Chapter VIII

MONET-MULTIPLIER ANALYSIS - A CASE STUDY OF INDIA
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MONEY-MULTIPLIER ANALYSIS - A CASE STUDY OF INDIA

In the previous chapter, we have seen that the yield structure of government securities, is independent of the relative supply of securities under different maturity periods. We have also seen, in the Appendix to the Chapter 7, that the maintenance of the yields on government securities, comparatively at a low level, is generally, done with the help of the captive market. The role of the Reserve Bank in keeping the yield at a low level is not prominent. Changes in the security holding by the bank is more reflected in money supply rather than in security yields. In this chapter we will try to quantify such impact and will show its usefulness in open market operations.

The ability of the central bank to control the money supply is generally evaluated in terms of high-powered money (monetary base) and multiplier (the ratio between money supply and monetary base). The changes occurring in money supply as a result of changes in high powered money, can reasonably be controlled by the central bank, but the changes occurring in money
supply as a result of variation in money multiplier, cannot be controlled that easily. This is because the multiplier depends upon the currency demand and deposit demand of public and excess reserves and borrowed reserves demands of banks. Before explaining the variation in money multiplier, it is essential to explain the behavioural pattern of such variables. Various attempts have been made to integrate the above variables in multiplier and money supply analysis.

In the first section of this chapter we will try to go through some of the works in this direction. The model will be discussed in the second section. This model will be modified for Indian economy in the third section, and will be presented in two different forms. In the next section we will estimate the model and give the results. In the following section we will derive the


multiplier values for both models. In the sixth section we will test the results of the models. Subsequently we will examine the impact of changes in reserve requirement, over the money multiplier and try to compare them with observed multiplier values. In the same section, we will derive average multiplier values.

6.1 We have already surveyed some of the works in this direction in the First Chapter. Here we will glance through some of the works before entering into the analytical work relating to India. Philip Cagan's study shows that, in the economy the currency/money ratio is more responsive to such variables as expected income, direct taxes and expected net rate of interest paid on deposits than to urbanisation and retail trade. On similar basis, Acsessich and Akesov have tried for Canada and developing countries, respectively. Suraj B. Gupta has discussed factors affecting money

1/ Philip Cagan (1959), op. cit., p. 25.
supply. He also made an empirical study on money supply, where he has taken currency/demand deposit ratio, time deposit/demand deposit ratio and reserve ratio to derive money multiplier (m). Gurushree Sany's\(^1\) work and H.A. Shahi's\(^2\) work are based on such ratios. We have already examined these works in the First Chapter.\(^3\)

In above mentioned studies banks' behaviour is not given explicit consideration. However, some economists have tried to explain, in isolation from its relevance for money multiplier, the expansionary or contractionary policy through excess reserves and borrowed reserves of the banking sector. If the actual free reserves (i.e. excess reserves minus borrowed reserves of banks), exceed, desired level of free reserves, then it is taken as signal for expanding credit, leading to decline in rates of interest.\(^4\) Of course, while expanding credit or contracting the credit, profitability is also taken into consideration.\(^5\) A general approach, regarding

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1/ Gurushree Sany (1975), op.cit.
2/ H.A. Shahi (1973), op.cit.
3/ Chapter I (1.4.2).
4/ Peter A. Frost (July/August 1971), op.cit., p.836.
the behaviour of excess reserves, is popularised by Polak and White,\(^3\) and Frost.\(^2\) Polak and White have shown close relationship between rate of interest and excess reserves. Goldfield,\(^3\) concludes that banks borrow for both need and profit. Brunner and Meltzer\(^5\) Goldfield and Kane\(^5\) and Meigs\(^6\) have also arrived at similar conclusion. The author has analysed the behavioural pattern of excess reserves, borrowed reserves and free reserves, with reference to market rate of interest (call

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money rate), and assets held by banks, in general in Indian context. Excess reserves has shown negative relationship with the inter-bank call money rate. Banks' borrowing has shown positive relationship with call money rate. This is in conformity with the theory. Frost, confirms this type of behaviour on theoretical and empirical base. S.B. Gupta, while analysing factors affecting money supply, observes that some components such as borrowed reserves may be endogenous so it needs behavioural explanation. Further he states that "the excess reserves-holding behaviour of banks can be given a rational economic explanation - a point which has not been fully appreciated by several analysts of the Indian monetary scene, and a point which is of substantial importance for the formulation of monetary-control policy. In this context, it is worth while to integrate bank's behaviour with regard to excess reserves,borrowed reserves and peoples' behaviour, with regard to currency and deposit demands, in money supply analysis.

1/ M.C. Thaker, 1980, op.cit.
2/ R.A. Frost (July/August 1971), op.cit, p.821.
4/ S.B. Gupta (1979), op.cit, p.130.
Brunner and Meltzer have incorporated demands of excess reserves, borrowed reserves, currency and deposits, in deriving the money multiplier with respect to high powered money. There they have taken ratios between currency and demand deposit, time deposit and demand deposit and reserve ratios with total deposits. They have avoided the estimation of public demand for currency and banks' demand for excess reserves explicitly. Further in this analysis, monetary base summarises "the main policy actions of the monetary authorities - open market operations, changes in reserve requirements and administration of discount window." The analytical work presented in this chapter enables to separate out the impact of changes in debt holding by the bank and impact of changes in reserve requirements under, certain assumptions. "The degree of accuracy that can be achieved by the monetary authority in controlling the money stock is a function of their ability to determine," changes in debt held by the bank, "and to predict the net influence of the public's and banks' behaviour as summarised by changes in the money supply multiplier."


"The greater the predictability the greater is, Federal Reserve Control of the money supply." 1

In this respect a model developed by Warren L. Smith2 has been further expanded by Shatkhate and Villanueva3 for deriving the money multiplier for United States. They have derived the multiplier with respect to security holding (including Treasury bills) by the central bank. This model, then may be extended, with some modifications to explain the monetary aspect of public debt management.

3.2 The model is reproduced as follows. First four equations are accounting identities in the model. Equations, from fifth to ten are behavioural equations. Eleventh and twelfth equations, generate permanent income and expected prices respectively. Some degree of specification error in estimation of structural parameters is likely to occur, as the estimated model is partial one.


