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# Determinants of Capital Structure: Evidence from BSE Sensex

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**ABSTRACT**

This study aims at to examine the determinants of capital structure of BSE Sensex companies. In nutshell the study concludes that the model's intercept is positive, but it lacks statistical significance. Among the independent variables, only DOL (Degree of Operating Leverage) and the measure of size based on tangible assets show significance. The majority of the other variables exhibit insignificance, with over half of them having negative coefficients. Despite this, the model's adjusted R-squared value of 0.843 indicates that it effectively explains around 84 percent variation in the dependent variable.

**Introduction**

Capital structure decisions rank among the most critical choices made by financial managers. They represent a significant and complex aspect of corporate finance. Determining the right balance between debt and equity in a company's capital structure is a matter of ongoing debate in the literature on this subject. Numerous researchers have delved into this domain, striving to ascertain whether an optimal capital structure exists that can enhance shareholder wealth. This optimal blend of debt and equity in a company's capital structure aims to maximize returns for shareholders while minimizing the cost of capital. The question of how to strike the right balance between debt and equity has consistently piqued the interest of researchers worldwide.

Several capital structure theories have provided guidance and inspiration for researchers worldwide. Our research paper primarily centers on two key theories: the pecking order theory and the trade-off theory. The pecking order theory posits that firms primarily utilize internal finances, followed by debt capital when seeking external financing. Equity, in this framework, is the option of last resort. In this context, a company's profits are typically distributed as dividends to equity shareholders. Nevertheless, firms retain the flexibility to reinvest a portion of their earnings as retained earnings for future growth and expansion. According to the pecking order theory, if a company requires funds, it will first turn to retained earnings as internal financing before considering debt and equity as external sources of capital. Figure 1 in our paper visually illustrates the sources of funds as outlined by the pecking order theory.

**Figure 1. Sources of Funds as per the Pecking Order Theory**

| *Retained Earnings (Internal) (1"Preferred Source)* | *Debt (External) (2" Preferred Source)* | *Equity (External) (Last resort)* |
|---|---|---|

In accordance with the pecking order theory, the concept of an optimal capital structure is deemed non-existent. In contrast, the trade-off theory places a strong emphasis on the existence of an optimal capital structure. This theory posits that companies should conduct a thorough cost-benefit analysis before incorporating debt into their capital structure. As previously mentioned, one of the significant advantages of including debt in the capital structure is the potential for tax savings on the interest paid on debt capital. However, a notable drawback of

introducing debt into the capital structure is the heightened financial risk due to the ongoing interest obligations associated with the debt component. Hence, it is the responsibility of the finance manager to meticulously weigh the pros and cons of integrating a debt component into the capital structure. Consequently, achieving an optimal capital structure necessitates finding the right blend of equity and debt in the capital structure to minimize costs and maximize returns.

A number of empirical works have been done in the area of determinant of capital structure. Some of the studies referred to by us for our study are as follows: Amasaveni and Gomathi (2012) undertook a study to investigate the factors influencing capital structure within the Indian pharmaceutical industry. Srivastava (2012) conducted research aimed at understanding the determinants of capital structure in Indian public limited companies, particularly during the pre and post-liberalization periods. Anwar (2012) explored the determinants of capital structure in three distinct industries in Pakistan: cement, textile, and the power sector. Khare and Rizvi (2011) endeavored to identify the most influential variables impacting the capital structure decisions of companies within the BSE 100 index. Maji and Ghosh (2007) investigated whether the capital structure of Indian companies could be predominantly explained by either the static trade-off theory or the pecking order theory. Nadeem and Zongjun (2011) conducted a study into the determinants of capital structure for firms in Pakistan. Karadeniz, Kandir, Balcilar, and Chal (2009) aimed to uncover the factors that influenced the capital structure decisions of Turkish lodging companies. Parlak (2010) conducted research on the factors influencing the capital structure of manufacturing companies in the Turkish scenario. Khan (2010) sought to identify the variables significantly impacting the capital structure of paint companies in Pakistan.

Our research paper seeks to explore the factors that influence a firm's capital structure, particularly during periods of economic recession, encompassing both the pre-recession and post-recession phases. Understanding these determinants is crucial for making informed decisions regarding a company's capital structure. While reviewing existing literature on capital structure, we observed that these determinants can vary significantly from one industry to another. For instance, the factors influencing the capital structure of a textile company may differ from those impacting a steel or cement company.

To address this variation, we opted for a comprehensive approach, examining a diverse set of industries. We found it prudent to base our research on the BSE Sensex, a stock market index that represents a substantial portion of the market capitalization on the Bombay Stock Exchange, one of India's primary and oldest stock exchanges. This index encompasses a wide range of industries in India, including cement, textiles, pharmaceuticals, information technology, and more. By selecting the BSE Sensex for our study, we aimed to incorporate cross-sectional data from various major sectors in India, rather than focusing exclusively on one specific sector or industry.

