DATA BASE AND METHODOLOGY

Present study is an investigation of the “Investment climate and industrial Efficiency: An Analysis of Punjab and Haryana”. In this chapter, an attempt has been made to discuss the scope of the study, sources of data, limitations of data, underlying variables and the methodology used for the analysis.

Scope of the study

The organizational pattern of the firms, in Indian corporate sector, on the basis of their ownership suggests that under collective ownership, Joint Stock Companies assume added importance. According to Shetty (1971), “the private corporate sector in India is understood as the totality of privately owned Joint Stock Companies engaged in any business activity, partnership and sole proprietary concerns are thereby excluded, although such undertakings are fairly important in the economy.”

Present study is confined to 180 firms, out of which 90 firms are of Punjab and 90 are of Haryana. The firms satisfy the following conditions:

- Firms, which are quoted, on the Bombay Stock Exchange Directory, Bombay.
- Firms, which continued to fulfill the above conditions for the period of 1993-2007.
- Firms, which are mainly engaged in major industrial groups, are chosen.

Almost all the firms (180), related to chosen industrial groups, which continued during the fifteen years of the study period were selected. The fifteen years period is fairly a long one, to indicate the general tendencies. No doubt a still longer period would have given us still more reliable and satisfactory results, but the difficulty, in getting a sufficiently large number of firms, constituted the major impediment in the selection of longer period.

The firms examined in this study tend to be important in analyzing the corporate growth behavior because these firms find it convenient to gain access to the capital market to finance their growth. Access to capital market also implies a wider distribution of share ownership than would be found in a non-quoted firm. This is because; one of the requirements of listing on the stock exchange is that the shares and securities are not concentrated in few hands.
Data Source

For the desired analysis, time series data, for individual firm, for the period of 1993-2007 were required. The basic data for the analysis have been drawn from Prowess Database, and various reports of Center for Monitoring Indian economy (CMIE) and Confederation of Indian Industry (CII). Prowess database contains information for about 10,000 companies. The coverage includes public, private, corporate and joint sector companies. Approximately, the coverage of this database is 70 percent of the economic activities of the country. Information available includes data from companies, balance sheets, profit and loss statements and also flow fund accounts.

Limitations of the data

The financial statements (i.e. balance sheet and profit and loss accounts) convey an impression of completeness, accuracy and finality. These are however, not absolute realities and are subject to certain limitations. These statements are not complete and accurate because these are essentially an interim reports and flow of income and cost transactions is cut off artificially at each balance sheet date. These statements are not final because the ultimate profit or loss can be ascertained only in the liquidation of the company. Thus, these statements involve personal judgments and bias mainly in the matters of depreciation and stock value etc.

Financial statements are expressed in terms of exact rupee amounts, which give an erroneous impression of accuracy. Transaction involving rupee values of many dates such as plant and machinery acquired at different price levels are aggregated together, as if they represent rupee of equal value. Since the rupee has been steadily depreciating in the recent years there arises the problem of under valuation and over valuation of different items in balance sheet, which makes the financial statements inexact and inadequate for comparison purposes. Assets are valued in balance sheet on a going basis concern. Fixed assets are shown as the historical costs less depreciation charged to the profit and loss statements in previous years on the basis of some accounting conventions. The resulting figures do not reflect either the current saleable value of the fixed assets or the amount to be expended to replace them. Thus, the financial statements do not necessarily indicate
the current economic realities. These considerations tend to make the financial statements inexact and inadequate for comparison purposes.

Further, financial statements do not record many factors which affect the financial condition and operating results of an enterprise, because these cannot be stated in terms of money. Amongst these, we can include the credit rating of the company and its reputation and prestige with public. Management is one of the most significant and least tangible of all the factors. The record of the management in control, its competence, and its outlook are important considerations which must be taken into account, in analyzing and interpreting financial statements.

Another important shortcoming of the available data is of the accounting years of the selected firms. Some firms in our study closed their accounts on 30th June whereas; majority of the firms closed their accounts on 31st March. Although, the defects or limitations discussed about data are important but these need not vitiate the significance of data for our purpose. The important feature of valuation convention is that they all work in the same direction either over valuation or under valuation. The length life of fixed assets, for example, is an important factor determining the average age of assets and therefore the degree of error in historical cost valuation is likely to depend on the technology of the industry.