1. \[ S + Br + F_a + U + c_1^t + \frac{d}{b_q} + br \]
2. \[ a_q^d = k_1 \]
3. \[ a_q^t = k_2 \]
4. \[ m = c + d \]
5. \[ Br = c_0 + c_1 + U_1 \ldots \ldots c_1 < 0 \]
6. \[ U_2 = b_0 + b_4 + U_2 \ldots \ldots b_4 < 0 \]
7. \[ C = c_0 + c_2 + c_1 + c_2^t + c_3 \left( \frac{p}{p} \right)^2 + u_2 \ldots \ldots c_1 < 0 \]
8. \[ D = d_0 + d_2^p + c_4 + d_2^t + d_3 \left( \frac{p}{p} \right)^2 + u_4 \ldots \ldots c_1 < 0 \]
9. \[ T = t_0 + t_2^t + t_4 + t_2^t + t_3 \left( \frac{p}{p} \right)^2 + u_3 \ldots \ldots t_3 < 0 \]
10. \[ F_a = F_0 + F_2^o + F_4 + F_2^t + F_3 \left( \frac{p}{p} \right)^2 + \]
    \[ F_4 \times + b_6 \ldots \ldots F_4 > 0 \]
11. \[ x = x + \sum_{i=1}^{n} \beta_i Y_{t-1} \]
The specification of notations are as follows:

$\bar{L}$ = Government securities and Treasury bills held by the central bank.

$R$ = Borrowed reserves of banks.

$f_a$ = Foreign assets and gold held by the central bank.

$C$ = Currency with public.

$k_1$ = Required reserves on demand deposits.

$k_2$ = Required reserves on time deposits.

$R_e$ = Excess reserves of banks.

$R_1$ = Required reserve ratio on demand deposits.

$R_2$ = Required reserve ratio on time deposits.

$M$ = Money supply.

$r_1$ = Call money rate.

$D$ = Demand deposit.

$p^*$ = Permanent income

$t$ = Time deposit

$\bar{p}$ = Expected rate of price changes.
\( r_t \) = Rate of interest on time deposit.

\( x \) = Exchange rate

\( u_1 \) to \\
\( u_6 \) = Error terms

Indicates exogenous variable for the model.

\( b_1, b_2, b_3, b_4, b_5, b_6 \) are constant terms.

First equation shows the sources and uses of base money. Base money is defined in terms of currency held by public and reserves held by banks in the central bank. Reserves include required reserves and excess reserves. Sources of base money consists of net securities and Treasury bills held by the central bank, and borrowing of banks from the central bank and foreign assets (including gold) held by the central bank.

Equations second and third show required reserves on demand deposits and time deposits, in which ratios \( k_1 \) and \( k_2 \) are fixed. Equation four gives the definition of money supply. Equation five to nine show the excess reserves and borrowed reserves demands of banks; and currency demand, demand deposit demand and time deposit demand of public. Equation ten shows holding of net foreign assets and gold by the central bank.
Excess reserve is assumed to be related negatively with market rate of interest. Some economists observed that the market rate of interest is an opportunity cost of holding excess reserves, so with higher rate of interest banks will hold less amount of excess reserves and vice-versa. It is assumed that the borrowing of banks from the central bank is positively related with market rate of interest. This is because of the increased demand for loan in the market. This induces the rate of interest to go up; to fulfill the increased demand for loan, either banks may reduce their excess reserves or increase their borrowing from the central bank.

In case of demand of public, for currency and deposits, it is assumed that those demands will show negative relationship with rate of interest and positive relationship with permanent income, or observed income and negative relationship with expected rate of inflation.

6.3 Modified Model for India

Above model can be applied to developing countries, with slight modifications. In this modified model it is intended to analyze money multiplier with respect to income.

effect of the open market instrument (securities including Treasury bills), rather than with respect to interest rate effect of the open market instrument.

Interest rates may be an effective indicator of monetary policy in developed countries like U.S.A. and U.K. But in country like India, they may not be true indicators of money market conditions. L.M. Hole has found interest elasticity of demand for money, between -0.60 to -0.43. This shows that the demand for money is inelastic to rate of interest. The use of interest rate as an indicator of effectiveness of monetary policy is misleading in India. L.M. Smith has observed, "A better measure of effectiveness of monetary policy (in the sense of the potency of open market operations) would be $\frac{dy}{dy}$, rather than $\frac{dy}{ds}$, since the objective of monetary policy is to control aggregate demand for goods and services in order to achieve optimal price stability". In the above notation 'X' stands for aggregate spending in the economy, 'Y' stands for open market operation instrument and

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2/ L.M. Smith, 1967, Empir., p.03.
'i' stands for rate of interest on primary securities.

Security is taken as exogenous variable which can be controlled by the bank through open market operation.

Further traditionally, impact of monetary policy is being measured in terms of movements in money supply in the economy. Smith\(^1\) remarks in this respect "...... \( \frac{dM}{dt} \) rather than \( \frac{dM}{ds} \) could generally be used as an index of the effectiveness of monetary policy". In context of Indian economy this approach seems consistent. We hence formulate two different models with two definition of money supply.

**Model I**

In first model, equations 1 to 3, remain as they are, that is

\[
\begin{align*}
\Delta + \Delta r + \Delta a & = \Delta + \Delta d + \Delta t + \Delta r \\
\Delta d & = \Delta g \cdot D \text{ and} \\
\Delta t & = \Delta g \cdot T
\end{align*}
\]

---


(4a) \( M = C + G + T \) - In this equation definition of money supply is extended upto time deposit.

(5a) \( Dr = c_0 + eY + e_i i_t + u_1 \quad \ldots \quad c > 0; \ c_1 < 0 \)

(6a) \( Dr = b_0 + bY + b_1 i_t + u_2 \quad \ldots \quad b > 0; \ b_1 < 0 \)

In equations 5a and 6a, one more variable is added, that is \( Y \) (observed income), as an independent variable, to capture the impact of the expansion of overall economy on the banking sector.1/

(7a) \( C = c_0 + eY + c_1 i + c_2 \frac{t}{p} + c_3 \frac{V}{p} + u_3 \ldots \ c > 0; \ c_1 < 0 \)

(8a) \( D = d_0 + dY + d_1 i + d_2 \frac{t}{p} + d_3 \frac{V}{p} + u_4 \ldots \ d > 0; \ d_1 = 0 \)

(9a) \( T = t_0 + tY + t_1 i + t_2 \frac{t}{p} + t_3 \frac{V}{p} + u_5 \ldots \ t > 0; \ t_1 < 0 \)

In equations 7a to 9a, \( \frac{Y}{p} \) and \( \frac{V}{p} \) are replaced by current income \( Y \) and current rate of inflation \( \frac{V}{p} \).

as it is observed that, "... monetary policy can largely be based upon current income".1/ In case of prices, "... decay coefficient for price... is so small as to make any significant difference between expected and current price".2/ Hence, in the model current income and current rate of price changes are shown, and equations 11 and 12 are not essential in the model. Further, in case of equation ten, one can safely assume closed economy, as it is observed in Reserve Bank of India Bulletin, that, "we are operating a closed system and developments in the world's money markets are not of any immediate relevance from our point of view".3/4/

Model II:

In the second model the definition of money is narrowed down to currency plus demand deposit, that is


2/ Ibid.