It is essential for finance managers to grasp the intricacies of the different variables that influence a company's capital structure during economic downturns. This knowledge is vital for making critical decisions related to capital structure.

In this research study, we have employed multiple regression analysis to explore the factors that influence the capital structure of companies listed on the BSE Sensex during the study duration. Our focal point is the dependent variable, "financial leverage," which we've investigated alongside nine independent variables, all of which are potential determinants of financial leverage or capital structure. Consequently, the primary objective of this research is to delve into the determinants of the capital structure and financial leverage of the companies listed on the BSE Sensex during our study period.

**Objectives of the Study**

The major objectives focused upon in the present research paper are as follows:

1. To examine the determinants of capital structure of BSE Sensex companies.
2. To investigate diagnostic test for determining the goodness of fit.

**Hypothesis of the Study**

1. **$H_1$:** Independent variables are not influencing the financial leverage.
2. **$H_2$:** There is normality among the residuals of the model.
3. **$H_3$:** There is homoscedasticity among the residuals of the model.
4. **$H_4$:** There is no autocorrelation among the residuals of the model.

**Research Methodology**

**Data Source:** In this research, we focused on companies listed on the BSE Sensex. To compile our dataset, we utilized the CMIE Prowess database, extracting information for 30 companies spanning the years 2010 to 2022, totaling 12 years. Any companies that were non-operational during any part of this 12-year period or had missing data for any year within the study were excluded. Ultimately, we used data from 23 companies that met all the specified criteria.

**Statistical Methods:** To analyze our data, we employed various statistical techniques within the R programming environment. We conducted descriptive statistics, computed a correlation matrix, and performed multiple regression analysis. The correlation matrix allowed us to assess the presence of multicollinearity, a condition where independent variables exhibit high correlations, which can impede the accuracy of multiple regression analysis. If multicollinearity is detected, it may not be appropriate to proceed with the multiple regression analysis.

**Variables Taken in the Study**

| Category | Variable | Variable | Details |
|---|---|---|---|
| Dependent | FL | Financial Leverage | Average Total Debt/ Average Total Asset |
| Independent | 1. Profitability | Return on Assets | Average Earnings before interest and tax (EBIT)/Average Total Assets |
| | 2. BR | Business risk | Standard Deviation of PBIT/ Average PBIT |
| | 3. GR | Growth rate (Assets) | Compound Growth Rate of Total Assets |
| | 4. DOL | Degree of operating leverage | Change in EBIT to %% change in Sales |
| | 5. SIZE 1 | Size of the firm (1) | Log (Average Total Sales) |
| | 6. SIZE 2 | Size of the firm (2) | Log(Average Total assets) |
| | 7. TAN | Tangibility | Average Net Fixed Assets/Average Total Assets |
| | 8. NOTS | Non Debt Tax Shield | Average Depreciation/ Average Total Assets |
| | 9. DPR | Dividend payout Ratio | Average Dividend/Average PAT (Profit after Tax) |

**Empirical Analysis and Results:**

**Table 2: Descriptive Statistics**

| | FL | ROA | BR | GR | DOL | Size (L_S) | Size (L_TA) | TAN | NDTS | DPR |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.01 | 0.10 | 0.76 | 0.13 | 20.86 | 9.85 | 10.69 | 0.18 | 0.02 | 0.36 |
| **S. E.** | 0.00 | 0.02 | 0.18 | 0.01 | 20.28 | 0.43 | 0.27 | 0.03 | 0.00 | 0.12 |
| **Median** | 0.00 | 0.08 | 0.50 | 0.13 | 0.20 | 10.60 | 10.76 | 0.16 | 0.01 | 0.31 |
| **S. D.** | 0.01 | 0.07 | 0.84 | 0.04 | 97.28 | 2.07 | 1.31 | 0.13 | 0.01 | 0.58 |
| **Variance** | 0.00 | 0.01 | 0.71 | 0.00 | 462.84 | 4.30 | 1.72 | 0.02 | 0.00 | 0.34 |
| **Kurtosis** | 17.20 | -0.57 | 7.53 | 0.83 | 22.98 | 5.37 | -0.24 | 0.25 | 3.82 | 7.37 |
| **Skewness** | 3.94 | 0.89 | 2.75 | -0.16 | 4.79 | -2.24 | -0.25 | 0.79 | 1.66 | 1.44 |
| **Range** | 0.06 | 0.23 | 3.48 | 0.18 | 467.24 | 9.25 | 5.22 | 0.51 | 0.07 | 3.32 |
| **Min** | 0.00 | 0.02 | 0.28 | 0.02 | -0.21 | 3.42 | 7.87 | 0.00 | 0.00 | -0.92 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Max** | 0.06 | 0.25 | 3.76 | 0.21 | 467.03 | 12.67 | 13.10 | 0.51 | 0.07 | 2.39 |
| **Sum** | 0.15 | 2.35 | 17.39 | 2.99 | 479.78 | 226.62 | 245.90 | 4.11 | 0.42 | 8.33 |

Table 2 provides descriptive statistics for both dependent and independent variables. The mean values of DOL and size are greater than 1 and their degree of variability is highly spread. Except for ROA and size measure by tangible assets, all the other variables have positive kurtosis values and 60% of them shows leptokurtic nature. Around 70% of the variables are right-skewed.

