M1t	21366500	1797050
4	1956-57 to 1984-85	HMt	M1t,3 past M1t	20693300	2470350
5	1956-57 to 1984-85	M3t	HMt,3 past HMt 3 Future HMt	245374000	933493
6	1956-57 to 1984-85	M3t	HMT ,3 past HMt	233530000	12777100
7	1956-57 to 1984-85	HMt	M3t ,3 past M3t 3 Future M3t	21815000	1348610
8	1956-57 to 1984-85	HMt	M3t ,3 past M3t	20614600	2549000

Table IV.7

F. Statistic For Causality Tests

Table No.	Equation number	F-Value	Degrees of Freedom		Result
			numerator	Denominator	
M1 and HM		Granger Test			
IV.5	1 & 2	49.38	3	20	HM Significant in causing M1t
IV.5	2 & 3	23.58	3	20	M1t Causes HM
M 3 and HM					
IV.5	4 & 5	47.6	3	20	HM causes M 3
IV.5	5 & 6	19.07	3	20	M 3 cause HM
M1 and HM		Sims Test			
IV.6	1 & 2	33.11	4	20	M1t Significant in causing HM
IV.6	2 & 3	2.49	4	20	at 1 % & 5 % level of significance, HM not significant in causing M1 but at 10% HM is significant.
M3 and HM					
IV.6	4 & 5	63.4	4	20	M3 causes HM
IV.6	5 & 6	4.45	4	20	HM causes M3

Our objective in this chapter has been to examine statistically the direction of causality between money stock measures (both M1 and M 3) and high powered money in India. Our results strongly suggest that the causality is bidirectional. Both money stock and high powered money are found statistically significant in causing movements in each other. It seems there exists a high degree of association between the base money and the money stock in India and the propelling force influencing money stock rests with the monetary base; the rate of the high powered money in money stock determination is found to be predominant one.

Our empirical results are also important and interesting in that they indicate causality from money stock to high powered money. This could be nationalised of one takes into consideration the monetary impact of time deposits. Time deposits consitutes one major part of money stock, broadly defined. At least in the Indian Context, the time-trend and structural features relating to time deposits establish that time deposits grow autonomously and on account of their rates of return . They are lso income elastic and interest elastic. In India, the level of time deposits has grown so rapidly, over time, that they would before long, be as much as narrow money and thereafter exceed the sum total of currency and demand deposits. This is essence suggests that in the Indian context, time deposits may be regarded as a base for determining the "high powered money" and through which one can arrive at money supply in the narrow sense. Our results of bidirectional causality pose an interesting question as to whether the equations forming part of the theory of supply of money cannot be suitably manipulated to make any of the components of money a

base for estimating high-powered money money supply.

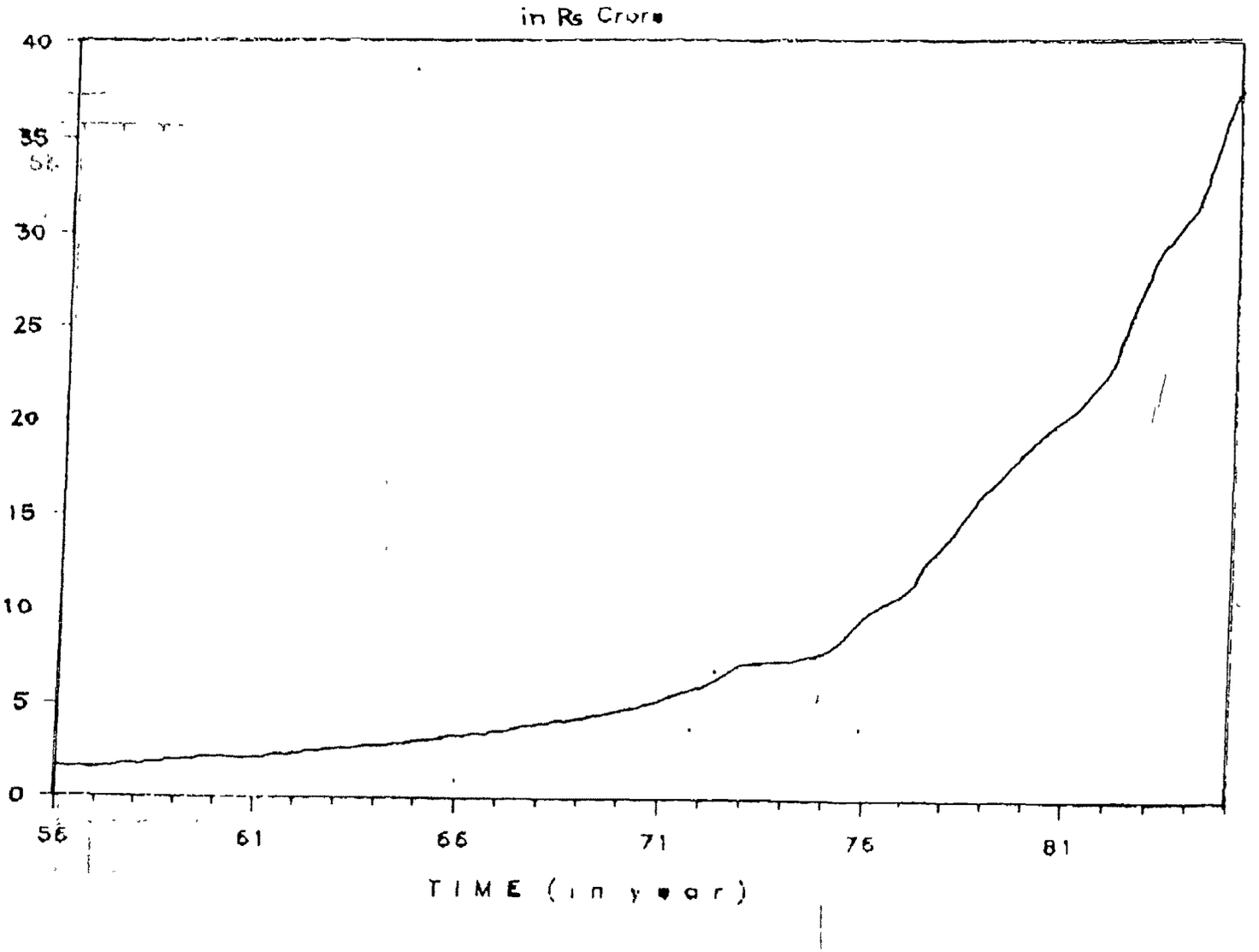
It seems higher growth of money stock attributable mainly to the growth of time deposits could exert an upward pressure on monetary base and could cause reserve money to increase to an appropriate level which can support to an appropriate level which can support a higher level of money stock.

