

CHAPTER - IV

OUTPUT-MONEY SUPPLY RELATIONSHIP OVER THE PERIOD (1950-91)

4.1. INTRODUCTION :

India, since Independence, has been trying to be self-sufficient in both agricultural and industrial production. Several ambitious economic plans have been undertaken since 1950 in order to usher in a planned growth in both the spheres. As a result thereof, India achieved a spectacular development in agriculture. Again India could transform herself from a pure agrarian economy to a thriving and outstanding industrial country among the developing countries in the world. National income has been growing over the last few decades almost steadily though since 1973 the growth seems to be shy and is occasionally marked by prominent ups and downs since 1980.

Output growth is marked by simultaneous growth of money supply along with growing monetization of the Indian Economy. With such growing monetization, Indian economy underwent a transformation from the barter economy to exchange economy. Because of this transformation, money could rise above its traditional position of medium of exchange and gradually assume more sophisticated roles day by day. In addition to its traditional role of medium of exchange, it has started playing the roles of store and standard of payments in the economy. Growing monetization of the economy, coupled with lower interest rate policy following cheap money policy⁹ in the earlier phase of the economy, stimulated investment. Consequently, output registered an upward growth which evidently added to the purchasing capacity in the economy. Thus, expansion of money supply resulted in the growth of output level in the economy.

The figure 4.1 represents the time plot of output level (GNP) over the period 1950-91. The plot delineates a rising pattern of GNP though at a very lower rate since 1950 to 1972. With a sudden jump in 1985 GNP describes a pattern of steep rise in the following years.

9. Monetary authorities followed cheap money policy in the first plan (1951-56) and controlled expansion policy in the second plan (1957-62).

It may, however, be noted that the figure 4.1 presents the time plot of a non-stationary ¹⁰ series for GNP. A better picture of the movement in GNP may, therefore, be obtained from the time plot of the stationary series of GNP as given in figure 4.2. It is observed from the figure 4.2 that variation ⁷ in the GNP was not noticeable until 1962. The variation in GNP since 1963, though very insignificant, was noticeable until 1972. Since 1972 variation became spectacular. GNP displayed significant rise with some occasional ups and downs until 1985. Since then, there was a steep rise in GNP for subsequent years (1985 - 1991).¹¹

Another important feature of the Indian economy over the period 1950-91 is that the economy with its growing monetization has transformed herself progressively from a barter economy, as initially in 1950, to the state of exchange economy. During the process of transformation money played an important role in economic activities. Cheap money policy followed by the monetary authority in the very early phase of economic development reduced interest rates and stimulated investments. This helped the output level grow. On the other hand, with rise in money supply, purchasing power capacity grew. This supported the growth of output level. Thus, expansion of money supply is usually considered to be a stimulating factor for output level over the past few decades. Nevertheless, whether income growth has really been related to the growth of money supply still remains an issue of debate.

An idea about the nature of association between output level (Y_t) and money supply (M_t) can be obtained from the examination of the time plots of GNP and money supply as given in Fig. 4.3. Fig. 4.3 presents the time plots of non-stationary series of output level and money supply. It appears that

(i) Money supply (M_t) describes an exponentially rising pattern over the period, 1950-1991.

(ii) Exponential rise in output level over this period exhibits a positive association between Y_t and M_t . It may, however, be noted that Y_t registered a steeper rise than M_t since 1985.

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

11. A very little fall was observed in 1989.

Fig. 4.4 represents the time plots of stationary series for Y_t and M_{t-1} . Some interesting features of the association between these two variables are as follows :

- (i) There exists very high and positive degree of association between these variables until 1979 ;
- (ii) Since 1980 output level is found to exhibit higher variation than that in lagged ¹² money supply until 1984 ;
- (iii) Since 1986 the variation in output level is far more spectacular than that in the lagged money supply. It may also be noted that variations in these variables show somewhat different patterns with extent of variations being different over time. Consequently, the association between Y_t and M_{t-1} seems to be weak over the period 1986-1991.

This graphical analysis gives only a tentative idea about the relation between these macro-economic variables. For the precise and conclusive idea about the relationship between money supply and output level, we seek to undertake an investigation in this direction with bivariate data set on money and income. An attempt in this direction has been undertaken. The model has been specified below together with the subsequent estimation and explanation of the findings.

