SECTION - I I I

AN EMPIRICAL ANALYSIS

C H A P T E R - 6

M E T H O D O L O G Y

6.1.0 SAMPLING :

Sixty firms were drawn from the 251 private giants published in the Economic Times of 7th April 1983. For the present study only large scale firms were chosen because the nature of the problem studied is such,the behaviour of larger firms would be more relevant and useful. The basic problem with the smaller sized firms is that their accounting and other data processing systems are not as standardised as required for the present study. Not only Cyert and March who formulated their Behavioural Theory ofthe Firm from a case study of a large departmental store but also others' studies had chosen their samples only from the larger firms.

The sample firms were selected according to the purposive stratified sampling method. On account of time,budget constraints and convenience only those firms whose headquarters

are situated in Calcutta,Madras and Coimbatore cities were selected. Sixty firms were contacted for the purpose. A number of firms had to be eliminated on account of (i) non-availability of data for the entire study period,(ii) unwillingness on their part to cooperate in providing the requisite data. Ultimately the sample size settle at thirty five,the industrial composition of which is given in Table-6.1.

Table-6.1 : Industry composition of sample firms.

Industry	Number of firms in the sample of 60	Number of firms in the finally selected 35
Engineering	21	13
Textiles	7	3
Cement	1	1
Paper	3	2
Sugar	1	1
Chemical	6	3
Jute	3	2
Electrical	2	-
Miscellaneous	14	8
Total	60	35

The other studies like this had also to be satisfied with a sample size like this only; (For example Cyert and March (1963)-one firm, Schiff and Lewin (1968)-three firms,and Monsen et al (1968)-thirty six firms).

The present study used two types of data for analysis : (i) quantitative data collected from the annual reports of the firms,and (ii) qualitative data based on interviews with the senior executives with the help of a questionnaire and / or direct conversation. The quantitative data used is for a period of ten years from 1970 to 1983 as most of the firms do not keep records for a longer period. The other studies by Brooks and Buckmaster (1976),Monsen et al (1968) and Amihud et al (1983) were also based on data for a period of 9 years,12 years and 15 years respectively.

6.1.2 HYPOTHESIS :

The primary hypothesis of this study,as explained earlier already :

> "Economic Leverage is deliberately created and managed with the intention of giving stability or smoothness to the performance of the firm measured by income streams,"

is tested by thepresence of smoothing behaviour in income streams,because,the ultimate consequence of the creation and management of Economic Leverage will smoothen the incomes via total costs.[1]Besides the impact of the size of the firm on the amount of Economic Leverage was also tested.

6.2.0 TEST DESIGN :

6.2.1 The Time-Trend Model :- The Time-Trend model was used to test the presence of smoothing of income streams behaviour of the firm. The model consists of the following steps :

(i) the time series of the observed Y was detrended by

$$Y_{it} = a_1 + a_2 T + e_1 \qquad (1)$$

where Y represents the 'performance variables' or the smoothing object;T is the time variable,e_1 is the random variation of Y from the time trend or smoothed line which the management is supposed to follow,a_s are parameter coefficients.

(ii) Similarly the time series of the observed EL, Economic Leverage,variable were detrended by

$$EL_{it} = c_1 + c_2 T + e_2 \qquad (2)$$

where EL is the Economic Leverage variable,e_2 is the deviation from the trend or smoothed line,c_s are parameter coefficients.

(iii) The deviations e_s of equations (1) and (2) were tested for smoothing behaviour. If the above trend Y were associated with above trend EL value, or if below trend Y were associated with below trend EL value then the behaviour of smoothing of Y series would be indicated.[3]

(iv) The correlation between error terms of the 'performance' variables (e_1) and those of Economic Leverage variables (e_2) as explained above has been computed and summarised in Table-7.1 in Chapter-7. Instead of giving 7 x 21 x 35 correlation coefficients we have presented only the number of firms in whose case the correlation has been found to be significant.

The following other statistical and econometric models were used in processing data.

1. Linear trend line estimated by least square method. The model was

$$y = a + \beta x$$

a and ß are parameters; x is the independent variable time ; y is the dependent variable.

2. Simple correlation coefficient. The formula was

$$r = \left(\Sigma(x_i-\bar{x})(y_i-\bar{y})\right)/\left(\Sigma(x_i-\bar{x})^2\right)$$

$\bar{x} = (\Sigma x_i)/n$; $\bar{y} = (\Sigma y_i)/n$; n= number of observations

