Chapter 4

ASSESSING CREDIT WORTHINESS OF FIRMS

--- CONCEPTS AND METHODOLOGY

Introduction

There is need to bring credit risk analysis within a theoretical framework. It is argued that such a requirement may be met by integrating credit risk analysis into the mould of growth models. In this chapter, we attempt this integration by building a multivariate model of firm growth, in which the ‘ability to pay’ of a firm, that is, its credit worthiness, is explained by the marginal productivity of loan in terms of the growth in assets.

Growth of a firm is nothing but a change (increase) in its size. Therefore, we need to have a measure of size in order to perform a growth analysis. We discuss the size concept in the context of our study before moving on to explain the data and variables used in the study. Then we discuss the methodology adopted and formulation of the model also.

Size Of The Firm.

There are conceptual problems associated with the measurement of corporate size and its interpretation. Measures of size often adopted in studies of corporate growth have been assets, sales, employment, equity, profits etc. “Studies of Hart and Prais (1956) and Bayes(1965) showed that alternative measures of firm size were highly correlated, which was thought to be an ample justification for the interchangeability of alternative measures” (Prem Kumar, 1985, p:28). In general, researchers have used that measure of size which seemed appropriate for the purpose of their study.

In this study, total net assets is taken to be the measure of size. This is because our purpose is to examine the inter-relationship between the firm’s credit worthiness and its use of the economic and financial resources available to it. Our concern is to examine how a firm utilises its resources to keep itself creditworthy in the view of the lender. Profit does not seem a suitable indicator because it is volatile and may even be
negative. A firm is capable of meeting its payment obligations even when it does not make a profit, as long as the loss does not wipe off its entire net worth (Net Worth = Paid up capital + Total Reserves and Surplus - Accumulated Losses). Thus, the appropriate measure of size for our analysis is the total net assets. We have used the balance sheet value of total assets. It includes current assets, net fixed assets, investment in subsidiaries, miscellaneous assets and intangible assets.

A limitation of the use of assets as a measure of size largely arises from the fact that the valuation of the fixed asset component in it, typically done at cost, may be unrealistic. During the period of inflation, this would mean over estimation of the creditworthiness of the firm. However, for lack of a more appropriate measure of size in the context of the present analysis, we use total (net) assets as the measure of size.

**Sample And The Data**

For our analysis, we have chosen a total of 174 firms both in the private and the public sector which belong to the two industry groups. They are that of fertilisers and pulp & paper. The list of firms was made following the industry classification by CMIE. The firms that were considered in the study were more or less large in size within the particular industry, viz., fertiliser and pulp & paper. We have analysed the growth and creditworthiness of firms for the period from 1988 to 1998. In order to ensure the availability of complete time series, we selected only those firms which had been incorporated prior to 1987. There were 56 firms in the fertiliser industry and 118 firms in the pulp and paper industry. The relevant firm level data consisting of balance sheets and profit and loss statements for the period considered in our study was collected from various volumes of the Bombay Stock Exchange (BSE Directory). In addition to this, various CMIE documents, RBI’s Report of Currency and Finance, were consulted.

**Methodology**

We discuss the methodology in two parts: In the first part, analysis of the growth and in the second part, an assessment of the creditworthiness of firms is discussed.
We need to investigate the growth process of firms in detail and we attempt to do this by developing a multivariate model of growth. Growth theory literature guides us in selecting a large number of variables that are significant from the growth perspective. We discuss the variables below:

1. **Net Profit to Total Asset:** The growth of a firm depends much on the profitability of its operations. In the long run, unless a firm generates enough profits, its growth cannot be sustained. The ratio of net profit to total assets measures the overall profitability and efficiency of an enterprise and reflects the productivity of the total resources employed by the firm.

2. **Return on Capital Employed:** This ratio gives the net return on the total capital employed by the company. It is calculated as the ratio of (interest + Net Profit) to (Net Worth + Debentures + Long-Term Finance + Loans and Advances) X 100. It is a good indicator of the efficiency with which the funds available with the company are put to use and captures the efficiency of financial management by the firm, which is very vital from the growth perspective.