**Table 3: Correlation Matrix**

| | **FL** | **ROA** | **BR** | **GR** | **DOL** | **Size (L_S)** | **Size (L_TA)** | **TAN** | **NDTS** | **DPR** |
|---|---|---|---|---|---|---|---|---|---|---|
| **FL** | 1.00 | | | | | | | | | |
| **ROA** | -0.14 | 1.00 | | | | | | | | |
| **BR** | 0.10 | -0.42 | 1.00 | | | | | | | |
| **GR** | -0.25 | 0.08 | -0.12 | 1.00 | | | | | | |
| **DOL** | -0.11 | -0.17 | -0.09 | 0.13 | 1.00 | | | | | |
| **Size (L_S)** | -0.50 | 0.06 | 0.01 | -0.14 | -0.69 | 1.00 | | | | |
| **Size (L_TA)** | -0.48 | -0.42 | 0.09 | -0.21 | 0.31 | 0.34 | 1.00 | | | |
| **TAN** | -0.13 | -0.03 | 0.46 | -0.06 | -0.30 | 0.35 | 0.22 | 1.00 | | |
| **NDTS** | -0.16 | 0.11 | 0.63 | -0.13 | -0.28 | 0.31 | 0.06 | 0.83 | 1.00 | |
| **DPR** | -0.13 | 0.18 | -0.22 | 0.41 | -0.02 | -0.15 | -0.27 | -0.32 | -0.36 | 1.00 |

A negative correlation between FL and ROA (-0.14), suggesting that as financial leverage increases, return on assets tends to decrease. ROA and TAN has a negative correlation with half of the other variables. Additionally, FL, GR and DOL exhibits negative correlation values with most of the variables, indicating the inverse relationship. The highest correlation value is 63% between BR and NDTS.

**Table 4: Multicollinearity test**

| **Variable** | **VIF** |
|---|---|
| **ROA** | 2.044 |
| **BR** | 2.851 |
| **GR** | 1.53 |
| **DOL** | 2.67 |
| **Size (L_S)** | 1.91 |
| **Size (L_TA)** | 2.27 |
| **TAN** | 4.79 |
| **NDTS** | 7.41 |
| **DPR** | 1.54 |

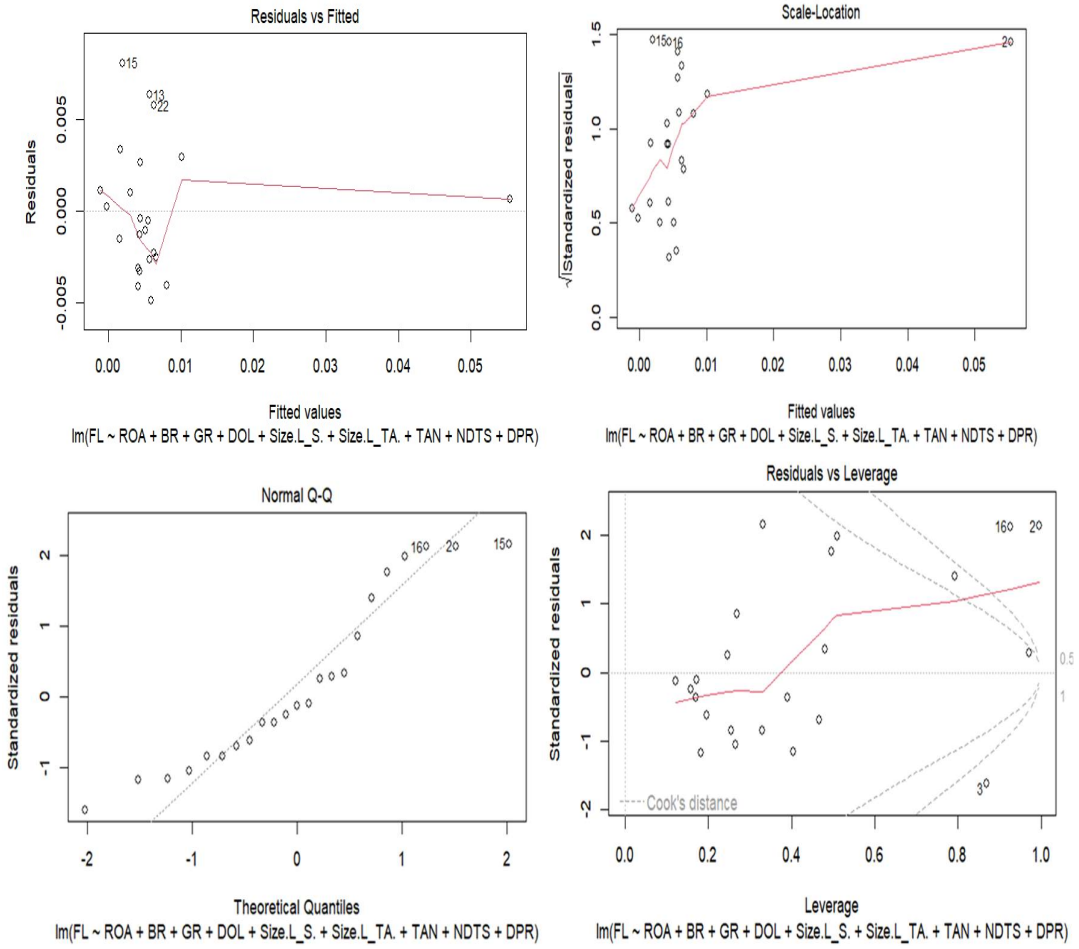
Table 4 presents the Variance Inflation Factor (VIF) values for each independent variable in a regression model. Majority of the variables have VIF values around or below 2, indicating relatively low multicollinearity. However, TAN and NDTS exhibit higher VIF values of 4.79 and 7.41, respectively, suggesting strong intercorrelations with other variables.