4/ The ratio between internal debt held by the central bank and the foreign assets, was highest for India (2.71), as compared to other countries during 1969-70. For other countries, these ratios were as follows: U.S.A. (0.42), U.K. (2.93), Argentina (2.53), Sweden (2.50), Chile (1.98), Japan (1.29), Zaire (1.82), Mexico (1.87); M.S. Desecq, 1974, op.cit., p. 55.
equation.

(4) \[ M = C + D \]

Rest of the equations remain the same as in the first model. The model is estimated in next section.

3.4 Estimation of the model: In estimating the model theoretically speaking one should take into account different rates of interest, such as interest rates on time deposits, Treasury bill rates, saving deposit rates, dividends on shares, etc., as they are actually competitive. Due to imperfection of capital market, the interest rates do not reflect the market forces as assumed in competitive model. So in estimation only one rate of interest, that is, inter-bank call money rate, (which also fluctuates within a given range as prescribed by the Reserve Bank of India), has been taken into consideration. In order to avoid multicollinearity problem, rate of inflation is also dropped while estimating the model.

In estimation of the model yearly data from 1951-52 to 1975-76, are used as given by S.B. Gupta. All data are converted into index numbers with 1960-61 as base year. In the model linear relationship is assumed. Brunner and

Heltser have noted that, "the linear hypothesis yields an answer to questions about the response to open market operation and changes in requirement ratios." In order to deal with problem of serial correlation all data are transformed to correct for the first order serial correlation \( \rho \) using the two stage least squares (linear) process. In this estimation, intercept,

\[ \hat{\alpha} = \left( 1 - \hat{\rho} \right) \; \text{while the slope coefficient,} \; \hat{\gamma} \; \text{will have same asymptotic properties as the maximum likelihood estimators}. \]

Transformed data are shown with asterisk marks. The results are as follows:

**Results:** Bracket below coefficients show 't' values and asterisk mark on the bracket shows 5 per cent level of significance.

\[
\begin{align*}
\text{Income elasticity} \\
(5a) \quad & \hat{\gamma} = -0.8 + 1.26\hat{\alpha} - 0.23 1* \\
& \left( 0.51 \right) \left( 12.41 \right) \left( -1.84 \right) * \quad t = 1.15 \\
\hat{\rho}^2 = 0.92; \text{D.W.} = 1.97 \; \text{no serial} \\
\text{correlation.} \\
(6a) \quad & \hat{\gamma} = -1.62 + 0.73\hat{\alpha} + 1.56 1* \\
& \left( -2.03 \right) * \left( 1.50 \right) \left( 1.98 \right) * \quad t = 0.80 \\
\hat{\rho}^2 = 0.55; \text{D.W.} = 1.47, \; \text{no serial} \\
\text{correlation.}
\end{align*}
\]

3/ Ibid., p. 238.
\[(7a) \quad c^* = 33.06 + 0.68 y^* - 0.39 i^* \quad \text{R}^2 = 0.68; \quad D.W. = 1.71, \text{no serial correlation.} \]
\[(8a) \quad d^* = -55.27 + 1.79 y^* - 3.32 i^* \quad \text{R}^2 = 0.95; \quad D.W. = 1.75, \text{no serial correlation.} \]
\[(9a) \quad e^* = -61.42 + 1.75 y^* - 0.42 i^* \quad \text{R}^2 = 0.91; \quad D.W. = 1.41, \text{inconclusive.} \]

From the above estimated equations the following estimates of parameters, useful for deriving the multiplier, have been observed.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Partial derivatives</th>
<th>Partial derivatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>parameters with respect to income ((y))</td>
<td>parameters with respect to interest rate ((i))</td>
</tr>
<tr>
<td>(7a)</td>
<td>(b = 1.26)</td>
<td>(a_1 = -0.63)</td>
</tr>
<tr>
<td>(8a)</td>
<td>(b = 0.73)</td>
<td>(b_1 = 1.5)</td>
</tr>
<tr>
<td>(9a)</td>
<td>(c = 0.63)</td>
<td>(a_1 = -0.39)</td>
</tr>
<tr>
<td>(10a)</td>
<td>(d = 1.75)</td>
<td>(d_1 = -3.35)</td>
</tr>
<tr>
<td>(11a)</td>
<td>(t = 1.75)</td>
<td>(t_1 = -3.42)</td>
</tr>
</tbody>
</table>
In the above results all coefficients have expected signs. All income coefficients are significant except with respect to borrow reserves. All interest coefficients, are significant. In all cases values of Durbin-Watson test are reasonable looking to the time series nature of the data. Serial correlation is absent in four out of five cases. In one case test is inconclusive.

In estimation values of \( k_1 \) and \( k_2 \) are taken as 4 per cent and 3 per cent respectively, through out the period. This is because, before september 1962, the value of \( k_1 \) was 5 per cent and \( k_2 \) was 2 per cent; after that, both were fixed uniformly at 5 per cent, up to June, 1973. Now using these results, we turn to derive multiplier values.

3.5 Derivation of Multiplier:

Before deriving, multiplier using income coefficient, an attempt is made to see the relevancy of interest rate in deriving the multiplier. We differentiated the model, partially with respect to interest rate \( (1) \) and totally with respect to securities \( (2) \), using equations \( (1) \) and \( (2) \).

3/ In taking these values, it does not create any problem in estimation of the multiplier, that can be seen from the alternative multiplier values calculated in following discussion.
(4a) or (1) and (4); that is:

(1) \[ S + Br(i) + Pa(i) \]
\[ = C(i) + k_1 \delta(1) + k_2 \tau(1) + Br(i) \]

(4b) \[ M = C(i) + D(i) + \tau(1) \]
or

(4c) \[ M = C(i) + D(i) \]

By applying Cramer's rule, one can get following two solutions:

\[ \frac{\partial i}{\partial S} = \frac{-c_1 + d_1 + t_1}{c_1 + k_1 \alpha_1 + k_2 \tau_1 + b_1 - e_1} \]  

or

\[ \frac{\partial i}{\partial S} = \frac{-c_1 + d_1}{c_1 + k_1 \alpha_1 + k_2 \tau_1 + b_1 - e_1} \]  

By putting the values of partial derivatives with respect to rate of interest (Table 3.1) in above two equations one can get two values of multiplier, one for wider definition of money and second for narrow definition of money, that is
\[ \frac{\partial}{\partial r} = \frac{-2.002 - 0.38 - 3.32}{-2.009 - 0.34 (0.33) - 0.03 (0.42) = 0.23 - 1.96} \]

\[ = \frac{2.81}{1.94} = 0.42 \]

and

\[ \frac{\partial}{\partial s} = \frac{-2.37}{1.37} = 0.20 \]

respectively.