All in all, both money supply and high powered money are found to be endogenous to each other; variations in high powered money causes variations in money supply and on the other hand, money stock variations causes variations in high powered money.

The graphs IV.1 to IV.12 depict the growth rates of high powered money (HM) and money stock (M1 & M3). The positive relationship between HM and M1,M3 is very well demonstrated in these graphs.

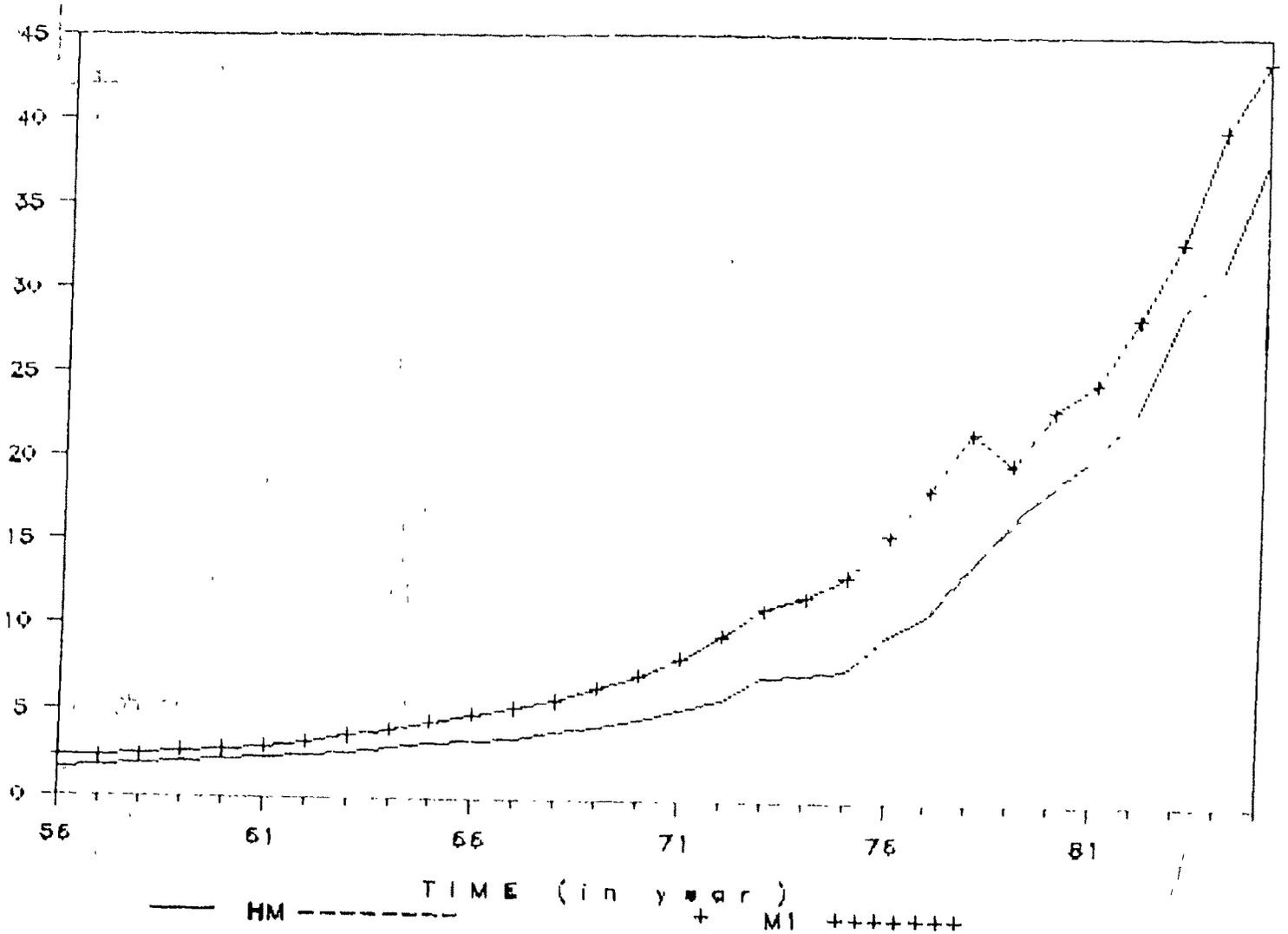
Graph no : IV-1

MONEY MEASURES HIGH POWERED MONEY



Graph no : IV. 2

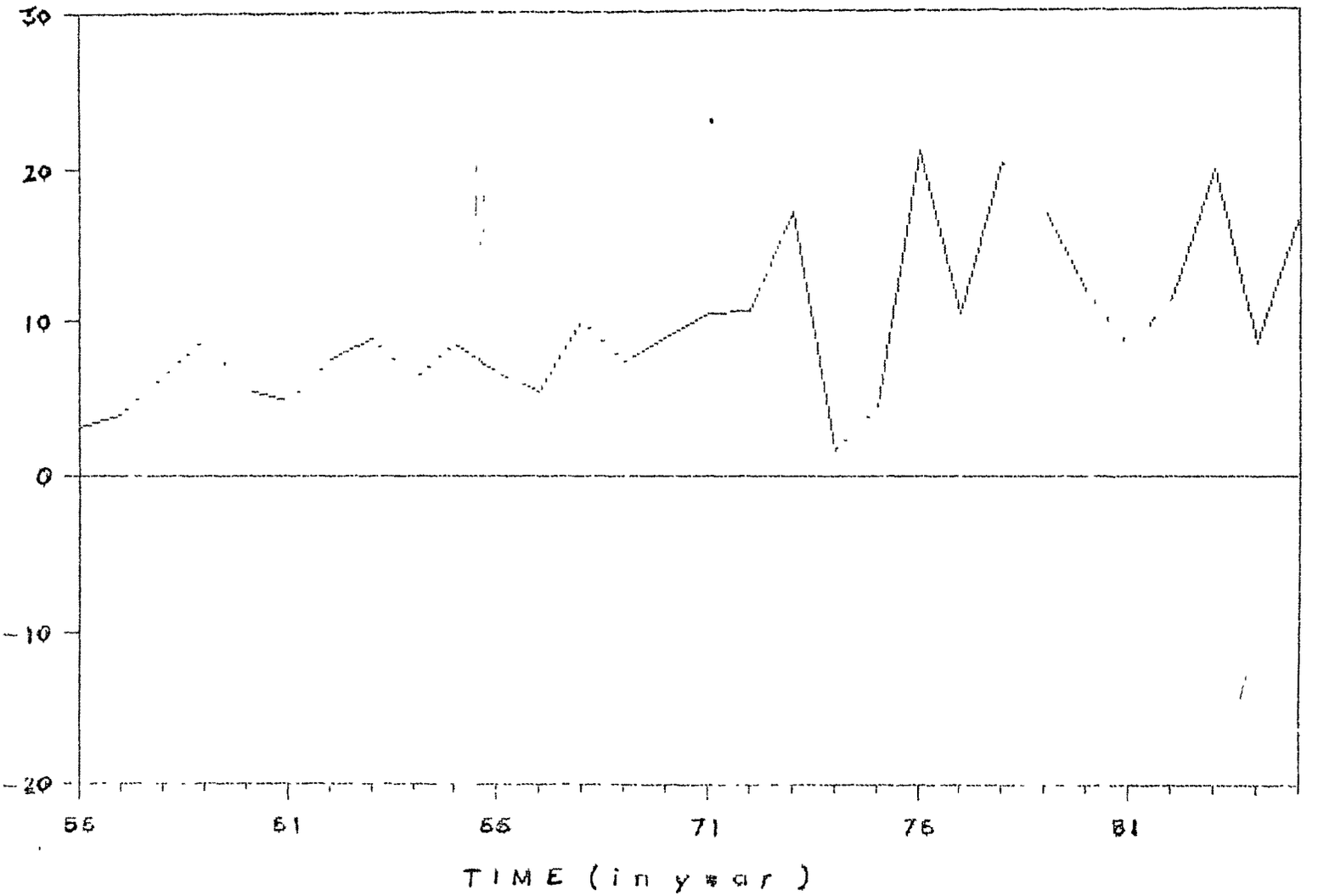
HM & M1 in Crore [Rs Crore]