3. **Growth of Sales:** Net sales effectively captures the volume of a firm's transactions. It is important because it reflects the demand conditions faced by the firm. Growth of the firm is constrained to a certain extent by the growth in the demand for its products. Also, the net earnings in the future as well as the long run survival of the firm are both a function of the growth in net sales. Thus, it is a figure of central importance in growth analysis.

4. **Turnover Ratio:** We have considered two measures of turnover ratio. One is the ratio of the net sales to total assets and the other is the ratio of net sales to (net worth + debentures). The former measures the relationship between the volume of sales generated and the assets of the firm while the latter measures the relationship between the volume of sales and the total funds employed. Both indicate operational efficiency.

5. **Capacity Utilisation:** growth of a firm is closely linked with its capacity utilisation. Firms with higher capacity utilisation are expected to show a higher rate of growth than those with lower capacity utilisation. Although of high relevance, this
variable could not be included in the analysis because of non-availability of firm level data.

6. **Inventory to Total Assets**: Inventory consists of goods held for sale or in the process of manufacturing, raw materials, semi-finished and finished goods. An excessive build-up of inventory will be captured in a high ratio of inventory to total assets and reflects adverse demand conditions faced by the firm. *A priori* it is expected to have a negative relationship with growth.

7. **Growth of Reserves**: Reserves are an important source of internal finance for companies and should have a positive relationship with growth.

8. **Retention Ratio**: This is the ratio of retained profits to total assets. Retained profits is again a major source of finance for the firm and helps in its expansion plans.

9. **Liquidity**: This is defined as the ratio of current assets to current liabilities and is a measure of the liquid assets available to the firm to meet its current payment obligations. It is included to study the effect of the liquidity on the growth rate of the firm.

10. **Net worth to Total Assets**: This ratio gives the percentage of assets financed by the share holders. The higher the ratio, the stronger the financial structure of the company and greater the edge it has over other firms for external financing. This is because creditors would favour those firms which are not already heavily borrowed. This has crucial implications for the growth prospects of firms especially during periods of liquidity crunch in the economy.

11. **Loans and Advances**: This variable shows the amount of short term bank borrowings by the firm and is a major component of its current assets. The working capital requirements of a firm to the extent it is borrowed, are largely met by bank borrowings and therefore is crucial to the smooth running of the firm in every period.

12. **Long Term Finance**: This is an intimate relationship between expansion and growth of the firm and the long run finance available to it. This variable is defined as the ratio of (debentures + long term loans) as a percentage of the total assets of the
Firms rely more on long term finance for financing expansion and diversification. It is the most crucial element in the firm growth analysis.

13. **Diversification:** The extent of diversification holds a major key to the expansion activities of a firm. Diversified firms are likely to have a better growth performance because they are able to offset an adverse growth rate in one market against a good performance in another. In fact, diversification is the route by which Penrose and other growth theorists argue that firms can overcome the demand constraint to growth in any one market. We have included this variable by taking the number of two digit products a firm produces.

14. **Market Share:** Market share of a firm reflects its power and standing in the market. It is calculated for each firm by dividing the total (net) sales figure of the firm by the total industry output.

15. **Wages to Sales:** Growth theorists have, throughout their argument on growth objective, emphasised the relationship between corporate growth and the salary status, power and security enjoyed by the management personnel in a firm. The greater the association between the pecuniary and non-pecuniary rewards enjoyed by them and the growth of the firm, the higher the growth envisaged by them. The most suitable measure to study this relationship would have been the value of managerial remuneration. But as the required data was not available, we have taken the wages to key sales ratio as a proxy.

16. **Stock Market Valuation:** In theories of corporate growth, specially after Marris, there has been considerable interest in the stock market valuation of a firm. Marris explains in great detail how market valuation affects the expansion plans of a firm. Here, stock market valuation is defined as the ratio of the average market price per share to the book value per share. Following Marris’ argument on valuation and takeover threats, the variable should be negatively related with growth.