These values (0.42 and 0.20), are very much different from those found by direct observation of rates. This will be shown in next section. Multiplier derived through interest rate sensitivity is not consistent with empirical observations in Indian context.1/ In Indian context, "\[ \frac{\partial}{\partial s} \]", rather than \[ \frac{\partial}{\partial r} \], could generally be used as an index of the effectiveness of the monetary policy.2/ Further, it is observed, "... that monetary impulses are relatively important in determination of aggregate income does not require, that the stock of

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1/ In case of United States, interest rate is relevant, that can be seen from the results obtained by Miller and Villenueve (March 1972), ibid., pp. 138-139.

money be independent of income or interest rates. 

In Indian context, in deriving multiplier, partial derivative with respect to current income is empirically consistent, this can be seen from the subsequent discussions. Here we turn to derive the multiplier value, using the above results, through partial derivatives with respect to income.

Note: In case of the first model multiplier is derived using the equations,

(1) and (4a), that is

\[ S + \frac{\partial X}{\partial Y} - \frac{\partial Y}{\partial X} = C(Y) + \frac{\partial C}{\partial Y} + \frac{\partial Y}{\partial X} + \frac{\partial M}{\partial Y} \]

(1a) \[ M = C(Y) + D(Y) + T(Y) \]

By differentiating the above two equations, totally with respect to \( Y \), one can get the following results:

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1/ Brunswick and Meltzer, "Friedman's monetary theory," *Journal of Political Economy*, September/October, 1972, Vol. 80, Iss. 5, "All economists tend to agree that given enough time there will be influence in both directions between money and income," p. 824.
\[(c + k_1 d + k_2 t + e - b) \frac{dy}{ds} = 1 \quad \ldots \quad (E.1)\]

and

\[\frac{d^2 c}{ds^2} = (c + d + t) \frac{dy}{ds} = 0 \quad \ldots \quad (E.2)\]

By applying Cramer's rule and putting \( f = 1 \), (as assumed), one can get

\[\frac{dy}{ds} = \frac{2 + d + t}{c + k_1 d + k_2 t + e - b} \quad \ldots \quad (E.3)\]

and

\[\frac{dy}{ds} = \frac{1}{c + k_1 d + k_2 t + e - b} \quad \ldots \quad (E.4)\]

**Example II:** By differentiating equation 1st and 4th totally, with respect to \( \xi \) one can get the following results:

\[\frac{d^2 c}{ds^2} = \frac{c + d}{c + k_1 d + k_2 t + e - b} \quad \ldots \quad (E.5)\]

In these models equation 3.3 and 3.3a, give multipliers values which contains five inclusions. It shows that the value of multiplier is the function of the partial
derivatives and $k_1$ and $k_2$ ratios. In other words, the value of multiplier is the function of behaviourally determined parameters and reserve requirement ratios as determined by the Reserve Bank. Now let us assume that the authority cannot change the coefficients. Then to change the value of multiplier it can use the reserve requirement ratios $k_1$ and $k_2$ as policy measures. The impact of $c$, $d$ and $t$ are ambiguous, as they appear in both numerator and denominator.

Now by putting values of the partial derivatives with respect to income (Table 8.1) in equations (8.3), (8.4) and (8.3a), we get the multiplier values for both models respectively. They are as follows:

$$\frac{dv}{ds} = \frac{0.68 + 1.25}{0.68 + 0.37 + 0.39 + 1.25 - 0.73} = \frac{2.17}{1.33} = 1.65 \quad \ldots \quad (8.3)$$

$$\frac{dv}{ds} = \frac{1}{1.33} = 0.752 \quad \ldots \quad (8.4)$$

$$\frac{dv}{ds} = \frac{0.68 + 1.25}{0.68 + 0.37 + 0.39 + 1.25 - 0.73} = \frac{2.57}{1.33} = 1.936 \quad \ldots \quad (8.3a)$$
Now here it is interesting to see the multiplier values of money supply (defined narrowly), under different assumptions, derived for India (based on income sensitivity) and derived for United States (based on interest rate sensitivity). For India, period of reference is 1951-1976 (yearly), and for United States it is 1959-1973 (quarterly). 1/ In the above analysis equation 8.3a, corresponds with equation 13 of Shatkhathe and Villanueva. Value of the equation 8.3a is equal to 1.86 while for equation 13, it is equal to 1.42. In equation 13b of Shatkhathe and Villanueva, currency drain and reserve requirement on demand deposit are allowed, which gives multiplier value equal to 3.03, corresponding equation for India is

\[ \frac{c+d}{c+k_1 d} = \frac{a+0.72}{0.63+0.07} = \frac{2.72}{0.75} = 3.62 \]

This equation represents traditional way of presenting multiplier values. 2/ Traditional equation is a mechanistic way, while equation 13 or 13.6 and the above multiplier take care of behaviouralistic pattern of demand and supply of money.

Equation 13.6 allows leakages due to reserve requirement on time deposit for U.S.A. This equation

1/ Shatkhathe and Villanueva (March 1972), 91-92.

2/ Traditional equation corresponding to this may be written as follows:

\[ a = \frac{1}{c+d+k_1 (1-c)} \]
gives multiplier value equal to 2.10 while in case of India similar equation gives multiplier value equal to:

\[
\frac{c + d}{c + k_1d + k_2t} = \frac{0.66 + 1.22}{0.66 + 0.07 + 0.05}
\]

\[
= \frac{2.02}{1.73} = 3.09
\]

If a difference occurs, when interest rate sensitivity of borrowed reserves is allowed in U.S. economy. This is presented by equation 13.4, which gives multiplier value equal to 1.73; in case of India, this equation is presented as follows:

\[
\frac{c + d}{c + k_1d - b} = \frac{0.66 + 1.22}{0.66 + 0.07 - 0.05}
\]

\[
= \frac{2.02}{1.73} = 123.50
\]

In U.S. economy, interest rate sensitivity reduces multiplier value below the traditional value (3.03), and brings it nearer to the value given by equation (13), that is 1.42. In the case of India things are different; the income coefficient of borrowed reserves increases the multiplier value up to 123.50, above the traditional value, that is 3.27.
In India borrowing activity by banking sector generates considerable impact over the multiplier value and there by on money supply in the economy. This discussion is intended to have glance over the two countries multipliers, without intending to compare them. In the next section we will test the multiplier values derived, using the above results.

2.6 Testing observed value and model value of the multiplier:

In the above analysis the security and Treasury bills held by the bank are not appearing explicitly. The expression \( T/y_{dc} \) shows the money multiplier. It shows that if changes in the security holding by the bank are multiplied by the value of multiplier, it gives quantity of variations in money supply. To test the value of multiplier, following procedure is adopted.