GRAPH NO : IV·3

% GROWTH RATE OF HM

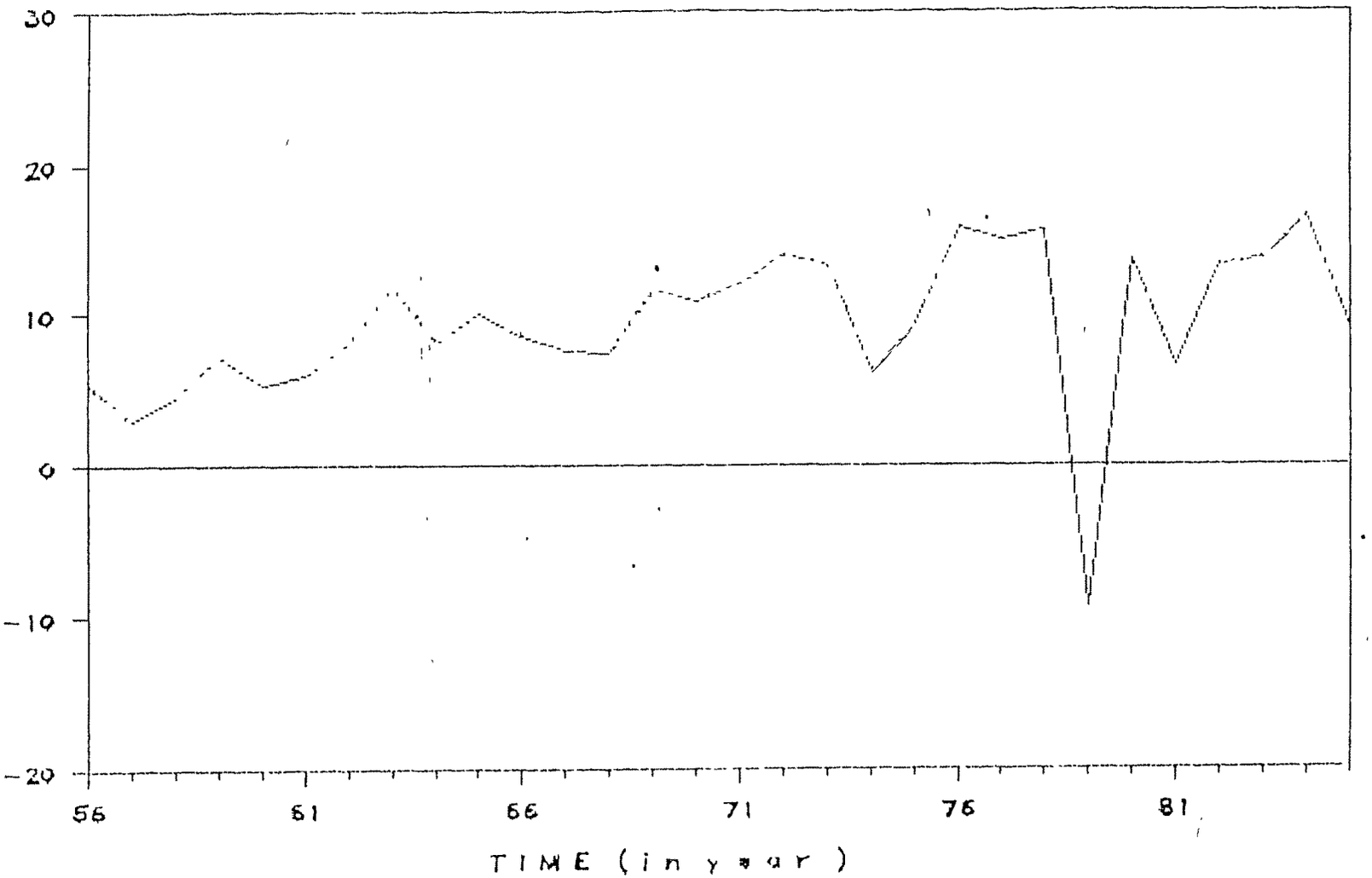
1956-85



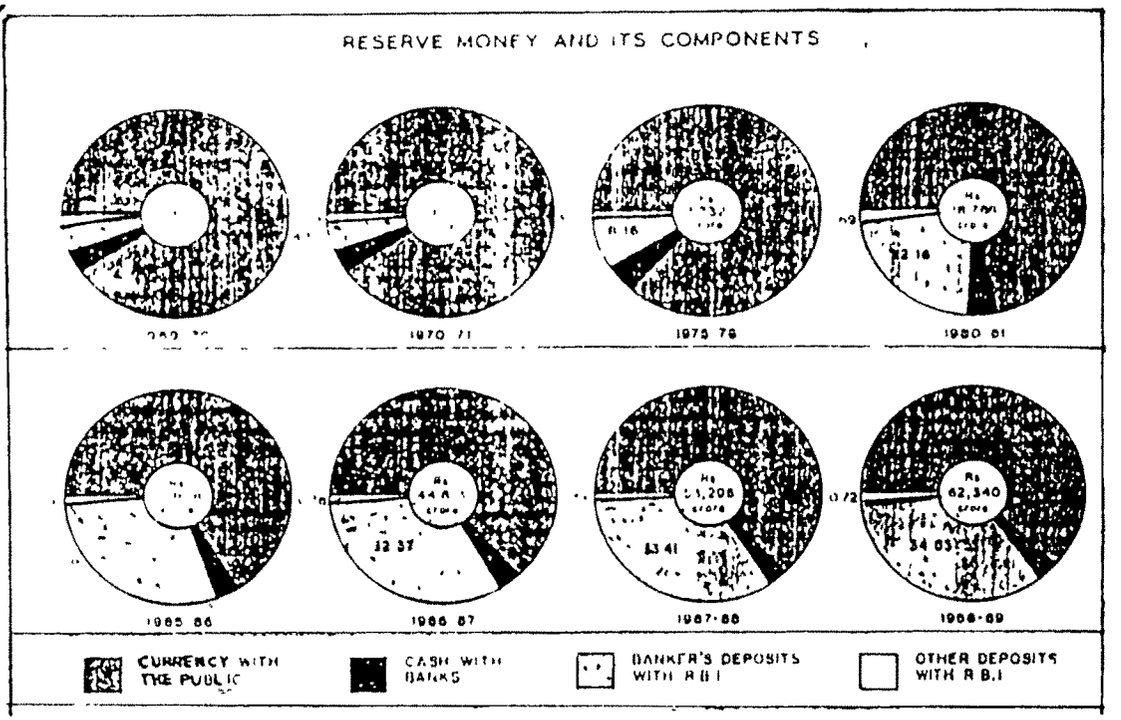
GRAPH NO :IV.4-

% GROWTH RATE OF M1

1956-85



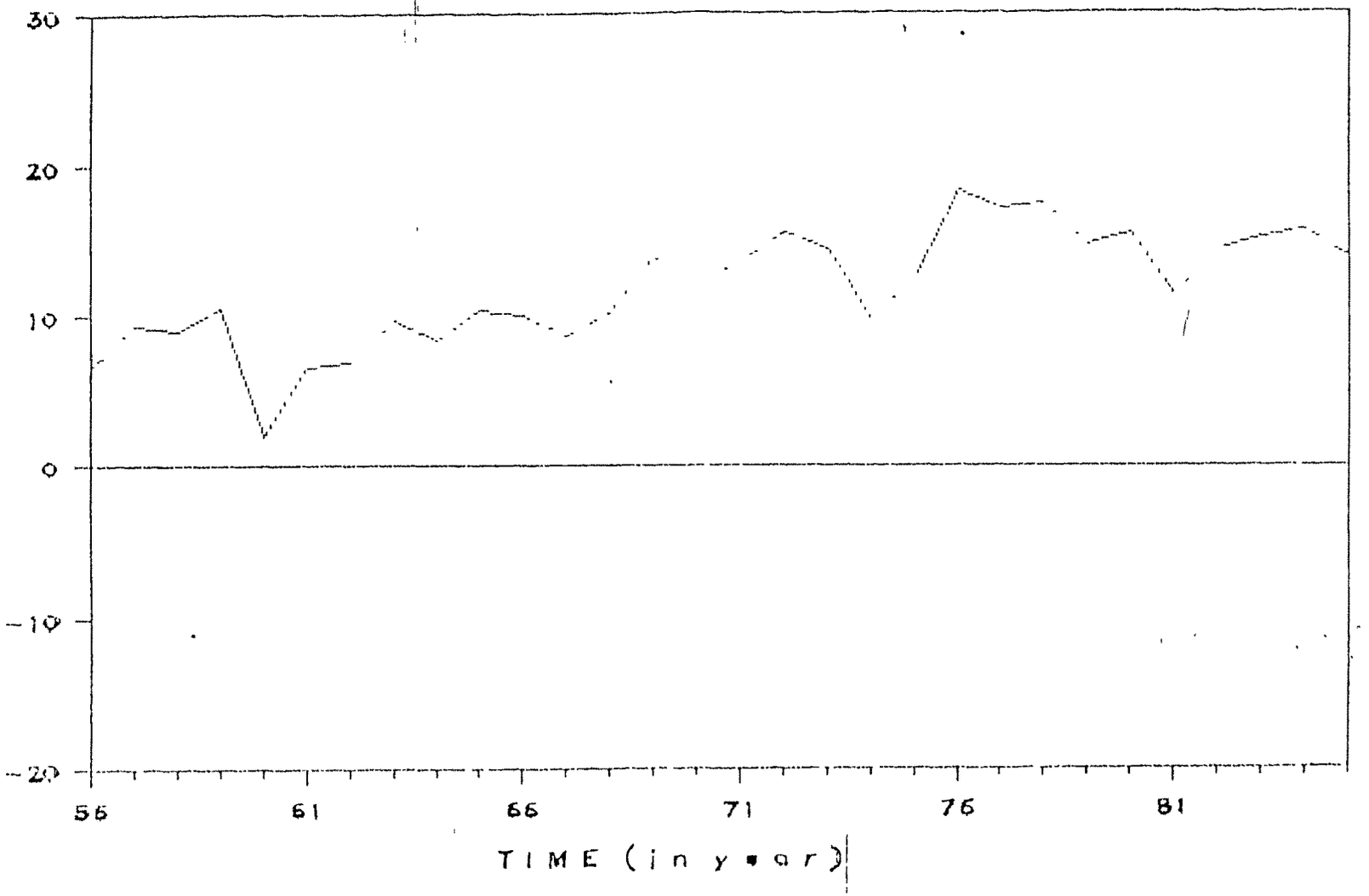
Graph no : IV.5


RESERVE MONEY AND ITS COMPONENTS
1970 71
1975 76
1980 81
1985 86
1986 87
1987-88
1988-89
Rs 62,340 crore
CURRENCY WITH THE PUBLIC
CASH WITH BANKS
BANKER'S DEPOSITS WITH R.B.I
OTHER DEPOSITS WITH R.B.I