4.2 THE MODEL :

The model for estimation in this present chapter is

$$Y_t = Y_p + \beta M_t + W_t \dots\dots\dots (4.1)$$

- where Y_t = (log of) output at period t
- M_t = (log of) Money supply at period t.
- t = 1950 1991.
- Y_p = Capacity Output.
- $W_t \sim i i d N (0, \sigma_u^2)$

12. Exertion of monetary influence on output level is a time-lag phenomenon. However, in rational expectationists model M_t i.e. instantaneous money supply is usually taken in the vector of regressors.

Y_p , the capacity output needs further explanation. Lucas, in his supply function, holds that it is the trend value of Y_t where Y_t is the co-variance stationary Time Series variable.

However, Durnbusch holds that in stationary process the long-run trend value may be approximated by the mean of the variable. Hence, in our model Y_p is approximated by \bar{Y} . Therefore, the model is

$$Y_t = \bar{Y} + \beta M_t + W_t \quad \dots\dots\dots (4.2)$$

$$\text{or } Y_t - \bar{Y} = \beta M_t + W_t \quad \dots\dots\dots (4.3)$$

$$\text{or } y_t = \beta M_t + W_t \quad \dots\dots\dots (4.4)$$

where y_t represents the deviation of Y_t from \bar{Y} .

It may however, be noted that the software package available for estimation does not allow estimation of the equation without regression constant. Because of these exigencies the estimable model becomes -

$$y_t = \alpha + \beta M_t + W_t \quad \dots\dots\dots (4.5)$$

4.3 ESTIMATION :

The equation has been estimated with GLS Method.¹³

The estimated equation is

$$\hat{y}_t = -0.027964 + 0.5403 M_t \quad \dots\dots\dots (4.6)$$

(0.0086166) (0.1517)¹⁴

[-3.2454] [3.5624]

$R^2 = 0.2455115$ D.F. = 39

$F^* = 12.691$ D.W. = 2.03

13. The OLS estimation suffers from autocorrelation. So, the GLS Method has been used as an alternative appropriate method of estimation. This removes autocorrelation from the estimated equation.
 14. Values in the parentheses indicate corresponding S.E. values while those in brackets represent corresponding t-values of the estimates.

Here we have taken non-stationary data set on GNP (Y_t) and Money supply (M_t) without log-transformation. y_t represents the deviation of Y_t from its mean \bar{Y} such that $y_t = Y_t - \bar{Y}$.

It is observed that

(i) regression constant ($\hat{\alpha}$) and regression co-efficient ($\hat{\beta}$) are significant even at 5% level ;

(ii) the equation is good fit since $R^2 = 0.995$ and $F^* = 9632$; and

(iii) the equation suffers from A.C. since $D.W. = 0.2538$.

so, the equation is omitted.

Alternative Model - 2

$$\log y_t = \alpha_1 + \beta_1 \log M_t + v_t$$

$$\text{i.e. } y'_t = \alpha_1 + \beta_1 M'_t + v_t$$

The OLS estimation of the equation is

$$\hat{y}'_t = -2.0166 + 1.0380M'_t$$

(0.01598) (0.0079236)

[-126.19] [131.0]

$$D. F. = 40 \quad R^2 = 0.99767$$

$$F^* = 17160 \quad D.W. = 1.037$$

We have taken non-stationary data set with log - transformation of the variables concerned in the alternative model-1. Here $\log y_t$ represents the deviation of $\log Y_t$ from its mean such that $\log y_t = \log Y_t - \text{mean}(\log Y_t)$. It is observed that

(i) regression constant ($\hat{\alpha}_1$) and regression co-efficient ($\hat{\beta}_1$) are found significant even at 5% level ;

(ii) the equation is good fit since $R^2 = 0.997$ and $F^* = 17160$; and

(iii) the equation suffers from A.C. even at 1% level since $D.W. = 1.03$.
so, the equation is ignored.

The alternative models (1) and (2) are shown in table-4.1.