Similarly, the differences in the accounting years, were no more a problem for us, because, we have taken the data for all the variables of each firm, for full fifteen years on annual basis, irrespective of the firms closing their accounts on 31st March or on 30th June. So, this is the best information available and can explain economic variables, better than the information available from the actual decision makers.

The Variables

An attempt is made here to define various economic and financial variables of the selected firms, used in the study. In all 10 variables were calculated for each firm for both the states (Punjab and Haryana) and details are as follows:

Gross sales

It is a measure of overall sales that is not adjusted for customer discounts or returns calculated simply by adding all sales invoices and not included operating expenses, cost of goods sold, and payment of taxes or any other charge. It is calculated by summing up all sales at invoice values, neglecting any adjustments such
as customer discounts, excise taxes or returns. In other words, these are the overall sales of a franchise not including expenses cost of goods sold, payment of taxes or any other expenses.

**Gross Fixed Assets**

Gross fixed assets refer to total assets of firm which are held for the purpose of providing or producing goods or services and those that are not held for resale in the normal course of business.

It is flow value. It is usually defined as the total value of additions to fixed assets by resident producer enterprises, less disposals of fixed assets during the quarter of year, plus additions to the value of non-produced assets (such as discoveries of mineral deposits or land improvements). The main asset types are plant and machinery, equipment, vehicles, land improvements and buildings. Some important assets are typically excluded from the official measure of gross fixed assets. These include armaments and military installations, the value of repair work, the value of standing timber, arm animals, and durable household equipment.

It is called “gross” because the measure does not make any adjustments for the depreciation of assets. In some ways, this terminology is confusing, because, in substance, the aim is to measure the value of the net additions to the fixed capital stock. In other words, it is the net capital formation that is of interest. Accidental damage and destruction is disregarded in the valuation, but tax levies and acquisition fees are included in gross fixed assets. So it is the “all-up” costs of fixed investment that are being measured.

**Depreciation**

Depreciation is a non- cash expense that reduces the value of an asset as a result of wear and tear, age or obsolescence. The gradual reduction of an asset value is often effectively a tax write-off, that a person or company usually enjoys over his /her/its taxable income by the amount of depreciation on the asset.

**Borrowings**

This means, to receive money from another as a loan, with the implied or expressed intention of returning the identical article or its equivalent in kind. Borrowings are made by a firm to fulfill their credit requirements. A firm can borrow
from local commercial banks, foreign banks, and also from the financial institutions etc. Money borrowed usually is in the form of long term loans.

**Interest**

Interest is used for the payment made for the use of money capital for a specified period. Thus, it is a charge made for the use of borrowed money levied as a percentage of the amount of the debt and on services of capital for the production of goods.

**Net Profits**

Net profit is called pure profit. In order to estimate net profit, deduction is made of implicit costs or depreciation and insurance expenditure from gross profit. Thus, the residue that an entrepreneur gets after deducting implicit costs of his own factors from gross profit is called net profit.

\[
\text{Net Profit} = \text{Gross Profit} - \text{Implicit Costs}
\]

Net profit is calculated by subtracting a company’s total expenses from total revenue, thus showing what the company has earned (or lost) in a given period of time (usually one year) also called net income or net earnings. Net profit is the amount of money earned after all expenses, including overhead, employee salaries, manufacturing costs and advertisement costs, having been deducted from the total revenue.

Net profit is equal to gross profit less all expenses such as costs of goods sold, selling expenses, tax, and interest on borrowings.

**Tax provision**

It is a fee charged by a government on product, income or activity. If tax is levied directly on person or corporate income, then it is a direct tax. If tax is levied on the price of good or service then it is called indirect tax. In general a tax is defined as levy or other type of financial charge or fee imposed by central government on legal entities or individuals.

**Raw material costs**

Raw material is something used by human labor or industry as a building material to create some product or structure. An income statement figure reflects the
cost of obtaining unfinished goods consumed by a manufacturer in providing finished goods.

**Power or energy cost**

It is the amount of energy consumed in the process or system or by an organization or society. It is the use of energy as a source of heat or power as a raw material input to the manufacturing process.

**Marketing and Advertisement costs**

Marketing or selling costs include all costs necessary to secure customer order and get the finished product in the hands of the customers.

