Capital Structure Determinants: Empirical Evidence from Listed Manufacturing Firms in India

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Abstract

Capital structure of a firm is an important financial decision and affects its financial risk and return. The purpose of this study is to examine the firm-level determinants of capital structure of listed manufacturing companies in India by using panel data regression method for a six year time period starting from 2010 to 2015. This study used a sample of 1283 listed manufacturing firms included in the manufacturing index of CMIE Prowess database. The study results reveal a significant positive relationship between the debt ratios and depreciation, R&D expenditure, liquidity of sampled firms. It is also found that the leverage ratios of these firms are negatively affected by profitability and tangible assets of the firms. Further, we observed an insignificant negative relationship between sales growth and debt ratios of sampled firms. The empirical results support the trade-off theory of capital structure.

Keywords: Capital Structure, Panel Data, Listed Firms, India

Introduction

One of the major focuses of empirical and theoretical corporate finance is capital structure decisions made by a firm. The objective of a financial manager is to select optimal capital structure that will maximize the value of a firm, as the risk-return of a firm gets impacted by the choice of capital structure decision. Since Modigliani and Miller (1958) irrelevance theory of capital structure, the extant literature attempted to explain the financing behaviour as well as the determinants of capital structure of a firm. In the academic literature there are different theories which explain the capital structure of a firm; these include agency theory (Jensen & Meckling, 1976), pecking order theory (Myers & Majluf, 1984) and trade-off theory (Modigliani & Miller, 1963), the latter two theories being the most important in explaining the capital structure decisions made by a firm.

According to trade-off theory, the capital structure choice of a firm is a result of a trade-off between the benefits of using debt, such as those arising from interest debt tax shield, and the costs of debt which include financial distress costs (Myers & Majluf, 1984)., whereas the pecking order theory states that there is a hierarchy of financing due to information asymmetry between the management of firm and investors, implies companies prefer internal to external funding as well as debt to equity financing. (Myers & Majluf, 1984). The present study contributes to the literature by examining the determinants of capital

structure of manufacturing firms in India by using the panel data regression method. The outline of this paper is structured into seven sections. The section 2 provides an account of literature review related to variables under the study. Section 3 discussed the data and sample used in the study. Section 4 outlines methodology employed in this study. This is followed by a discussion on the results in Section 5. Section 6 provides the conclusion of the study. Finally, section 7 narrates the limitations and scope of future research.

Literature review

The relationship between an optimal capital structure and firms' value can be traced back to Modigliani and Miller (1958). Jensen and Meckling (1976) argued that the firm's optimal capital structure will involve the trade-off costs and benefits associated with it. Agency theory suggests that optimal capital structure is determined by agency cost, which results from conflict of interest among different stakeholders (Jensen and Mackling, 1976).

There is contradicting and inconclusive evidence regarding the relationship between the size and leverage of a firm. Trade-off theory assumes a positive relationship between the size of a firm and leverage due to lower asymmetric information, financial distress, and other related costs. On the other hand, pecking order theory assumes a negative relationship due to the higher probability of retained earnings, lesser cash flow volatility and issuance costs of equity capital. This study used log of fixed assets as a proxy for measuring the size of a firm.

Previous studies have reported a positive relationship between the leverage and tangibility of assets as raising debt funds by the collateralization of tangible assets is easier. Raising long-term loans by the use of tangible assets will also reduce the agency costs associated with a firm (Jensen and Meckling, 1976). Further, tangible assets can be used to decrease the risk of lender.

The existing studies reported a negative relationship between non-debt tax shield (NDTS) and leverage. In order to measure this relationship annual depreciation to total assets is used as a proxy for NDTS. Previous studies documented a negative relationship between non-debt tax shield and leverage.

According to trade-off theory there is a positive relationship between profitability and leverage of a firm due to reduced risk of financial distress and agency costs. On the other hand pecking order theory predicts a negative relationship between profitability and leverage of a firm. Tax rate: There is a positive relationship between tax rate and leverage due to higher tax advantage associated with debt and non-debt tax shield. Pecking order theory predicts a positive relationship between profitability and leverage of a firm.