TABLE-4.1

Results of estimation of alternative models

Sl.No.	Model	Method	Estimation	DF	R ²	F*	D.W.
1	2	3	4	5	6	7	8
1.	$y_t = \alpha + \beta M_t + u_t$	OLS	$\hat{y}_t = -992.85 + 2.0952M_t$ (18.230) (0.021351) [-54.461] [98.143]	40	0.9959	9632	0.2538
2.	$\text{Log } y_t = \alpha + \beta \text{ log } M_t + v_t$ i.e. $y'_t = \alpha + \beta M'_t + v_t$	OL S	$\hat{y}_t = -2.0166 + 1.0380 M'_t$ (0.01598) (0,0079236) [-126.19] [131.0]	40	0.9977	17160	1.0376

4.5 FINDINGS :

The $\hat{\beta}$ co-efficient of the estimated equation (4.6) is significant at 5% level. Again $\hat{\beta} > 0$ indicates that output registered a significant rise following on increase in the money supply over the period concerned. So variation in money supply is found to lead to a significant variation in output level. Output level exhibits a rise significantly in response to a rise in money supply over the period concerned (1950-91).¹⁸

It may again be interpreted in the following way with reference to the equation (4.4). Since $y_t = Y_t - Y_p$, the variation in output level represents the variation from its capacity level. This variation seems to be positive so long as money supply rises. Thus, increase in money supply leads to a rise in output level over its capacity level, or the long-run trend level over the period of our study.

4.6 SOME RELEVANT ISSUES :

It may be noted that the estimated equation represents the variation of output level to change in overall money supply. This money supply has two parts - (1) the anticipated and (2) un-anticipated or surprize part. Consequently we face an immediate question - which part of money supply is responsible for the observed variation in output level? This needs further investigation. The next chapter is devoted to address this issue.

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18. The purpose of estimation is not to test causality and Econometric Exogeneity. We are not seeking to know if money supply caused income growth. It is an attempt to see if variations in output level could be explained through variation in money supply. Sim's approach, therefore, has not been adopted in the study.

It may again be noted that Sim's approach has tacitly been undertaken into consideration while formulating the capacity income (Y_p). In many works capacity income is defined as Y_{t-1} and in such case the variation in Y_t over Y_{t-1} is the object of study.

The stationary or capacity income as defined in our study tacitly involves the case of Y_{t-1} and therefore, tacitly in conformity with Sim's Approach.

$Y_t \Rightarrow$
(Thousands)