These costs are also called order getting or order filling costs. Advertisement expenses is a category included in financial accounting to represent expenses associated with promoting an industry, entity, brand, product name or specific product or services in order to stimulate a desire to buy the entity’s products or services. Marketing costs or selling costs include advertisement costs, shipping costs, sales commission and salesman's salary.

**Methodology**

In this section, it is intended to briefly outline the various statistical and econometric techniques employed in the study.

**Growth Rate**

To estimate the compound growth rate of various variables, the following model was used:

\[ Y = AB^t e^u \]

Or

\[ \log Y = \log A + t \log B + U \]

Where \( Y \) is the value of dependent variable,

\( t \) is the time variable,

\( A \) and \( B \) are constant

\( e^u \) is the error term

\[ r = (B^{-1}) \times 100 \]

\( r \) is the compound growth rate of \( Y \).
**Factor Analysis**

To measure investment climate of both the states, an effort is made to develop a composite index of investment climate by applying factor analysis. To examine, the contribution of different variables in making the investment climate business friendly, factor analysis were used. In factor analysis, a given set of n variables is grouped in to p number of groups called ‘Factors’ which are less in number than the set of original variables. The variables within a group (factor) are of the same nature or are complementary with respect to the phenomenon under study but between two groups ‘Factors’ variables are independent. Thus factors F₁ and F₂ are orthogonal. The data was first normalized using Nagar - Basu (2002) methodology. The selected variables were normalized by subtracting the minimum value of the particular variable from the actual value and dividing it by the range, which is the difference between the maximum and minimum value of the selected variables. The formula is given below:

\[
Z_{ij} = \frac{\text{Actual value}_{ij} - \text{Minimum value}_{ik}}{\text{Maximum value}_{ik} - \text{Minimum value}_{ik}}
\]

Where \(Z_{ij}\) = Normalized value of \(i_{th}\) variable for \(j_{th}\) year;

\[i = \text{variable;}
\]
\[j = \text{year;}
\]
\[k = \text{specific value.}
\]

The technique of factor analysis, as used in the present study, is given as under:

\[X = LF + U\]

Where \(X\) is vector of all the original variables.

\[X' = [X_1, X_2, X_3, \ldots, X_n]\]

\(F\) is vector of ‘Factors’ derived.

\[F' = [F_1, F_2, F_3, \ldots, F_p]\]

\(U\) is vector of error terms.

\[U' = [E_1, E_2, E_3, \ldots, E_n]\]
And $X'$, $F'$, $U'$ are the respective transposes.

L is matrix of factor loading (Loading Coefficient Matrix)

\[ L = \begin{pmatrix}
  a_{11} & a_{12} & a_{13} & a_{14} & \cdots & a_{1p} \\
  a_{21} & a_{22} & a_{23} & a_{24} & \cdots & a_{2p} \\
  a_{31} & a_{32} & a_{33} & a_{34} & \cdots & a_{3p} \\
  \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\
  a_{n1} & a_{n2} & a_{n3} & a_{n4} & \cdots & a_{np}
\end{pmatrix} \]

The coefficient (Factor Loading) $a_{ij}$ belongs to $i^{th}$ variable and $j^{th}$ factor which is similar to simple correlation coefficient and shows the extent to which variable $x_i$ is related to $F_j$ factor. “A Salient loading is one which is sufficiently high to assume that relationship exists between the variable and the factor. In addition, it usually means that relationship is high enough so that the variable can aid in interpreting the factor and vice-versa.” (Gorsuch, 1974).

The sum of the square of factor loadings of $x_i$ original variables under the derived P factors is called the communalities ($c_i$) for $x_i$ variables.

\[
(a_{i1})^2 + (a_{i2})^2 + (a_{i3})^2 + \ldots + (a_{ip})^2 = (c_i)^2
\]

Communality in Factor analysis is something like $R^2$ in the regression analysis and it shows the extent to which the derived factors explain the $i^{th}$ variables. Derived communality value generally should be larger (more than 70 percent) to be sure that each variable can be explained well. By definition, the communality of a variable is that proportion of its variance which can be accounted for the common factor (Lindeman et.al, 1980).

