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Non-linear dynamics of size, capital structure and profitability: Empirical evidence from Indian manufacturing sector

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ABSTRACT

The identification of optimal level of capital structure has been a topic of research for many years now. Yet, none of the theories on capital structure has been able to provide a convincing answer to this optimum debt problem. The current study aims at advancing the research on non-linear relationship between capital structure and firm performance for manufacturing sector in India. This has been accomplished by analyzing the non-linear associations among firm size, capital structure and profitability. The study deploys panel threshold regression methodology as proposed by Hansen (1999) to find out the different regimes in which capital structure differentially impacts profitability of firms based on their respective sizes. The study is based on a sample of 1194 publicly traded manufacturing firms in India. The time frame considered is from 2005 to 2014. The results confirm the significance of a single threshold for size, thereby indicating the presence of two separate regimes in which capital structure differentially impacts profitability. This threshold or cut-off size level is estimated to be around 148 million rupees. It is found that firms which exceed the threshold size are positively impacted by the use of debt in their capital structure and vice versa. The findings have useful implications for small size firms as they can reduce their overall costs of doing business by reducing the debt in their total capital. The empirical evidence supports both trade-off and asymmetric information theories of capital structure.

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1. Introduction

One of the most debatable areas in corporate finance pertains to finding the manner of optimum utilization of debt. The optimal debt level helps to minimize the overall cost of capital while enhancing the profitability of a firm. The identification of most appropriate level of debt is vastly researched in corporate finance. However, the findings are mixed. It is often found that debt has positive, negative, or no impact on the profitability of a firm. The identification of optimal debt level has often been debated and various authors have proposed different solutions for the “optimal-debt problem”. Some authors suggest that firms should try to weigh the cost of debt vis-à-vis its advantage and then decide on the optimal level of debt (Ferri & Jones, 1979; Kester, 1986; Rajan & Zingales, 1995). Some other authors argue that there is no particular target level of debt and capital structure choices are made on

the basis of requirements and availability of funds (Arosa, Richie, & Schuhmann, 2014; Hovakimian, 2004; Lee, Su, & Lin, 2012). A host of other theories also try to explain the key determinants of the optimal level of debt for different firms. The two most prominent theories pertaining to optimal capital structure include the trade-off theory and the asymmetric information theory.

The trade-off theory proposes that the optimal capital structure is determined by weighing the cost and benefits driven from the use of debt. Kraus and Litzberger (1973) argue that the major benefit of debt is the tax shield advantage associated with it. This is because interest paid to debt holders, in most countries, is deductible from the gross profits before calculating the tax liability of a firm. On the other hand, there are certain costs associated with debt such as cost of bankruptcy and cost of liquidation. These benefits and costs of debt are evaluated in order to arrive at the optimal capital structure. Miller (1977) adds to this theory and asserts that the capital structure of firms is determined by the interactions between corporate tax and differential rates of personal tax on interest income and dividend income. Thus, the trade-off theory proposes an optimal level of debt at which point the overall cost of capital is minimized. There have been a host of studies

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that have empirically tried to validate the trade-off theory (Antoniou, Guney, & Paudyal, 2008; Dudley, 2012; Guha-Khasnobis & Bhaduri, 2002; Handoo & Sharma, 2014).

The asymmetric information theory of capital structure claims that firms use their capital structure as a signaling instrument to the market. Ross (1977) proposes that firms that carry higher levels of debt are perceived to be of better quality as compared to firms that have low levels of debts. This is because firms having a stable stream of earnings can easily meet their interest obligations on time. Firms with more volatile earnings, on the other hand, are more likely to default and hence carry higher bankruptcy risks. This signaling effect helps the firms in managing future capital requirements. Myers and Majluf (1984) propose that there is an asymmetric information problem between managers and investors. Managers being insiders know more than the investors who only invest money but do not actively participate in the managerial process. The investors would prefer to factor this asymmetric information problem before lending money to the firm. This problem is more severe for equity issues than for debt issues. Hence, investors discount equity more than debt. In order to avoid this discounting problem, firms rely on equity as a last resort. Thus, firms prefer to follow a hierarchical path for issuing capital. Initially, firms prefer to utilize the retained earnings, and then they issue debt due to its lower cost. Finally, when the debt capacity is exhausted, firms issue equity. There have been various studies that have empirically validated the asymmetric information theory in different contexts (Bayraktaroglu, Ege, & Yazici, 2013; De Jong, Verbeek, & Verwijmeren, 2010; Paligorova & Xu, 2012; Psillaki & Daskalakis, 2009).