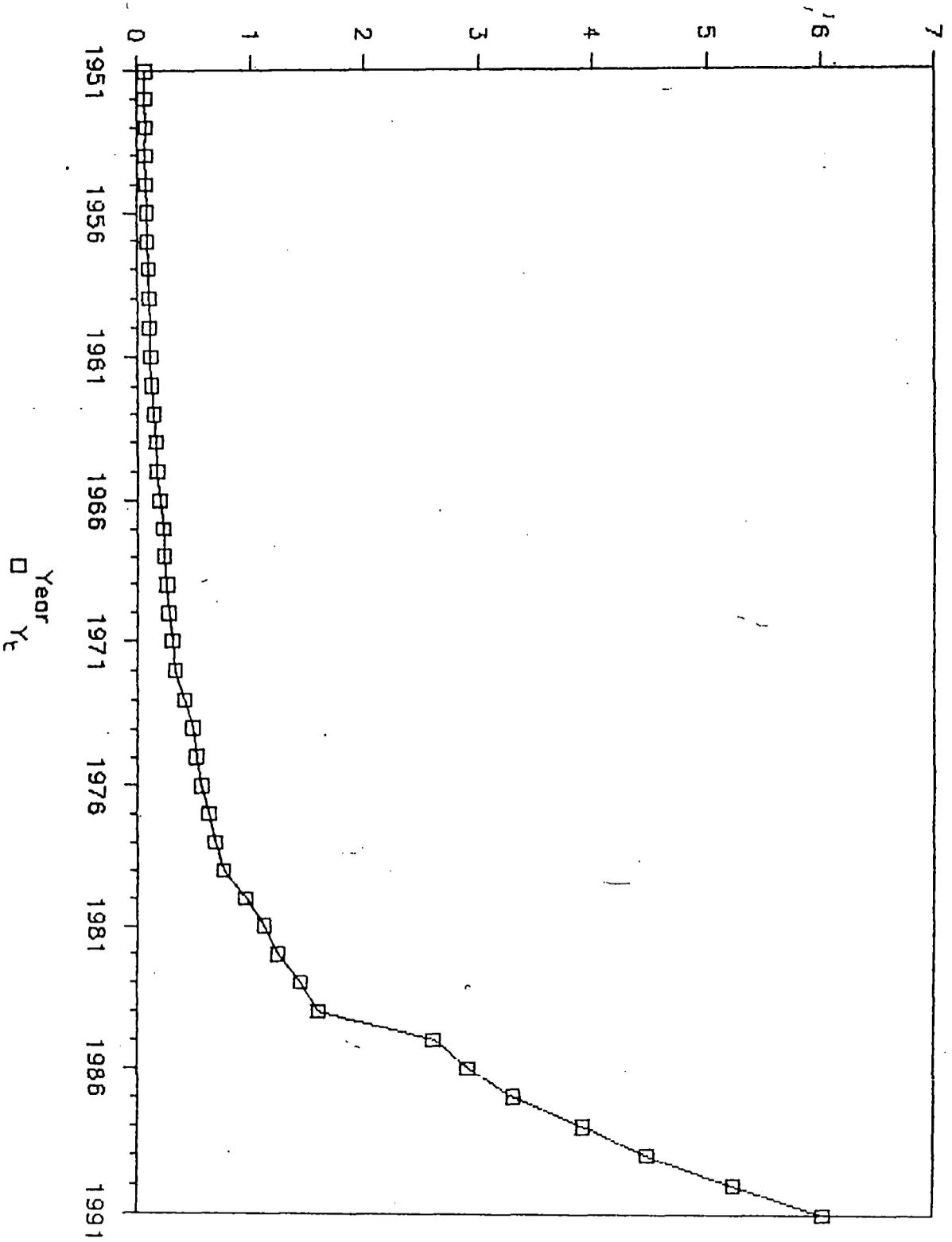


Fig. 4.1

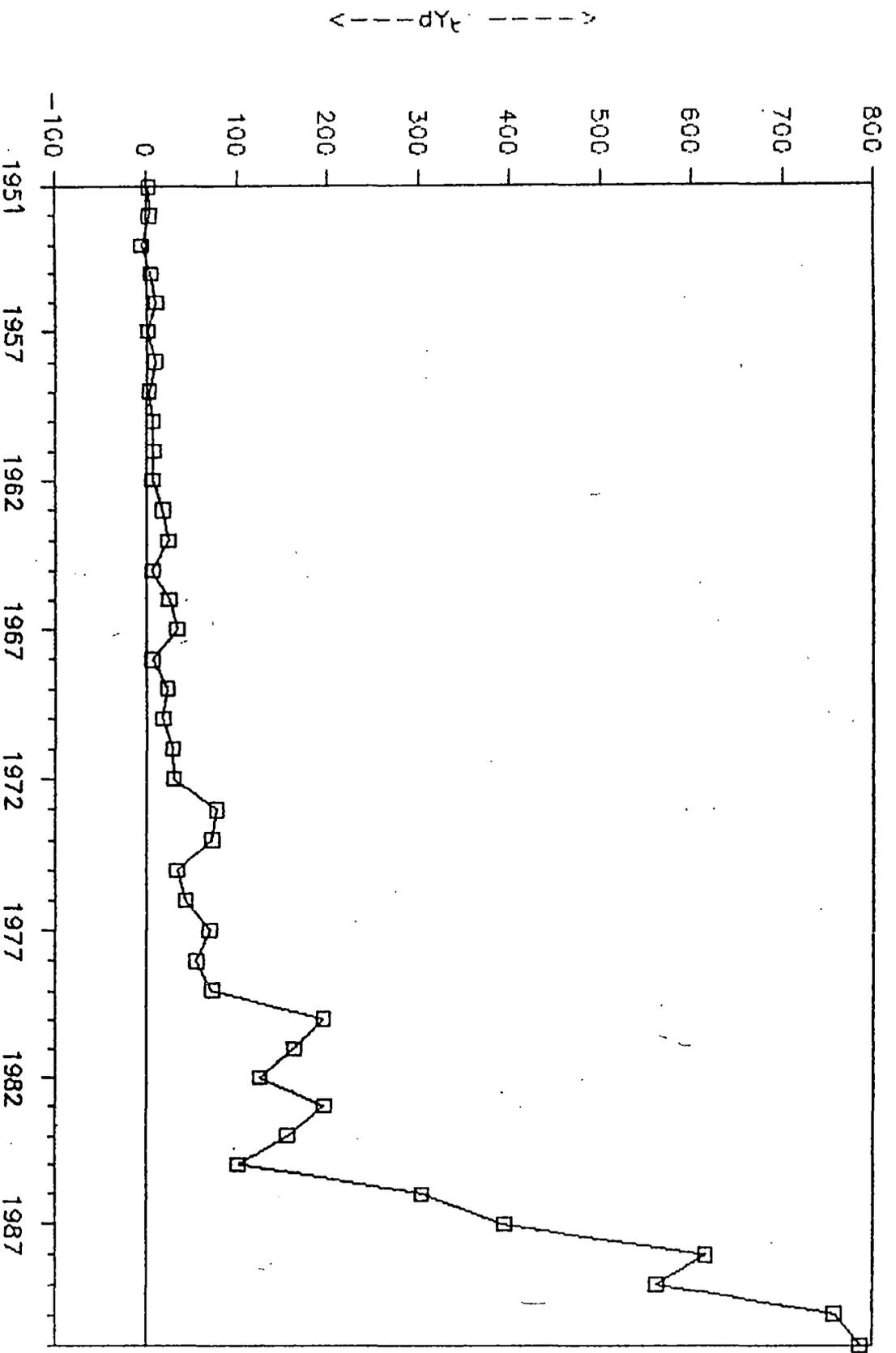


Fig. 4.2

TIME PLOT OF G N P (Y) AND MONEY SUPPLY (M)