6.2.2 Exponential smoothing models[4] :

First Order :-

$$y_j = a.y_{j-1} + 1-a.y_{j-2}$$

Second Order :-

$$s = a.y_{j-1} + 1-a.y_{j-2}^2$$

$$y_j = (2+(a.j)/(1-a).y_{j-1})-((1+(a.j))/(1-a)).s$$

Third Order :-

$$s1 = a.y_{j-1} + 1-a.y_{j-2}^2$$

$$s2 = a.s1 + 1-a.y_{j-2} \quad .3$$

$$p1 = (6(1-a)^2+(6-5a(a.j))).(y_{j-1} /(2(1-a)^2))$$

$$p2 = (6(1-a)^2+(2(5-4a).a.j)+(2.a^2.j^2)).s1/(2.1-a^2)$$

$$p3 = (2.1-a^2+((4-3a).a.j)+a^2.j^2).s2/(2.1-a^2)$$

$$y_j = p1-p2+p3$$

6.3.0 STATISTICAL DESIGN :

Correlation coefficient was tested for significant positive sign using a t-test. The t-statistic was computed to test the null hypothesis that r is distributed symmetrically about $\bar{r}=0$ against the alternative hypothesis $\bar{r}$ 0.The null hypothesis is :

$$H_o : r = p(t^{\S}>t) = p(t^{\S}<t) = 0$$

The alternative hypothesis is :

$$H_1 : r = p(t^{\S}>t) > p(t^{\S}<t) \neq 0$$

3. Simple linear regression model.

$$y = \hat{a} + \hat{\beta} x + \hat{e}$$

$$\hat{a} = \bar{y} - \hat{\beta} \bar{x}$$

$$\hat{\beta} = (n \Sigma xy - \Sigma x \Sigma y)/(n\Sigma x^2 - (\Sigma x)^2)$$

4. Multiple linear regression model.

$$y = x.\hat{\beta} + e$$

$$\hat{\beta} = (x'x)^{-1}x'y$$

$$e = y - x\hat{\beta}$$

where y is a vector of dependent variable of 1 x k order, x is a matrix of independent variables of k x n order, ß is a vector of parameter coefficients of 1 x k order.

$e'e = (y-x\hat{\beta})'(y-x\hat{\beta})$ = unexplained variation

var-cov $(\beta) = \sigma^2(x'x)^{-1}$

$\hat{\sigma}^2 = e'e/(N-K)$

N=number of observations; K=number of parameters estimate

$S_i = \sqrt{\sigma^2(x'x)^{-1}}$ = standard error of the estimate i

$R^2 = (\hat{\beta}'x'y - N\bar{y}^2)/(y'y - N\bar{y}^2$

$\bar{R}^2 = 1-(1-R^2).((N-1)/(N-K))$

$t = (x\hat{\beta}-y)/S_i \sqrt{1+x(x'x)^{-1}x'})$

$F = (R^2/(K-1))/((1-R^2)/(N-K))$

where t is the theoretical t-value, $t^{\S}$ is the computed t-value. The higher the positive correlation between the deviations from the trend line the more intensive is the smoothing phenomenon. In this study correlation coefficients were used as an estimate of the maginitude of smoothing behaviour.

Similarly the significance of the coefficient of determinations were also tested by using an F-test. The F-statistic was computed to test the null hypothesis that R^2 is distributed symmetrically about $R^2=0$ aganist the alternative hypothesis R^2 0.

6.4.0 VARIABLES STUDIED :

CODE	VARIABLE
	PERFORMANCE VARIABLES (y_s)
y1	sales revenue
y2	gross profits
y3	net sales revenue
y4	net operating profits
y5	profits before tax
y6	profits after tax
y7	total income

ECONOMIC LEVERAGE VARIABLES (ELs) :

EL1 direct labour costs

EL2 administrative costs

EL3 selling costs

EL4 total operating costs

EL5 machanisation costs

EL6 office modernisation expenditure

EL7 research and development expenditure

EL8 inventory at all stages

EL9 investments in subsidiaries

EL10 total investment

EL11 staff and workmen welfare expenditure

EL12 public services expenditure

EL13 travel expenses

EL14 perquisites

EL15 deferred revenue expenditure

EL16 accounts receivables

EL17 advertising expenditure

EL18 remuneration to the managing directors

EL19 total manufacturing costs

EL20 commission paid to the managing directors and agents

EL21 net operating expenditure

OTHER VARIABLES (v) :-

v1 net worth

v2 equity capital

v3 total funds employed

v4 degree financial leverage

v5 financial leverage

v6 net profit margin

v7 net return on assets

v8 operating profit margin

v9 return on worth

v10 y7-y6

v11 y2-y6

v12 gross block

Accounts receivables (EL16) was considered for the quickness and delays in collecting dues which is considered to be an Economic Leverage variable. Average collection period was found out by dividing the average balance of accounts receivables by average daily net sales. Average daily net sales was obtained by dividing the annual net sales by 360 days. Expenditure on machineries was considered as a proxy for machanisation (EL5).

N O T E S

1. Because most of the Economic Leverage variables involve accounting costs.
2. Data were converted into tens of thousands of Rupees.
3. This is based on Amihud et al's (1983) model.
4. Data were converted into millions of Rupees.