Firms which have growth opportunities involve higher information asymmetry. According to pecking order theory, firms prefer internal funds to external financing due to information asymmetry between insiders and outsiders. This establishes a positive relationship between the debt and growth opportunities of a firm.

Bhaduri (2002) applied factor and regression analysis to explain the changes in capital structure choice of 363 manufacturing firms and concluded that size, product, growth, cash flow and industry are major factors influencing the optimal capital structure choice of sampled firms. Mishra (2011) investigated capital structure determinants of central PSU's of India and found that leverage was positively related to asset structure. Further, his study results revealed that leverage was negatively associated with profitability and tax rate.

By using a sample of BSE listed manufacturing firms Majumdar (2012) examined the determinants of both secured and unsecured debt ratios. His study concluded that there is a positive relationship between tangibility, growth opportunities and secured debt. While, unsecured debt is negatively related with tangibility. Handoo & Sharma (2014) examined the capital structure determinants of 870 listed companies in India, by using regression analysis and found that firm-level factors such as profitability, debt service ratio, rate of tax, size, growth, cost of debt capital and tangibility of assets have significant impact on the choice of capital structure made by the selected sample of firms.

The extant literature used various empirical methods, such as Ordinary Least Square (OLS) regression, Fama–Macbeth regression, cross-sectional and time series regression. However, the number of studies which employed panel data method is limited in the Indian context; hence this study attempts to provide empirical evidence based on the panel data regression for the capital structure determinants of listed firms by using unique data set of listed manufacturing firms in India which include firms related to different manufacturing industries and market capitalizations. The results of the study can be compared with empirical results documented in previous literature for evaluating the applicability of existing models discussed in literature to an emerging economy like India.

Data and sample

The study sample consists of companies included in manufacturing index of CMIE Prowess database and listed either in National stock exchange (NSE) or Bombay stock exchange (BSE) or both of exchanges over a period of 2010¬ to 2015. The final sample includes 1283 firms covering 7722 firm years unbalanced panel data. The data were sourced from CMIE Prowess database.

Methodology

This study employed panel data regression analysis for the estimation of capital structure determinants. Basically, panel data has both cross-sectional and time-series dimensions. This kind of data has various advantages such as higher variability as the same cross-sectional items were observed over a period of time, low degree of collinearity among independent variables, greater degree of freedom and higher efficiency (Baltagi, 2008). The basic structure of a panel data model can be written as: Yit= $\alpha+\beta X\_it+\mu\_it$ with the subscript "i" represent the cross-sectional dimension; "t" signifies the time series dimension. The left-hand side variable "Yit" represents the dependent variable (Total debt to total assets) "Xit set of independent variables used in the estimation of model. These include size of the firm (SIZE) which is natural logarithm of total assets of a firm; ratio of depreciation to total assets (DEP), ratio of R&D expenses to total assets (R&D), ratio of net fixed assets to total assets (NFA), current ratio (CR) is the ratio of current assets and current liabilities, average tax rate (TXR), profitability measured as return on assets (PROF) and sales growth (GROW). The base line model used for the estimation of determinants of capital structure can be stated as follows:

$$\frac{TD_{it}}{TA_{it}} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 \frac{DEP_{it}}{TA_{it}} + +\beta_3 \frac{R\&D_{it}}{TA_{it}} + \beta_4 CR_{it} + \beta_5 TXR_{it} + \beta_7 PROF_{it} + \beta_8 GROW_{it} + \mu_{it}$$