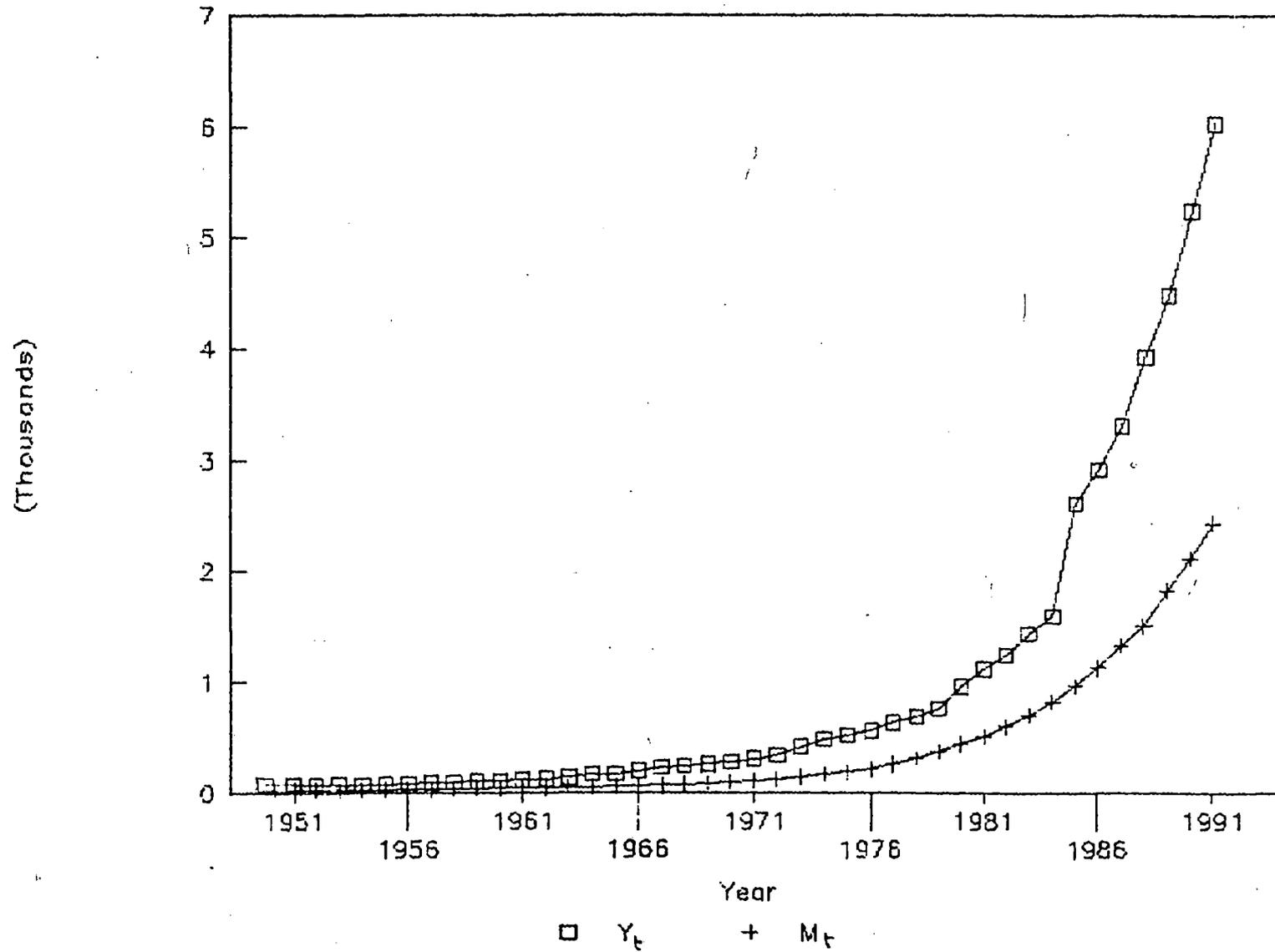


Fig. 4.3

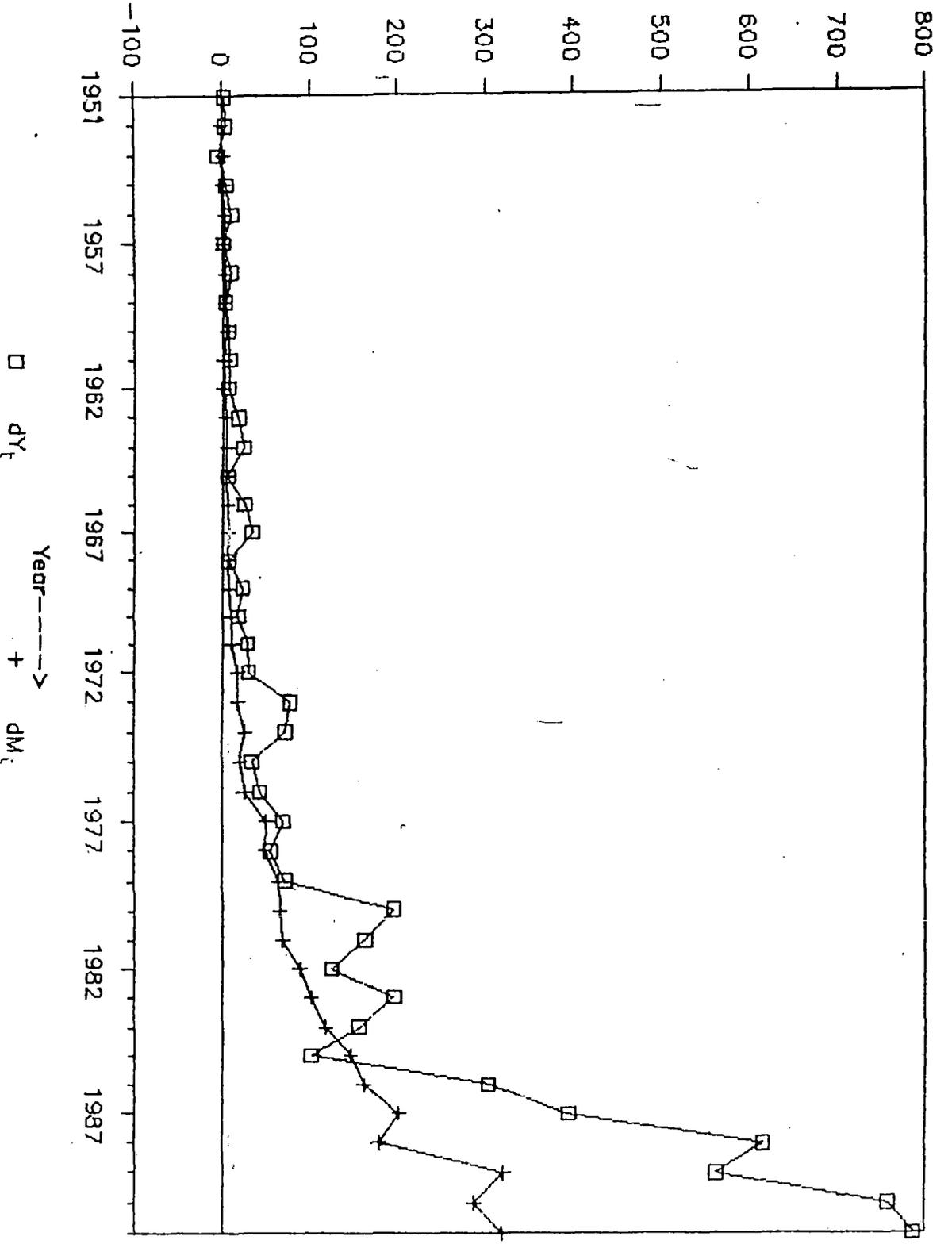


Fig. 4.4