The above discussion highlights that the identification of optimal capital structure is a critical issue for every firm. However, the issue pertaining to the identification of the non-linear dynamics of optimal capital structure is yet to be investigated in depth. The current study aims at finding the optimal level of size that helps in identifying the right combination of debt and equity for various categories of firms operating in the manufacturing sector in India.

Although, India is the third largest economy in terms of aggregate GDP as scaled by purchasing power parity, the sustainability of India's high growth trajectory depends on the growth of the manufacturing sector. The sector generates a meagre 16 percent of the nation's GDP as compared to the services sector that contributes 55 percent.¹ Massive workforce and abundance in certain natural resources such as iron ore, cotton and coal can possibly make India as the most viable manufacturing alternative to China. On the other hand, poor transport infrastructure, high cost of power, rising cost of capital, and labour issues are some of the factors that are plaguing the competitive edge of the sector. Besides, the cost of power is approximately 50 percent higher in India than in China. The cost of capital hovers around 10 to 12 percent as against the international average of 6–8 percent. The stringent labour laws in India have been a major concern confronting the growth of manufacturing sector (Fallon & Lucas, 1993; Gupta, Hasan, & Kumar, 2009).

The preceding discussion highlights that high capital intensity, accompanied by very high cost of capital, has been one of the major deterrents to the growth of manufacturing sector in India. The Indian economy in general and the manufacturing sector in particular can benefit greatly by any reduction in the overall cost of capital. One of the most important modes of accomplishing this is through

establishing the right balance between various sources of funds. More precisely, the overall cost of capital can be reduced by achieving the right combination of debt and equity in the total capital. In this backdrop, it is very important to identify the most appropriate combination of debt to equity ratio for different types of firms in India. This shows that the current study is highly relevant in the current context.

The present study is different from previous studies in three important aspects. First, it deploys a methodology which can take into account the non-linear relationship between capital structure and profitability. Second, the current study explains the complex nature of relationships among size, capital structure, and profitability. This is achieved by considering size as the basis for grouping firms and then finding the differential impact of capital structure on profitability across firms belonging to different size groups. Finally, the study deals with an exhaustive datasets which encompass listed firms from multiple industries and a long time frame. To the best of our knowledge such a study has never been conducted for the Indian markets before.

2. Data, methodology and results

2.1. Data collection

The current dataset consists of records on several firm-wide variables for publicly listed manufacturing firms in India. The data has been collected from Prowess database. The study period is from 2005 to 2014.² The original data was obtained for 3501 publicly listed companies. This dataset has been subject to certain filters. All companies with missing data for any time period have been deleted.³ Companies with negative total net-worth have also been deleted. Finally, companies with negative sales and negative total assets have been deleted. The filtering process yields a final sample of 1194 firms.

2.2. Measures

2.2.1. Dependent variable

The dependent variable for the current study is Return on Assets (ROA). ROA has been taken as profit prior to interest, tax, depreciation, and amortization as a percentage of total assets. This definition of ROA avoids earning manipulations by firms to a great extent and is also independent of the manner in which profitability is shared among shareholders, debtholders and governments.

2.2.2. Explanatory and control variables

In the current study capital structure (CS) is the major variable of interest. CS has been defined as long-term borrowings as a percentage total assets. CS is also the regime-dependent explanatory variable in the panel threshold estimation. Size of the firm (SIZE) is another important variable of interest. SIZE represents the natural log of total assets. Total assets are originally measured in million of Rupees. Many previous studies have pointed out that firms with different sizes have different capital structure (Deesomsak, Paudyal, & Pescetto, 2004; Wald, 1999). This suggests that there is a differential impact of debt on profitability based on the size of the firm. This relationship can be exploited by considering size as the threshold variable. Further, marketing intensity (MI), intangible

² Indian firms mostly observe 'April to March' fiscal year in order to match the tax year.

³ This has been primarily done to avoid the dataset becoming an unbalanced panel. The threshold panel model applied in this study is applicable to the balanced panel.

¹ The share of India's manufacturing output to overall GDP has been only 15.8% in 2010–11, as compared to 30% in China, 31% in Korea, 36% in Thailand, 26% in Malaysia, 25% in Indonesia and 22% in Singapore. Manufacturing sector employs 12% of the Indian workforce or 53 million people (CMIE Business Beacon).

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