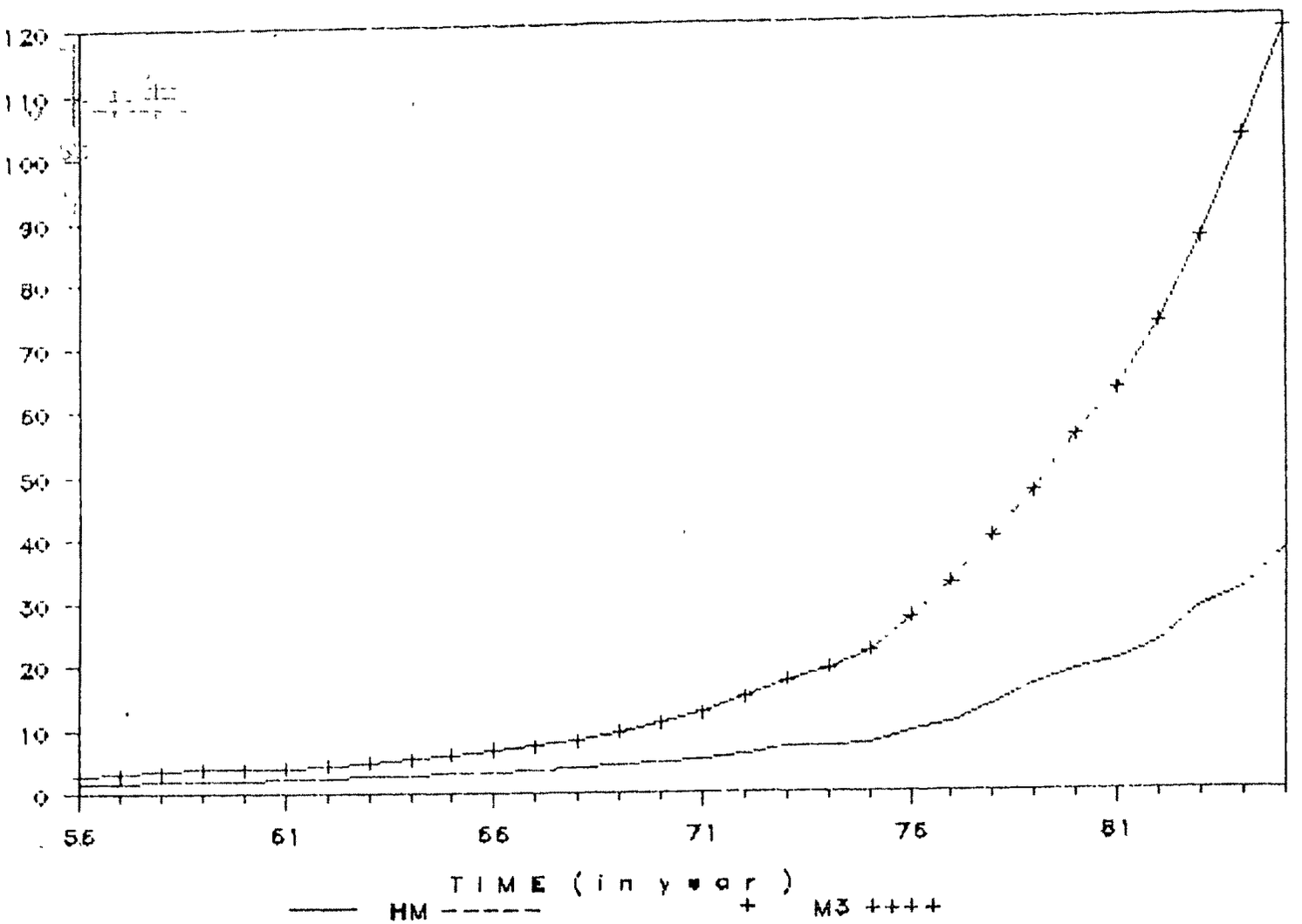
GRAPH NO : IV·6

% GROWTH RATE OF M3

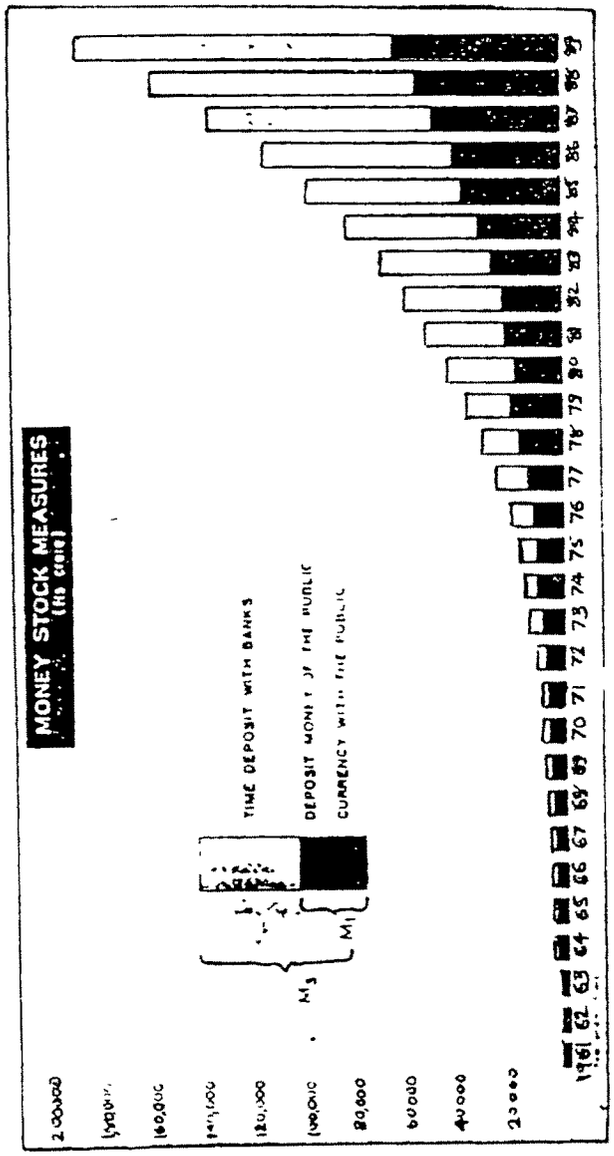
1956–85



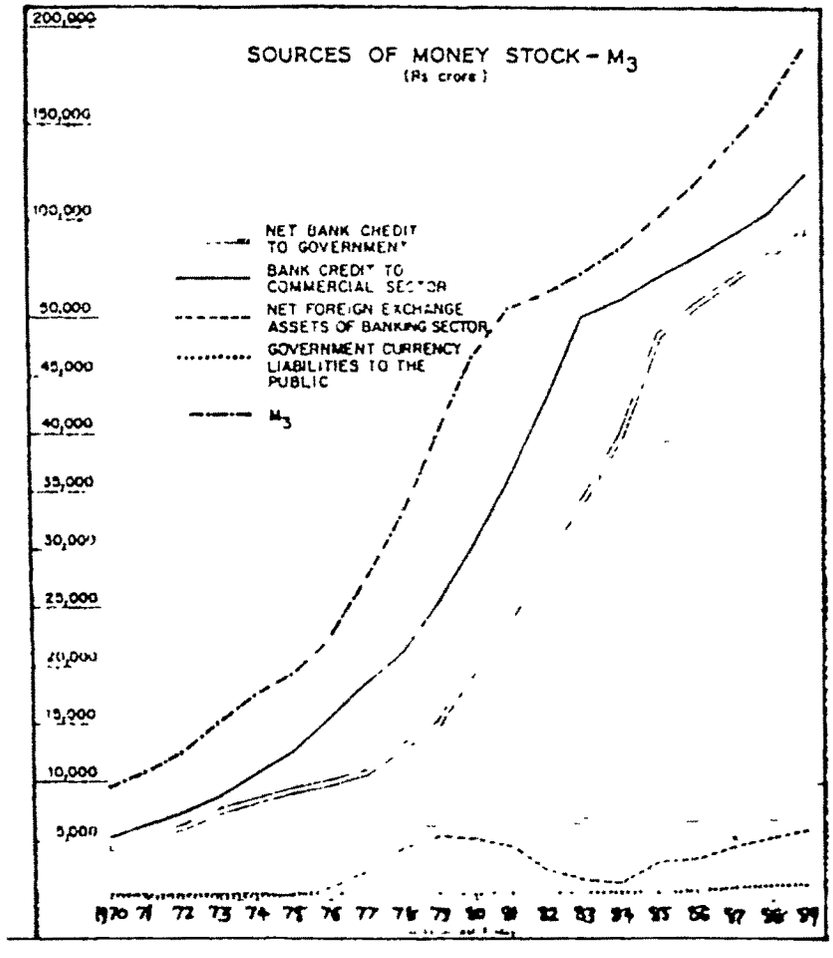
Graph no : IV. 7 **HM & M3 in Rs Crore**