\textbf{Method I:} To test the multiplier value, we simply obtained changes in money stock (\( \Delta m \)) and changes in securities (\( \Delta S \)) held by the Reserve Bank during 1950-76,

This gives,

\[
\frac{\Delta m}{\Delta S} = \frac{2.163}{1973} = 3.04
\]

This observed multiplier value differs from the model value 3.17, (given by equation 5.3), by 4.10 per cent.
This shows the exactness of the model value (3.17).

Model II: Similarly change in money supply \( (\Delta M) \) during 1953-76, is obtained. This change is divided by change in securities held by the Reserve Bank.

That is

\[
\frac{\Delta M}{\Delta S} = \frac{10.313}{9973} = 1.03
\]

This value differs from model value 1.05 (obtained through equation 6.3a) by 7.53 per cent.

This shows that the value obtained from equation 6.3 is more accurate than the value obtained through equation 6.3a. That is 3.17, obtained with wider definition of money supply is more nearer to the approximation than the value 1.05, obtained with narrow definition of money supply. The following table 6.2 shows these values and differences between them. The impact of changes in reserve requirement on multiplier value is discussed below.
Table 8.2

<table>
<thead>
<tr>
<th>Equation No.</th>
<th>Model Values</th>
<th>Observed value</th>
<th>Percentage difference between observed value and model value ( )</th>
</tr>
</thead>
<tbody>
<tr>
<td>d2</td>
<td>A(2)</td>
<td>A(2)</td>
<td></td>
</tr>
<tr>
<td>d3</td>
<td>A(3)</td>
<td>A(3)</td>
<td></td>
</tr>
</tbody>
</table>

(Model I)

| 8.3         | 3.17         | 3.04           | 4.10                                                             |

(Model II)

| 8.3a        | 1.86         | 1.72           | 7.53                                                             |

8.6.1 Reserve Requirement Ratio and Multiplier Value

Now in the model, if we assume that the behavioural coefficients cannot be changed by the Bank's policy, the Bank can affect the multiplier value by changing the reserve requirement ratio. During September 1972, the reserve requirement ratio was raised to 7 per cent. By putting \( k_1 = k_2 = 7 \) per cent in equations 8.3 and 8.3a, we get multiplier values equal to 2.69 and 1.69, respectively. We compared this values with observed values obtained through 5 years moving differences in money stock and security holdings. Such values are shown in following Table 8.3. The table also shows the multiplier value obtained through changes in reserve requirements.
## Table 6.3

**Model Values and Observed Values**

<table>
<thead>
<tr>
<th>Period</th>
<th>Model I Value</th>
<th>Observed Value</th>
<th>Percentage Difference</th>
<th>Model I Value</th>
<th>Observed Value</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963-74</td>
<td>2.69</td>
<td>2.90</td>
<td>0.34%</td>
<td>1.69</td>
<td>1.66</td>
<td>1.81%</td>
</tr>
<tr>
<td>1969-75</td>
<td>3.05</td>
<td>3.19</td>
<td>0.32%</td>
<td>1.79</td>
<td>1.81</td>
<td>1.10%</td>
</tr>
</tbody>
</table>
During 1968-74, the model value 2.89 differs from the observed value 2.90, only by 0.34 per cent. (Model I). Similarly in Model II, the model value 1.69 differs from observed value 1.66, only by 1.81 per cent. During June 1974 the reserve requirement ratio was changed to 5 per cent. By putting this value in equations 8.3 and 8.3a we obtained multiplier values equal to 3.05 and 1.79 respectively. These values differ from the observed values 3.19 and 1.81 by 4.39 per cent and 1.10 per cent respectively, during 1969-75 (Table 8.3). To obtain observed values of multiplier for subsequent years we may have to take into consideration the variations in holding of foreign assets by the Bank. We have discussed this as follows:

In the model we have assumed that impact of variations in foreign assets of the Bank, may be negligible, hence we put (f = 0) zero for the coefficient of foreign assets of the Bank. Now the net foreign exchange asset holding by the Reserve Bank has shown increasing trend, particularly from 1975-76. This can be seen from the following Table 8.4. The table shows the net foreign exchange assets of the Bank and adjusted changes in security holding by the Bank.

The Table 8.4 shows that the net foreign exchange holding by the Bank, was ranging between ₹ 369 crores
Table 9.4

Net Foreign Exchange Assets (FA) of the Reserve Bank of India and adjusted changes in security holding by the Reserve Bank of India (Δ S + Δ FA)

(₹ crores) (5 years differences)

<table>
<thead>
<tr>
<th>Years</th>
<th>FA</th>
<th>Δ FA</th>
<th>Δ S</th>
<th>(Δ FA + Δ S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-71</td>
<td>532</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971-72</td>
<td>668</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972-73</td>
<td>569</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973-74</td>
<td>661</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974-75</td>
<td>389</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975-76</td>
<td>924</td>
<td>324</td>
<td>2722</td>
<td>3116</td>
</tr>
<tr>
<td>1976-77</td>
<td>2599</td>
<td>1291</td>
<td>2430</td>
<td>4421</td>
</tr>
<tr>
<td>1977-78</td>
<td>4532</td>
<td>3963</td>
<td>2299</td>
<td>6562</td>
</tr>
<tr>
<td>1978-79</td>
<td>5431</td>
<td>4773</td>
<td>2094</td>
<td>6364</td>
</tr>
</tbody>
</table>

to a. 661 crores, during 1970-71 to 1974-75. It was ranging between 924 crores to a. 5431 crores during 1975-76 to 1978-79. It clearly shows that from 1975-76 onwards foreign exchange holding by the Bank, increases substantially. With the net increase in foreign exchange holding by the Bank money supply increases in multiple terms. Similarly with the net decrease in foreign exchange holdings by the Bank money supply decreases in multiple terms. This may occur through following process.

When private individuals or corporate sectors purchase foreign exchange from the Reserve Bank, they make the payment in rupee terms to the Bank. To this extent currency in circulation reduces. Similarly, when they sell foreign exchange to the Bank, in exchange of rupees, currency in circulation increases.

The impact of the government purchases and sell of the foreign exchange depends upon mode of its payment and receipts. If the government purchases the foreign exchange from the Bank, by borrowing from the public, it reduces the currency in circulation to that extent.

If it purchases, by borrowing from the Reserve Bank, it may not have impact over circulation of currency in the economy. If the government sells the imported goods, and utilizes the sale proceeds to reduce the borrowing from the Bank, it reduces the currency in circulation to that extent.
With such considerations, to obtain observed multiplier value we adjusted security holding by the Reserve Bank, to the extent of variations in its net foreign exchange holding, during 1975-76 to 1978-79 as shown in Table 8.4 column No.5. This gives observed multiplier values as shown in the Table 8.5. The table shows model and observed values of the multiplier.