Empirical results and discussion

Table1: Descriptive statistics of variables

Variable	TD/TA	TXR	SIZE	PROF	R&D/TA	NFA/TA	GROW	DEP/TA	CR
Mean	0.72	0.20	8.17	0.05	0.00	0.32	0.55	0.03	1.56
Median	0.65	0.20	8.12	0.05	0.00	0.31	0.10	0.03	1.18
Maximum	0.85	33.67	15.20	4.58	0.62	1.00	1293.29	0.53	110.82
Minimum	0.00	-3.39	-2.30	-15.23	0.00	-0.41	-1.00	-0.05	0.00
Std. Dev.	1.46	0.43	1.81	0.28	0.01	0.17	19.02	0.02	2.39
Skewness	44.67	60.41	-0.14	-27.18	24.29	0.32	57.13	3.74	19.72
Kurtosis	2426.60	4653.50	4.95	1369.4	958.13	2.78	3477.51	56.14	677.07
Sum	5551.74	1512.51	63085.2	393.05	26.30	2442.24	4210.22	230.60	12083
Sum sq. dev.	16392.3	1444.11	25308	602	1.56	226.17	2766702	3.50	44079
bservations	7722	7722	7722	7722	7722	7722	7647	7722	7722

Source: Author's own calculation

Descriptive statistics of the variables used in the model are presented in Table1. As per the results presented in Table 1, this study observed that the minimum and maximum total debt ratios of sampled firms range between 0 and 0.85. The mean capital structure ratio of observed sample is 0.72 percent with a standard deviation of 1.46 percent. The median capital structure ratio of listed manufacturing firms in India equals to 0.65 percent. The mean value of leverage is 0.72 with a standard deviation of 1.46, which reveals that listed manufacturing firms in India on an average depend more on debt financing than equity and other alternative sources of finance. The average size of sampled firms is 8.17 with a standard deviation of 1.81. While net fixed assets to total assets ratio has a mean value of 0.32 with a standard deviation of 0.17. The value of skewness and kurtosis reported for the variables visibly suggests that there is an asymmetry in the distribution of data used in the model. On the basis of the skewness and kurtosis values presented in Table 1, it is observed that the frequency distributions of underlying variables are not normal. There is no problem of collinearity based upon the test results.

Table 2: Fixed-effects regression method results

Variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	
Const	0.656	0.113	5.835	0.000	***
SIZE	0.000	0.013	0.019	0.984	
DEP/TA	3.455	0.391	8.839	0.000	***
R&D/TA	4.329	0.417	10.382	0.000	***
NFA/TA	-0.145	0.056	-2.565	0.010	**
CR	-0.019	0.002	-8.268	0.000	***
TXR	-0.017	0.009	-1.865	0.062	*
PROF	-0.118	0.015	-7.844	0.000	***
GROW	-0.000	0.000	-0.757	0.449	

and indicates significance at the 5% and 1% level respectively*

Mean dependent var	0.691	S.D. dependent var	0.599
Sum squared resid	603.252	S.E. of regression	0.308
R-squared	0.781	Adjusted R-squared	0.736
F(1290, 6356)	17.54	P-value(F)	0.000
Log-likelihood	-1139.95	Akaike criterion	4861.906
Schwarz criterion	13824.12	Hannan-Quinn	7936.467
rho	0.298	Durbin-Watson	0.975

Source: Author's own calculation.

The above table shows fixed effects regression results by using 1283 observations. The dependent variable is Total debt/TA; Size is the natural log of assets; DEP/TA is the ratio of depreciation to total assets; R&D/TA is the ratio of research and development expenses to total assets; NFA/TA is the ratio of net fixed assets to total assets; CR current ratio, TXR is average tax rate, PROF return on assets, GROW is sales growth rate.

Test for differing group intercepts - Null hypothesis: The groups have a common intercept

Test statistic: F (1282, 6356) = 15.3094, with p-value = P (F (1282, 64) > 15.31) = 0

The above test result shows that fixed effect method is appropriate for the estimation of given econometric model in comparison with pooled OLS method.

Breusch- Pagan test statistic: LM = 8448.96 with p-value = Prob (chi-square (1) > 8448.96) = 0

The above test result shows that random effect method is suitable for the estimation of given econometric model in comparison with pooled OLS method.