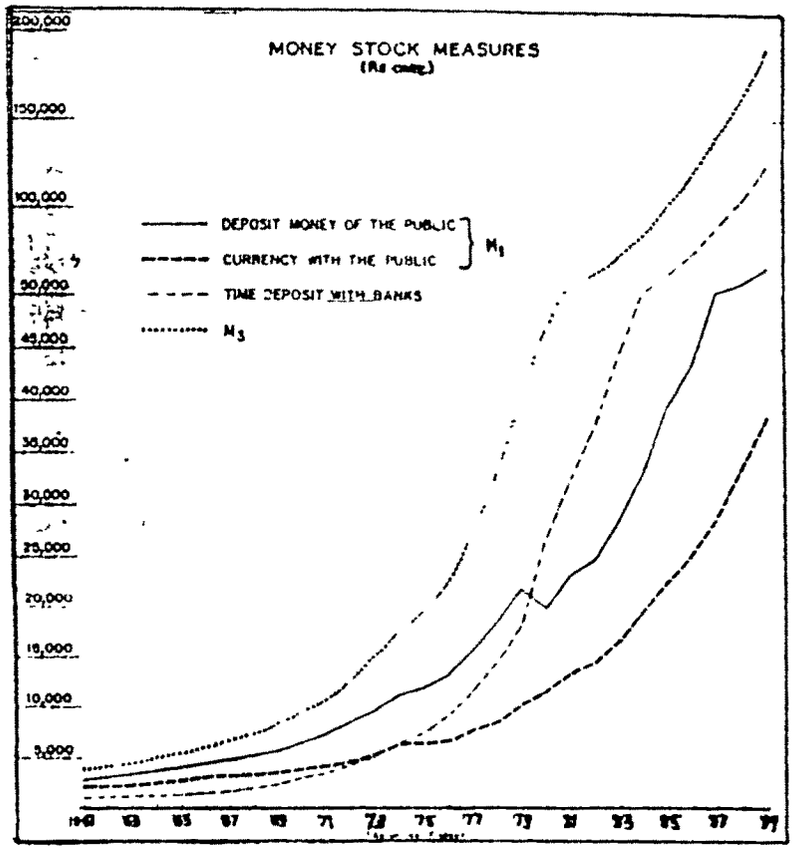
Graph no : IV. 8


MONEY STOCK MEASURES
(Rs crore)
TIME DEPOSIT WITH BANKS
DEPOSIT MONEY OF THE PUBLIC
CURRENCY WITH THE PUBLIC
M3
M1
1961 62 63 64 65 66 67 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89