During 1975-76 the reserve requirement ratio was changed to 4 per cent. So by putting $k_1 = k_2 = 4$ per cent in equations 8.3 and 8.3a, we obtained model multiplier values equal to 3.13 and 1.03 respectively. These two values differ from the observed multiplier values 3.31 and 1.25, by 5.14 per cent and 4.57 per cent respectively, during 1970-76. Similarly during 1976-77, the reserve requirement ratio was raised to 6 per cent. By putting this value in equations 8.3 and 8.3a, we obtained multiplier values equal to 2.97 and 1.74. These two model values differ from the observed values 2.88 and 1.64 by 3.13 per cent and 6.19 per cent respectively, during 1971-77. For subsequent two periods 1972-78 and 1973-79 we have obtained observed multiplier values 2.94, 1.43, 3.34 and 1.60 respectively. But we have not tried to compare with model values. This is because the Reserve Bank started publishing new series of money supply from 1977-78. The new series
<table>
<thead>
<tr>
<th>Period</th>
<th>Model value</th>
<th>Observed</th>
<th>Percentage Difference</th>
<th>Model value</th>
<th>Observed</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-76</td>
<td>3.73</td>
<td>3.31</td>
<td>5.14%</td>
<td>1.83</td>
<td>1.75</td>
<td>4.47%</td>
</tr>
<tr>
<td>1971-77</td>
<td>2.37</td>
<td>2.83</td>
<td>3.13%</td>
<td>1.74</td>
<td>1.64</td>
<td>6.00%</td>
</tr>
<tr>
<td>1972-78</td>
<td>-</td>
<td>2.94</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1973-79</td>
<td>-</td>
<td>3.34</td>
<td>-</td>
<td>-</td>
<td>1.60</td>
<td>-</td>
</tr>
</tbody>
</table>
widely differs from the old series. This is so far so regarding the marginal money multiplier, with respect to security holding by the Reserve Bank. It is fairly consistent and predictive in Indian context. Now the average money multiplier is more popular, than marginal money multiplier among researchers. We have discussed this as follows:

8.6.2 Average Multiplier Value:

We obtain the average money multiplier values by taking simple ratio between money supply (model I and model II) and debt held by the Reserve Bank. These average multiplier values for both models are shown in Table 8.6 columns 3 and 6, respectively. These multiplier values also represent the marginal multiplier value if we present it in functional form as follows:

\[ \mu = \pi \left( \frac{m}{K} \right) \]

Security (debt) holding by the bank is a policy determined variable, while the multiplier (m) is determined by the behavioural functions of public and banking sector. We have shown this with empty bracket. Hence this multiplier is both average and marginal.

The average multipliers for the period 1951-79, are 2.86 for model 1st and 2.02 for model 2nd. The standard deviations of averages for both models are 0.34 and 0.66.

Table 9.6  

Average Multiplier Values for the period 1951-1979

<table>
<thead>
<tr>
<th>Years</th>
<th>M. crores (II)</th>
<th>M. crores (III)</th>
<th>M. crores (Debt) Securities held by RBI</th>
<th>Observed Average Multiplier Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monetary Resources</td>
<td>Money Stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1951-52</td>
<td>2196</td>
<td>2074</td>
<td>567</td>
<td>3.07</td>
</tr>
<tr>
<td>1952-53</td>
<td>2099</td>
<td>1752</td>
<td>546</td>
<td>3.54</td>
</tr>
<tr>
<td>1953-54</td>
<td>2137</td>
<td>1765</td>
<td>487</td>
<td>4.39</td>
</tr>
<tr>
<td>1954-55</td>
<td>2249</td>
<td>1850</td>
<td>553</td>
<td>4.07</td>
</tr>
<tr>
<td>1955-56</td>
<td>2505</td>
<td>2049</td>
<td>720</td>
<td>3.45</td>
</tr>
<tr>
<td>1956-57</td>
<td>2730</td>
<td>2222</td>
<td>1004</td>
<td>2.72</td>
</tr>
<tr>
<td>1957-58</td>
<td>2590</td>
<td>2334</td>
<td>1409</td>
<td>2.12</td>
</tr>
<tr>
<td>1958-59</td>
<td>3263</td>
<td>2394</td>
<td>1543</td>
<td>2.11</td>
</tr>
<tr>
<td>1959-60</td>
<td>3655</td>
<td>2551</td>
<td>1094</td>
<td>2.10</td>
</tr>
<tr>
<td>1960-61</td>
<td>3902</td>
<td>2725</td>
<td>1813</td>
<td>2.15</td>
</tr>
<tr>
<td>1961-62</td>
<td>3798</td>
<td>2614</td>
<td>1910</td>
<td>2.39</td>
</tr>
<tr>
<td>1962-63</td>
<td>4389</td>
<td>3098</td>
<td>2128</td>
<td>2.06</td>
</tr>
<tr>
<td>1963-64</td>
<td>4723</td>
<td>3475</td>
<td>2138</td>
<td>2.24</td>
</tr>
</tbody>
</table>

contd...
<table>
<thead>
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<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964-65</td>
<td>5269</td>
<td>3866</td>
<td>2450</td>
<td>2.12</td>
<td>1.36</td>
<td></td>
</tr>
<tr>
<td>1965-66</td>
<td>6266</td>
<td>4236</td>
<td>2718</td>
<td>2.14</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
<td>1966-67</td>
<td>6462</td>
<td>4641</td>
<td>2923</td>
<td>2.21</td>
<td>1.59</td>
<td></td>
</tr>
<tr>
<td>1967-68</td>
<td>7041</td>
<td>5008</td>
<td>3303</td>
<td>2.34</td>
<td>1.67</td>
<td></td>
</tr>
<tr>
<td>1968-69</td>
<td>7704</td>
<td>5428</td>
<td>3335</td>
<td>2.34</td>
<td>1.63</td>
<td></td>
</tr>
<tr>
<td>1969-70</td>
<td>6414</td>
<td>5011</td>
<td>3406</td>
<td>2.59</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>1970-71</td>
<td>6779</td>
<td>6729</td>
<td>3827</td>
<td>2.07</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>1971-72</td>
<td>11477</td>
<td>7558</td>
<td>4285</td>
<td>2.50</td>
<td>1.76</td>
<td></td>
</tr>
<tr>
<td>1972-73</td>
<td>13304</td>
<td>8559</td>
<td>3423</td>
<td>2.45</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>1973-74</td>
<td>15256</td>
<td>10058</td>
<td>6124</td>
<td>2.07</td>
<td>1.64</td>
<td></td>
</tr>
<tr>
<td>1974-75</td>
<td>13148</td>
<td>11233</td>
<td>6297</td>
<td>2.07</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>1975-76</td>
<td>20303</td>
<td>12175</td>
<td>6549</td>
<td>3.10</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td>1976-77</td>
<td>24218</td>
<td>13975</td>
<td>6715</td>
<td>3.01</td>
<td>2.08</td>
<td></td>
</tr>
<tr>
<td>1977-78</td>
<td>32905</td>
<td>18383</td>
<td>7722</td>
<td>4.20</td>
<td>2.38</td>
<td></td>
</tr>
<tr>
<td>1978-79</td>
<td>39867</td>
<td>21658</td>
<td>8218</td>
<td>4.85</td>
<td>2.66</td>
<td></td>
</tr>
</tbody>
</table>