Hausman test statistic: H = 285.716 with p-value = Prob (chi-square (8) > 285.716) = 0

The above test statistic suggests that fixed effect method is suitable for the estimation of given econometric model in comparison with random effects method.

At first, this study used the pooled least square regression (OLS) regression for estimating the given model. After that we have applied panel data diagnostic tests to check whether the pooled OLS method is appropriate for the estimation of given econometric model. Breusch-Pagan test statistic suggested the random effects model over the pooled OLS model. In addition, we tested for differing group intercepts, which suggested the use of fixed effects model over the pooled OLS model. All these test results recommended the use of panel data regression method over the pooled OLS method. Hence we applied panel data regression method for estimation of the model.

In order to make a choice between fixed or random effects model, we applied Hausman test statistic. The "P" value of this test is less than 0.001, which suggests that fixed effects method is appropriate for the estimation of econometric model. Therefore, we have used fixed effects regression method to estimate the model. The empirical results of fixed effects regression method are presented in the Table 2. Based on these results, it is observed that the estimated model is statistically significant at 1% level in explaining the determinants of capital structure of sampled firms with F-value of 17.54 (p = 0). The adjusted R-square value of 0.7362 shows that about 73.62% of the variation in the capital structure levels of sampled firms has been explained by the eight explanatory variables. We estimated the econometric model by using robust standard errors for controlling the heteroskedasticity and serial correlation.

The t-statistics related with the independent variables DEP/TA, CR, R&D/TA and PROF specify that they are statistically significant at one percent level, whereas, the variable NFA/TA statistically significant at 5 percent level as indicated by its respective t-ratio. These results also imply that the leverage ratios of sampled firms have significant positive relationship with the variables DEP/TA, R&D and current ratio (CR). On the basis of the significant positive between liquidity and debt ratio, we can infer that one unit increase in the current ratio of the firm causes 0.019 unit increase in the leverage ratio. This can also be interpreted that the firms with more liquid assets may need to increase their leverage ratios to support the liquidity of firms. This finding is in contrary to the existing studies documented in literature. It also suggests the financing behavior of the Indian listed firms can't be explained by the pecking order theory. On the other hand, the finding of significant positive relationship between the profitability and leverage is in line with extant literature. This results support the trade-off theory, which suggest that a firm will trade-off the costs and benefits associated with leverage to make a capital structure choice. The companies with higher profitability ratio may have higher leverage ratios to make use of the benefits associated with leverage. There is an insignificant negative relationship between tax rate, sales growth and the leverage ratios of sampled firms as suggested by its respective t-ratios. Further, this study observed that there is an insignificant positive relationship between the gearing and size of selected listed manufacturing firms in India.

Conclusion

The focus of this study is to investigate the firm-level determinants of capital structure of 1283 listed manufacturing companies in India included in CMIE Prowess database manufacturing Index for a time period of six years (2010-2015). At first, we used the ordinary least square regression (OLS) regression to estimate the model but panel diagnostic tests were used to determine whether to apply to OLS regression or panel data regression method. These tests suggested the use of panel data regression method for the estimation.

Further, Hausman test results suggested the application of fixed effects method over random effects method. Hence, we estimated the panel data model by using fixed effects method. The study results reveal a significant positive relationship between debt ratios and depreciation, R&D expenditure and liquidity of sampled firms. This study observed that the leverage ratios of sampled firms are negatively affected by PROF and NFA of the firms. The empirical results support the trade-off theory and contradict to pecking order theory. This study has implications for the academicians, researchers, and finance professionals.

Limitations and future research

The sample of the study is limited to listed manufacturing companies listed in India during the period of 2010-2015. This study also excluded the endogeneity issues involved in the econometric model for the estimation of determinants of capital structure of sampled firms. Further studies can include industry, agency costs and macro-economy related variables, which may impact the capital structure decision of a firm. There is a scope to consider and model the capital structure determinants of both listed and unlisted firms.

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