

CHAPTER-VII

7.1 INTRODUCTION :

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

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

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

7.2 Identification of sub-periods : Graphical Study

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

This finding has two implications.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

t = time.

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

TABLE-7.2

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

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

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

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

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

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

TABLE-7.3

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

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

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

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

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

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

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

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

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

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

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

Ho : $\gamma_i = \gamma_j$ against

HA $\gamma_i > \gamma_j$

or $\gamma_i < \gamma_j$

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

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

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

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

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

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

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

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

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