**Average for the period**
1951 - 1979, *n* = 28

<table>
<thead>
<tr>
<th></th>
<th>2.66</th>
<th>2.02</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.54</td>
<td>0.66</td>
</tr>
</tbody>
</table>

**Average for the period**
1957-58 to 1974-75, *n* = 18

<table>
<thead>
<tr>
<th></th>
<th>2.33</th>
<th>1.62</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.21</td>
<td>0.10</td>
</tr>
</tbody>
</table>
respectively. However, if we exclude initial period 1951-57 and later period 1975-76 to 1978-79, we get stable multiplier values. That is during 1957-58 to 1974-75, the multiplier values have shown less deviations from their respective means. These values are 2.33 (0.25) and 1.62 (0.10). The bracket shows their respective standard deviation about their respective means. Probably this stability in multiplier values may be attributed to the absence of disturbances from the foreign asset holding by the Reserve Bank. In our model, we have assumed that the foreign asset coefficient (f = 0) will be zero, during the period of analysis. During major part of the period of analysis (18 years out of 25 years) this assumption comes out to be consistent. This can be seen from the stability shown by the standard deviations (0.25, 0.10) of the average multiplier values 2.33 and 1.62 during 1957-58 to 1974-75.

Now during the early period of analysis (1951-57) foreign asset holding by the Reserve Bank was ranging between L. 611 crores to 812 crores. While during 1957-58 to 1969-70, it ranged between L. 77 crores to L. 396 crores.1/ During 1970-71 to 1974-75 it ranged between L. 369 crores

1/ This reduction was due to withdrawal of foreign reserves, (accumulated after II world war), for the IIInd Five Year Plan; M. J. Hody, 1974, op.cit., p.75.
to Rs. 661 crores. While during 1975-79 it ranged between Rs. 286 crores to Rs. 5431 crores. That means during the initial six years and later four years foreign exchange holding was larger than the rest of the period. The foreign exchange asset holding position of the Bank, is shown in the Table 8.6.1. Such holding by the Bank may be explained as follows:

Foreign assets accumulation was substantial during Indo World War and Korean boom. During the First Plan period and following one year, the government deficit was small, hence withdrawal from the foreign assets was also less. Substantial withdrawal from the foreign assets from the year 1957-58 for the plan purposes, brought down the holding of the Bank. At the same time securities held by the Bank started increasing.

The fall in the foreign asset holding by the Bank during 1952-53, was due to an outflow of private capital. In the ensuing years foreign asset holding position by the Bank improved. Such accumulation "was interrupted in April 1956. Thereafter, reserves fell both continuously and rapidly". 1/ "This was mainly due to large increase in imports particularly of capital goods, resulting from a

<table>
<thead>
<tr>
<th>Years</th>
<th>(Rs. Crores)</th>
<th>Years</th>
<th>(Rs. Crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>832</td>
<td>1965-66</td>
<td>192</td>
</tr>
<tr>
<td>1951-52</td>
<td>612</td>
<td>1966-67</td>
<td>894</td>
</tr>
<tr>
<td>1952-53</td>
<td>698</td>
<td>1967-68</td>
<td>164</td>
</tr>
<tr>
<td>1953-54</td>
<td>717</td>
<td>1968-69</td>
<td>2301</td>
</tr>
<tr>
<td>1954-55</td>
<td>736</td>
<td>1969-70</td>
<td>396</td>
</tr>
<tr>
<td>1955-56</td>
<td>723</td>
<td>1970-71</td>
<td>520</td>
</tr>
<tr>
<td>1956-57</td>
<td>611</td>
<td>1971-72</td>
<td>608</td>
</tr>
<tr>
<td>1957-58</td>
<td>171</td>
<td>1972-73</td>
<td>599</td>
</tr>
<tr>
<td>1958-59</td>
<td>178</td>
<td>1973-74</td>
<td>661</td>
</tr>
<tr>
<td>1959-60</td>
<td>163</td>
<td>1974-75</td>
<td>359</td>
</tr>
<tr>
<td>1960-61</td>
<td>123</td>
<td>1975-76</td>
<td>924</td>
</tr>
<tr>
<td>1961-62</td>
<td>114</td>
<td>1976-77</td>
<td>2359</td>
</tr>
<tr>
<td>1962-63</td>
<td>105</td>
<td>1977-78</td>
<td>4532</td>
</tr>
<tr>
<td>1963-64</td>
<td>112</td>
<td>1978-79</td>
<td>9431</td>
</tr>
</tbody>
</table>

Table 8.6.1
Foreign Assets (Rs) held by the Reserve Bank

Sources: (1) Supplement to Banking and Monetary Statistics of India, Part I, July 1964, p.126.
sharp increase in the rate of investment. The foreign counterpart of the investment expenditure was met partly through long-term government borrowing and foreign grants, but largely through the drawing down of reserves.\footnote{1}{"India’s Balance of Payments 1968-49 to 1961-62", Reserve Bank of India, 1963, p.25.}

Such deficit continued in ensuing years also. But it was accompanied by corresponding capital inflows on official (Government) accounts, as well as from international development agencies. The official loans and grants were attached with some conditions, such as to import, from the country giving the aid or loan. Other non-aid loans or aids were also attached with some informal conditions, such as planning of imports and granting of import licences were to be based on potential flow of aid. Due to such reasons there was little net effect on foreign exchange reserves.\footnote{2}{Surajshri Surya, "An Analysis of sources of change in high-powered money in India" in "Recent Developments in Monetary Theory and Policy", Reserve Bank of India, 1978, p.105.}"
improvement in balance of trade. This is brief discussion regarding the foreign asset accumulation on account of the Reserve Bank. Here we resume our discussion regarding the average money multiplier.

We have seen in earlier discussion that the increase in the net foreign asset holding by the Bank, inflates the money supply and decrease in the net foreign asset holding by the Bank deflates the money supply. Due to exclusion of such assets in the security (S) holding by the Bank, in the estimation, the observed average multiplier values, range between 2.72 to 4.39 during 1951-52 to 1956-57, and 3.1 to 4.85 during 1975-76 to 1978-79. While during 1957-58 to 1974-75 the observed average values remain fairly stable between 2.06 to 2.87 (Table 3.6 column 5, model I). In 1Ind model also it shows similar trend (Table 3.6 column 6).