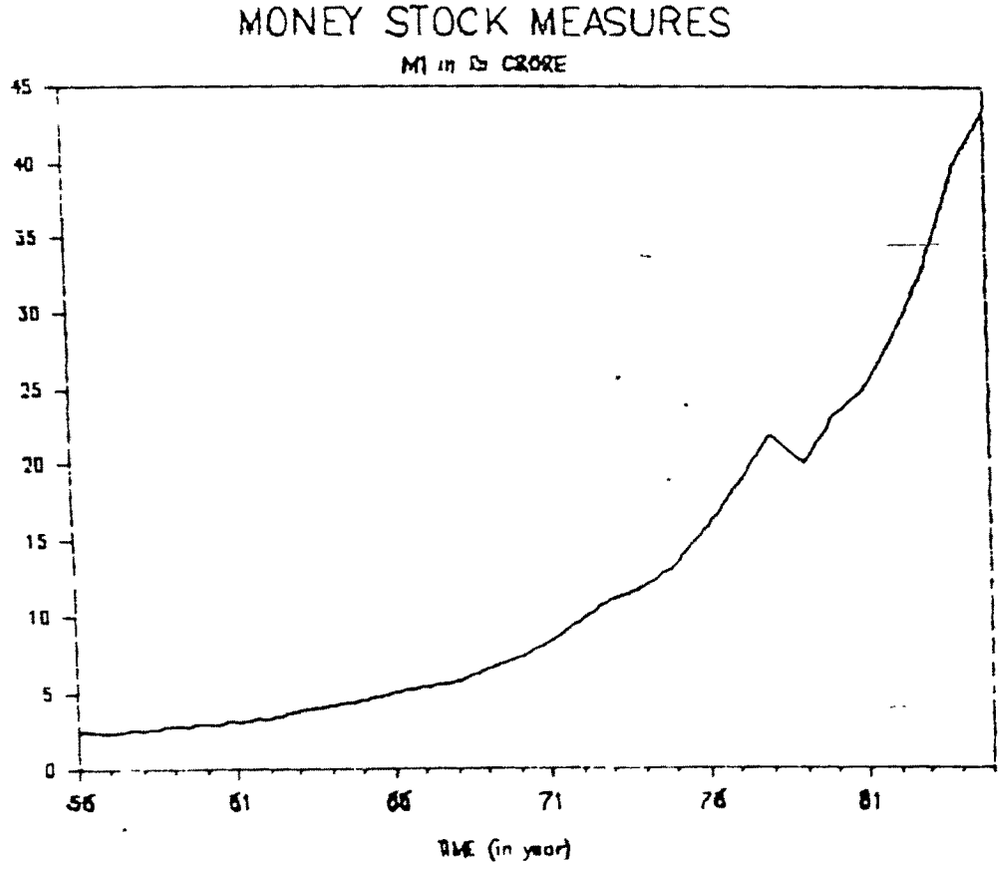
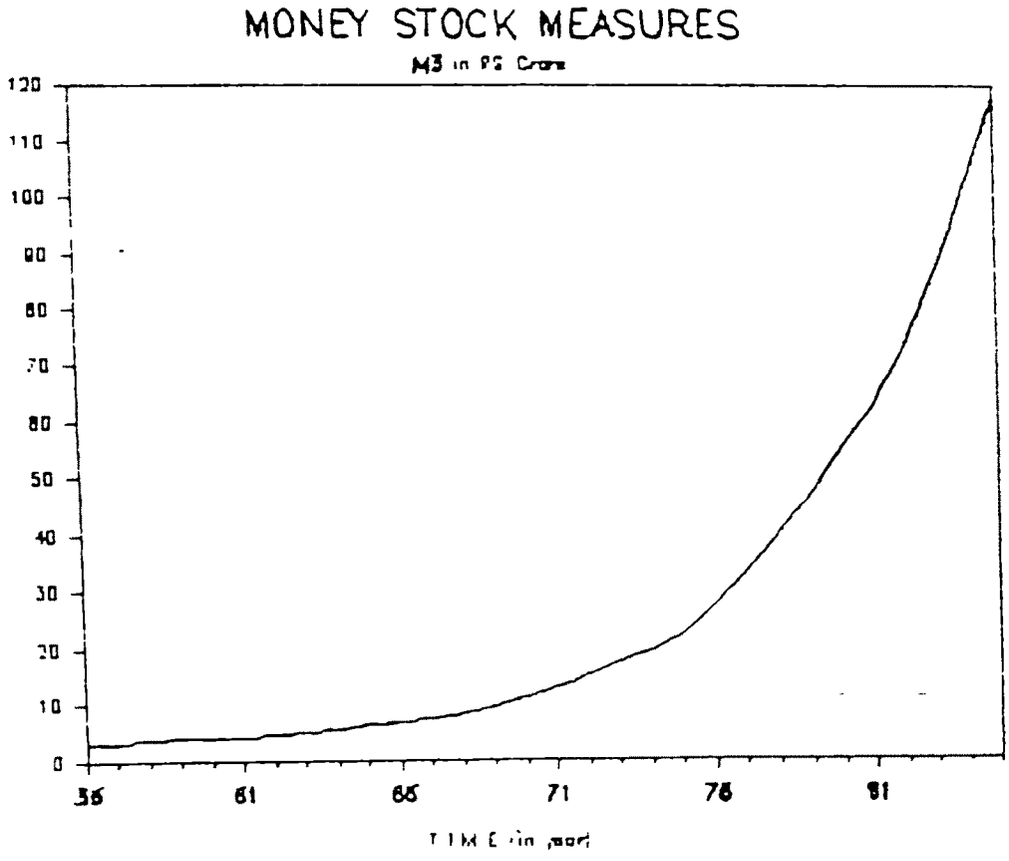
Graph no : IV.9


SOURCES OF MONEY STOCK – M_3
(Rs crore)
200,000
150,000
100,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
NET BANK CREDIT TO GOVERNMENT
BANK CREDIT TO COMMERCIAL SECTOR
NET FOREIGN EXCHANGE ASSETS OF BANKING SECTOR
GOVERNMENT CURRENCY LIABILITIES TO THE PUBLIC
M_3
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89

Graph no : IV. 10



Graph no : IV. 11



Graph no : IV. 12