The Principal Component Analysis (Factor analysis) produces components (Factors) in descending order of their importance and Factor loadings which explain the relative importance of different variables in explaining variance in the phenomenon. In this study, all the Principal Components (Factors derived) are taken in to account to determine the relative weights of selected variables so as to reflect the maximum possible variations in the investment climate. The method for determining the relative weights for the variables is explained below:
\[ W_i = F_{ik} \lambda_k \]
Where, \( W_i \) = weight of \( i^{th} \) variable

\( F_{ik} \) = factor loading of \( i^{th} \) variable and \( K^{th} \) factor which reflects the highest correlation between variable \( (X_i) \) and Factor \( (F_k) \).

\( \lambda \) = variations explained by \( K^{th} \) factor

**Composite Index**

The statistical technique employed to develop the weighted composite index involves finding out the “Principal Components” of the groups consisting of the selected 10 variables and derive the implicit weights based thereon. The composite index is then constructed by combining various indicators whose implicit weights are already determined through the technique of ‘Principal Component Analysis’ (Haggod, 1943), Aldeman and Morris, (1967).

\[ \frac{W_i Z_{ij}}{W_i} \]
Composite index for \( i^{th} \) year = \[ \frac{W_i Z_{ij}}{W_i} \]
Where \( Z = \) Normalized value of the \( i^{th} \) variable for the \( j^{th} \) year

\( W = \) Weight of the \( i^{th} \) variable

**DEA**

Data Envelopment Analysis is a non-parametric technique that converts multiple inputs and output variables into a single comprehensive measure of productivity. This is done by linear programming, which constructs the frontier technology from data.

Data Envelopment Analysis involves the linear programming methods to construct a non-parametric mathematical approach to frontier estimation. The DEA is a special mathematical linear programming model and test to assess efficiency and productivity. It allows use of panel data to estimate changes in total factor productivity and breaking it down into two components namely, technological change (TECHCH) and technical efficiency change (EFFCH). In the present study the output-oriented model of DEA-Malmquist is used to put much weight on the expansion of output quantity out of a given amount of inputs. Malmquist index measures the total
factor productivity change (TFPCH) between two data points over time, by calculating the ratio of distances of each data points relative to a common technology. In the present study, we considered only one output and two inputs at constant prices. Using appropriate price deflators all monetary data has been deflated.

Fare et.al (1994) specifies the Malmquist productivity change index as:

\[ m_o (Y_{t+1}, Y_t, X_t) = \left[ \frac{d_o^{t+1}(Y_t, X_t)}{d_o^{t+1}(Y_{t+1}, X_{t+1})} \times \frac{d_o^{t+1}(Y_t, X_t)}{d_o^{t+1}(Y_{t+1}, X_{t+1})} \right] \]  

(1)

The above equation represents the productivity of the production point \((X_{t+1}, Y_{t+1})\) relative to the production point \((X_t, Y_t)\). This index uses period \(t\) technology and the other period \(t+1\) technology. TFP growth is the geometric mean of two output based Malmquist TFP-indices from period \(t\) to period \(t+1\). A value greater than one will indicate a positive TFP growth from period \(t\) to period \(t+1\), while a value lesser than one will indicate a decreases in TFP growth or performance relative to the previous year. The Malmquist index of total factor productivity change (TFPCH) is the product of technical change (TECHCH) and technical efficiency change (EFFCH) as expressed (Cabanda, 2001):

\[ TFPCH = TECHCH \times EFFCH \]  

(2)

Malmquist productivity index can be rewritten as:

\[ m_o (Y_{t+1}, X_{t+1}, Y_t, X_t) = EFFCH \times TECHCH \]  

(3)

Technical efficiency change (Catch-up) measures the changes in efficiency between current \((t)\) and next \((t+1)\) periods, while the technological change (innovation) captures the shift in frontier technology.

**Regression Analysis**

Linear regression equations were fixed by regressing dependent variable on each of the independent variables separately.

\[ Y = a + bx + u \]

Where \(Y\) is dependent variable

\(X_i\) is independent variable

\(U\) is the disturbance term
The statistical significance of the estimates of ‘b’ was examined by applying t-Test and $r^2 / R^2$ was computed to see the percentage variations in the dependent variable explained by a particular independent variable. Beside these major statistical techniques other statistical tools like ratios, percentages, averages etc. were used and results have been interpreted accordingly.