It means if we give consideration to foreign asset holdings of the Bank we may get smoother series of multiplier for the entire period. Now the Reserve Bank has got a limited control over its foreign assets holdings. However to consider the impact of such asset holdings, we added such assets to security holdings (S) by the Reserve Bank during 1950-1977. Hence the money supply with expanded base takes the following shape.

1 G.S. Gupta, 1979, Quarterly, p.31.
\[ H = m (S + Te) \]

It shows that the money supply is a function of multiplier and security and foreign assets holding position of the Reserve Bank. In this case securities and foreign assets holding by the Reserve Bank becomes policy determined variable\(^1\) while the multiplier \(m\) is behaviourally determined variable.

In an empirical term, ratio between money stock and security plus foreign asset holding by the Bank, gives average multiplier value for each year. Such expanded security plus foreign asset holding position, gives new average observed multiplier values for model I and model II, which are shown in Table 3.7. Columns (3) and (4) of the Table 3.7 show the new average observed multiplier values for models I and II respectively.

This new series give average multiplier value\(^2\)

\(^1\) W.B. Smith, 1967, p.80 (exogeously determined variable).

\(^2\) The average values of the I st model, deviates more than the average values of the IInd model, that is because in the lst model, time deposit is included in the definition of money supply. The income elasticity of demand for time deposit (1.71), is greater than the income elasticity of demand for demand deposit (1.52). Therefore, over a period the multiplier values of the lst model show gently rising trend, while in the IInd model they rise at lesser rate than in case of the lst model. The time-trend for both series are given below

Period 1975-71 to 1978-77. I st model \( m = f \) (time 
\[ m = 0.40 + 0.04 \times \text{(time)}; \quad (t = 13.36)^{**}, \quad r = 0.96 \]
IInd model \( m = 0.95 + 0.005 \times \text{(time)}; \quad (t=5.42)^*, \quad r = 0.73 \)
<table>
<thead>
<tr>
<th>Years</th>
<th>Total Securities plus foreign assets held by RBI</th>
<th>Model I m</th>
<th>Model II p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950-51</td>
<td>1435</td>
<td>1.52</td>
<td>1.22</td>
</tr>
<tr>
<td>1951-52</td>
<td>1379</td>
<td>1.51</td>
<td>1.26</td>
</tr>
<tr>
<td>1952-53</td>
<td>1346</td>
<td>1.69</td>
<td>1.41</td>
</tr>
<tr>
<td>1953-54</td>
<td>1294</td>
<td>1.77</td>
<td>1.47</td>
</tr>
<tr>
<td>1954-55</td>
<td>1293</td>
<td>1.74</td>
<td>1.44</td>
</tr>
<tr>
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Average for the period 1957-58 to 1974-75

Average: 2.14
Standard deviation: 0.32

Average for the period 1958-59 to 1974-75

Average: 2.36
Standard deviation: 0.50
2.06 (0.32) and 1.47 (0.09) for both models, for the period 1950-79, respectively. Brackets show standard deviations around their respective means. The marginal adjustment smoothes the whole series of multiplier values. Such adjustment brings down the standard deviation of the two series nearer to standard deviations found during 1957-58 to 1974-75, (0.25 and 0.19, Table 8.6). The smoothening largely occurs during 1950-1957 and 1975-77. Such smoothening is absent during 1957-58 to 1974-75. The standard deviations during this period remain almost around 0.21 to 0.25 for the first model and around 0.08 to 0.10 for the second model (Tables 8.6 and 8.7). It shows that foreign asset holding by the Reserve Bank does not play much important role during 1957-58 to 1974-75. This further supports to our earlier assumption regarding impact of foreign assets holding by the Reserve Bank.

It is interesting to note that augmentation of money supply due to increase in the foreign asset holding position of the bank, is not of any serious nature. Because firstly, such an increase in the holdings gives purchasing power in the international market. Secondly, the Reserve Bank can utilise the increased liquidity in the economy for reducing amount of securities on its own account. This policy assists in reducing money supply
in the economy. Ultimately it assists in maintaining stable prices in the economy.

However, many other factors are working behind prices in the economy, we may say foreign exchange accumulation is essential for our country. We can utilise such exchange in importing essential goods such as food, fuel, fertilizer and machinery to improve the productive capacity of our country. This may further increase output in the country and may assist in reducing pressure over prices. With such brief discussion regarding the role of foreign exchange holding of the Bank in determining the multiplier value, we again turn to marginal multiplier value (derived through behavioural pattern of public and banking sector) and its policy implications.

The marginal multiplier values (3.47, 1.36) derived through equations 8.3 and 8.3a in the two models enable to regulate the money supply through reserve requirement and variations in debt holding position of the Reserve Bank. By changing the reserve requirement ratio, the Bank can change the value of the multiplier. Through multiplier value and changes in its debt holding position it can affect money supply in the economy. It may keep the reserve requirement ratios constant and thereby it may keep the multiplier value unchanged. At a given multiplier value

value it may generate changes in its debt holding position and through multiplier value it may affect the money supply in the economy.

For effective impact of such actions in the economy, the security market must be well developed. In absence of developed security market and in presence of some constraint over variations in the debt holding position of the Bank, the reserve requirement policy may be utilised rigorously and frequently. In course of time the open market operations (variations in debt holding position of the Banks) may be developed to have effective control over the money supply.

6.7 Thus in this chapter an attempt is made to estimate the money multiplier and to test it through observed multiplier values, obtained through ratio between changes in money stock and variations in the debt holding position of the Reserve Bank. Mode values obtained through variations in reserve requirement ratios also tally with observed values within the period of analysis and outside the period of analysis. An attempt is also made to derive average multiplier values for each year using the total money supply and total debt holding position of the Reserve Bank during 1951-1979. Such average values turn out to be fairly stable (in terms of standard derivations about their respective means). This further strengthens the usefulness
of the marginal multiplier values derived through
behavioural pattern of public regarding demands for
currency and deposits and bank's behaviour regarding
demands for excess reserves and borrowed reserves.

Such multiplier helps the central bank to formulate
its policy (in a limited sense) in such a way that it
can affect the variations in money supply in a desired
direction. According to this model, the central bank
may adjust reserve requirement and its debt holding
position in a desired direction and through that may
control the money supply in the economy. The development
of security market is helpful for effective use of open
market operations. Further with the favourable develop-
ments in foreign exchange situation, due consideration may
be given to foreign exchange assets holding position of
the Reserve Bank, while dealing with the stock of money in
the economy. However, exclusion of this variable has not
created any major problem, in estimating the multiplier
value, during the period of analysis.