**Table 5: Regression results**

| | **Coefficients** | **Std. Error** | **t value** | **P-values** |
|---|---|---|---|---|
| **Constant** | 0.036 | 0.017 | 2.149 | 0.051 |
| **ROA** | -0.032 | 0.019 | -1.741 | 0.105 |

| | | | | |
|---|---|---|---|---|
| **BR** | 0.000 | 0.002 | 0.116 | 0.910 |
| **GR** | -0.030 | 0.029 | -1.041 | 0.317 |
| **DOL** | 0.005 | 0.001 | 5.617 | 0.000 *** |
| **Size (L_S)** | 0.000 | 0.001 | 0.096 | 0.925 |
| **Size (L_TA)** | -0.003 | 0.001 | -2.257 | 0.042 * |
| **TAN** | 0.013 | 0.016 | 0.825 | 0.424 |
| **NDTS** | -0.067 | 0.170 | -0.396 | 0.699 |
| **DPR** | -0.001 | 0.002 | -0.522 | 0.610 |
| **Residual standard error** | **0.005** | | | |
| **Multiple R-squared** | **0.907** | | | |
| **Adjusted R-squared** | **0.843** | | | |
| **F-statistic** | **14.090** | | | |
| **p-value** | **0.000** | | | |

**Figure 2: Graphical representation of Diagnostic tests**




The intercept of the model, showing a positive but statistically insignificant. Apart from DOL and size measure by tangible assets, all the other independent variables are insignificant. More than 50% of the variables have negative coefficients irrespective of then significance level. The adjusted R-squared of 0.843 suggests that approximately 84% of the variation in the dependent variable is explained by the model.

**Table 6: Diagnostic tests**

| | Statistics | P-value |
|---|---|---|
| **Shapiro-Wilk normality test** | 0.940 | 0.180 |
| **Breusch-Pagan test** | 8.813 | 0.455 |
| **Durbin-Watson test** | 2.643 | 0.910 |

Table 6 presents the results of diagnostic tests to assess the assumptions and reliability of a regression model. The Shapiro-Wilk normality test ($p = 0.180$) indicates that the residuals of the model are normally distributed. The Breusch-Pagan test ($p = 0.455$) suggests that there is no significant heteroscedasticity, indicating that the variance of the residuals is relatively constant across different values of the independent variables. The Durbin-Watson test ($p = 0.910$) is close to 2, indicating minimal autocorrelation in the residuals.

**Conclusion**

The study concludes that average values of Degree of Operating Leverage (DOL) and the size metric are both greater than 1, and their variability is considerably wide. With the exception of Return on Assets (ROA) and the size measure based on tangible assets, all the other variables exhibit positive kurtosis values, with 60% of them demonstrating a leptokurtic distribution. Furthermore, roughly 70% of the variables display a right-skewed pattern.

Furthermore, study reveals that the model's intercept is positive, but it lacks statistical significance. Among the independent variables, only DOL (Degree of Operating Leverage) and the measure of size based on tangible assets show significance. The majority of the other variables exhibit insignificance, with over half of them having negative coefficients. Despite this, the model's adjusted R-squared value of 0.843 indicates that it effectively explains around 84% of the variation in the dependent variable.

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