17. **Average Share Price:** This will indicate the firm’s standing in the stock market. “The movements in share prices determine to large extent, the firm’s ability to mobilise finance from the capital market for its expansion plans” (Prem Kumar, 1985,
p; 41). For each firm, the highest and the lowest share prices for each financial year is given in the Stock Exchange Directory.

18. **Dividend to Equity:** Another variable of interest with regard to the firm’s standing on the stock market is the dividend paid out to the shareholders. It reflects the management’s commitment to its investors.

19. **Tax Burden:** This is measured as the ratio of provision for tax to Profit Before Tax (PBT). Higher the tax burden, the lesser the profits which is available for retention and thus it will have a negative relationship with growth.

20. **Research and Development:** Most of the recent literature on growth stresses the importance of information, learning etc. The ability to process and evaluate information - which might lead to the development of new invention, a marketing technique or a more efficient organisation form – becomes a key determinant of the direction and size of diversification and expansion. However, this crucial variable had to be omitted due to non-availability of data.

21. **Advertising Expenditure:** The growth of a large firm also depends on its ability to shift its demand curve. One of the most important ways in which corporates achieve this is by increasing non-production expenditure – i.e., advertising and other selling expenditure, aimed at establishing brand names and creating exclusive markets. CMIE database provides this particular data.

22. **Age:** emphasis on age of the firm as an explanatory variable in the growth process of firms came up strongly in the life-cycle theory of the firm. Although its influence has been analysed in studies abroad, this factor has been totally neglected in Indian studies related to growth and performance of firms. This variable has been incorporated by taking the number of years of existence of the firm since its year of inception.

23. **Industrial Growth:** Growth of a firm is closely linked to the growth of the industry it belongs to. Firms in expanding industries are likely to record faster growth rates than firms in slow growing industries. The rate of industrial growth captures the overall demand conditions faced by the industry and thus by firms. The annual growth
rates in the group-wise Index of Industrial Production (IIP) has been considered as the industrial growth rate. This variable also captures the policy environment in the economy.

24. **Percentage variation in Price Level:** This Variable has been included to examine the influence of price instability on growth. Instability in prices implies greater uncertainty for the firm with regard to earnings and this affects their plans for expansion. It will have a negative relationship with growth. Percentage change in the general WPI as well as percentage change in manufacturing WPI has been considered for the purpose.

**The Model:**

In order to explain the growth of firms in India, the following general regression model has been formulated, incorporating the variables discussed above:

\[ CG = \alpha + \beta_1 LS + \beta_2 V_1 + \beta_3 V_2 + \beta_4 V_3 + \beta_5 V_4 + \ldots \ldots + \beta_{22} V_{21} \]

\[ + \beta_{23} Lg WPI + \beta_{24} Lg MPI + \varepsilon \]

where

- \( CG \) is current period growth rate
- \( V_1 \) is Net Profit / Total Assets
- \( V_2 \) is Retained Profit / Net Profit
- \( V_3 \) is Return on Total Capital Employed
- \( V_4 \) is Average Market Price / Book Value Price per Share
- \( V_5 \) is Growth of Net Sales
- \( V_6 \) is Inventory / Total Assets
- \( V_7 \) is Long-term Finance
- \( V_8 \) is Net Sales / Total Assets
- \( V_9 \) is Current Assets / Current Liabilities
- \( V_{10} \) is Provision for Tax / Profit Before Tax
\begin{align*}
V_{11} & \text{ is } \text{Net Sales (Net Worth + Debentures)} \\
V_{12} & \text{ is } \text{Growth of Reserves} \\
V_{13} & \text{ is } \text{Age of the firm} \\
V_{14} & \text{ is } \text{Market Share} \\
V_{15} & \text{ is } \text{Diversification} \\
V_{16} & \text{ is } \text{Industrial Growth Rate} \\
V_{17} & \text{ is } \text{Wages / Sales} \\
V_{18} & \text{ is } \text{Net Worth / Total Assets} \\
V_{19} & \text{ is } \text{Dividend / Equity} \\
V_{20} & \text{ is } \text{Average Share Price} \\
V_{21} & \text{ is } \text{Loans and Advances} \\
\text{Lg WPI} & \text{ is Logarithm of % change in General WPI} \\
\text{Lg MPI} & \text{ is Logarithm of % change in Manufacturing WPI}
\end{align*}

All variables on the right hand side of the equation are expressed in logarithm. Variables lagged by one period and two periods are also included in the analysis. However, due to the presence of correlation between variables, some of them were eliminated during the econometric exercise to avoid the problem of multicollinearity.

The general regression model given above was used to derive individual growth equations for each industry considered in the study. This follows an earlier exercise carried out by pooling the data for a period of 1988 to 1998 across all the sample firms within each industry.

For the purpose of validation test, the estimated coefficients in the derived industry growth equations were used to calculate the individual growth rates for the last year for which data is available for all firms in each industry and compared with their actual growth rates for the same year. Then, the Root Mean Square (RMS) Error of Forecast was calculated as follows:

\[ RMS = \sqrt{\text{Avg} (g_i - \hat{g}_i)^2} \]
where \( g_i \) is the actual growth rate for a particular year and
\[ \hat{g}_i \] is the estimated growth rate for the next year for which actual growth rate was found.

Further, the Relative Root Mean Square (RRMS) error of forecast was calculated as
\[ RRMS = \sqrt{\text{Avg} \left[ (g_i - \hat{g}_i)^2 / g \right]} \]

**Assessing Creditworthiness**

The growth rate of a firm, \( g \), is given by
\[ g = f(LS, V_1, V_2, V_3, \ldots, V_{21}, GWPI, GMWPI) + \gamma \ln \mu \quad (6) \]

Where \( LS, V_i \) are all independent variables in logarithm explaining growth other than the loan variable \( l \) and \( \gamma \) is the estimated coefficient (\( \beta_l \) in the original growth equation) of this loan variable, \( l \). Thus, \( \gamma \) is the marginal coefficient of measuring the productivity of loan finance, in terms of the rate of growth in assets.

The loan variable was defined as:
\[ l = \frac{(\text{Long-Term Loans} + \text{Debentures})}{\text{Total Assets}} = \frac{\text{Long-term Liabilities}}{\text{Total Assets}} \]

i.e., \( l = L / A \quad (7) \)
\[ \frac{dl}{dL} = 1 / A \quad (8) \]

Equation (6) gives us the incremental growth rate resulting from an incremental loan \( \Delta \mu \) as
\[ \frac{dg}{d\mu} = \frac{\gamma}{\mu} = \frac{\gamma}{A / L} \quad (from \ eqn. \ 7) \]

Therefore, \( \frac{dg}{dL} = (\frac{dg}{d\mu}) \cdot (\frac{d\mu}{dL}) = \left( \frac{\gamma A}{L} \right) \cdot \left( 1 / A \right) \)
\[ \therefore \Delta g = \left( \frac{\gamma}{L} \right) \cdot (\Delta L) \quad (10) \]

Now, the increase in assets resulting from an incremental loan \( \Delta L \) is \( A(g + \Delta g) \).

\[ \therefore \text{Marginal Increase in assets due to an incremental loan } \Delta L \text{ is given by} \]
\[ \Delta A = A \left( g + \Delta g \right) - A \ g \]
Let \( Q = \text{Interest Payment/ Loan Amount} \) be the interest payable on one unit of loan. Then if for a firm, the marginal growth in assets due to the additional loan is adequate to cover the interest payment due, then that firm can be creditworthy.

i.e., if \( \frac{A}{L} \gamma > Q \),

then the firm can be said to be creditworthy.

We calculated an Index of Creditworthiness "C" as \( \frac{A}{L} \gamma - Q \).

"C" was calculated for all firms and then this index was used for ranking all firms within each industry.

In the next chapter we take a look at the results of the exercise (discussed here) carried out for assessing credit worthiness of firms.