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Differential Analysis of Various Industries on The Basis of Capital and Asset Structure: An Indian Study

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Abstract
The starting point for this paper is a belief that industry dependence should affect the capital structure of a company. The purpose of this report is to examine the capital structure across different industries for companies quoted on a stock exchange and headquartered in India. The paper demonstrates significant difference in the capital structure depending on the industry where the company operates. The debt ratio sensitivities to the explanatory variables differ significantly between the five industries studied. Almost every significant coefficient obtained in the regressions is in accordance with capital structure theory and other studies. Debt ratio is negatively related to profitability, and age, while asset structure, growth, and company size are positively related. The separate regressions on each industry show that the industries studied are influenced differently. Despite some variation the regression model performed well for the industries, with the R^2 ranging from 0.191 to 0.884, signifying that using the same model on every industry may not be fair in the sense that the debt ratio could be governed by different factors for different industries.
Keywords: Capital Structure; Static Trade-off; Pecking Order; Industry Effects; Listed Companies.

1. INTRODUCTION

1.1. *Purpose of the Study*

From the number of published papers concerning capital structure, it is apparent that this is an important, difficult and complex subject. Every company would like a capital structure which is best fitted to their current situation that minimizes the cost of capital. The choice of the financial policy is one of the most important decisions that the company will ever take. It consists on determining the optimal capital structure of the companies. Recently, the capital structure has increasingly gained importance since many companies have experienced financial distress and bankruptcy caused by the last financial crisis, it has drawn the interest of many researchers and it was a subject of considerable debate in both theoretical and empirical studies. Without good knowledge of the variables that control capital structure, more insight about what might be the optimal debt ratio cannot be revealed.

Various industries experience different business environments. Consequently, such circumstances can cause differences in the capital structure. In a growth industry, the need for new investments and increased debt capital can be larger than in a mature industry. The study shall present a cross-sectional snapshot of the capital and asset structure situation at the end of the last fiscal year, on companies quoted on a stock exchange and headquartered in India.

Every industry experiences its own set of economic conditions. For instance, if a company is operating in an industry with very volatile earnings, it tends to have more equity. Additionally, industries are subject to different challenges within technology development, environmental regulations, etc.

Thus, this paper aims at finding significant differences across various industries in the Indian market. Companies listed on the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) have been studied. Publicly quoted companies listed on the liquid Indian capital market are interesting, as equity capital is relatively easily available for these companies. Also, in India, the public debt market is liquid and a classical tax system is used in which 'dividend payments are taxed at both the corporate and personal levels and interest payments are a tax-deductible corporate expense that are only taxed at the personal level' (Fan *et al*., 2003:07). The tax reducing effect of debt is especially important in the capital structure context.

1.2. *Structure of the Study*

The paper begins with a short presentation of the existing theory used as a theoretical approach later in this text. Next, the capital structure hypothesis to be addressed will be formulated, followed by an introduction to the background information and methods used in the study. The main part of this paper starts with a presentation of the descriptive statistics, followed by separate regressions and the evaluations for the five industries studied. Subsequently, the pooled regression with industry dummies is presented. In the conclusion the main results are

discussed and areas for further research will be suggested.

2. A SHORT REVIEW

2.1. *Existing Theory*

Over the years numerous studies on capital structure theory have appeared. Modigliani and Miller (1958) were the first who theorized the issue by posing their "M&M capital structure irrelevance proposition". By stating the circumstances under which capital structure does not influence firm value, the authors isolate factors that can explain why daily observations of reality prove the opposite. In a comment that followed five years later Modigliani and Miller (1963) showed how the relaxation of one of their crucial initial assumptions, the absence of corporate taxation, could attribute to the understanding of empirical findings, which typically exhibit negative price reactions on equity offering announcements. These two classical publications triggered a stream of studies and hypotheses over time, which contributed to the clarification of "the capital structure puzzle".

Howe and Shilling (1988) were the first to study the capital structure issue for listed property by analyzing price reactions to the news of security issues of REITs. They attributed the resulting negative price reactions to SEO-announcements to the negative signal content of equity offerings. Jaffe (1991) disputed this reasoning and argued that under a general model, based on Modigliani and Miller (1958), the value of a partnership, REIT, or related entity is invariant to leverage. The most recent contribution to this debate comes from Ghosh, Nag and Sirmans (1999, 2000), who re-examined the issue by investigating a sample of equity offerings in the U.S. REIT-market that occurred in the period 1991 -1996. In accordance with Howe and Shilling (1988) they document negative price reactions on equity offering announcements, and find evidence for the dominance of alternative hypotheses over the tax-based model. The focus of this paper is to contribute to this ongoing discussion by offering outcomes originating from a unique European data sample.

The most popular capital structure model is the *static trade-off theory*, which claims that tax shield benefits of debt financing need to be adjusted for financial distress costs that rise with increasing debt levels, creating an optimal capital structure that balances both forces. Issuing equity means moving away from that optimum and should therefore be interpreted as bad news. The magnitude of this effect should be related to the size of the tax burden.

An alternative hypothesis that is available is the so-called *implied cash flow change hypothesis*, which claims that by raising additional resources a company signals that the net operating cash flows of current operations are disappointing. In the opinion of investors changing the financing policy may indicate that the future looks less bright than expected.

A second signaling hypothesis is the *informational asymmetry hypothesis*. Here Myers and Majluf (1984) assumed that firm managers have superior information about the true value of the company. Managers will therefore time a new equity issue if the market price exceeds their own assessment of the stock value – if the stocks are overvalued by the market. Since investors are aware of the existence of the information asymmetry they will interpret the announcement of an equity issue as a signal that the listed stocks are overvalued, which subsequently will cause a negative price reaction. Although information asymmetry is difficult to measure the example of Ling and Ryngaert (1992) can be followed, which showed that the transparency of property companies varies among the different property types. These variations are partly due to differences in lease contract structures. Offices, for instance, are typically managed using long-term lease contracts, in which the future rent is known in advance. Retail properties, however, are often managed using percentage rent contracts in which future rents are linked to the sales of the store, which make future rental inflows harder to predict, thus increasing information asymmetry.

An alternative hypothesis is derived from Bayless and Chaplinsky (1991) is the *debt market accessibility hypothesis*. The rationale of this theory is based upon the consideration of investors for the decision of managers to issue equity. If a company is already highly levered it will be regarded as being relatively risky by capital suppliers. Hence accessing the debt market will be less attractive and issuing additional equity instead becomes a sound decision. Assuming investor's reason in this manner it is expected highly levered equity issuers to be associated with better post-issue stock performance than issuers with relatively low debt-to-equity ratios.

2.2. *Empirical Studies*

Since there are many complicated factors, economists are working to explain the main driving factors behind the capital structure of firms. Hall *et al.* (2000) have an industry and capital structure study of small- and medium-sized unquoted enterprises (so-called SMEs) in the United Kingdom. Degryse et al. (2009) validated the Pecking Order Theory through an investigation of small firms' capital structure, employing a proprietary database containing financial statements of Dutch small and medium-sized enterprises (SMEs). Ellili et al. (2011) analyzed the explanatory power of some of the theories that have been proposed in the literature to explain the changes in the capital structures across companies. Mustapha et al. (2011) reported through their paper on a study which explores the factors associated with debt structure of public listed companies in Malaysia. Talberg et

al. (2008) examined in their paper, the capital structure across different industries for companies quoted on a stock exchange and headquartered in the United States. It demonstrates significant difference in the capital structure depending on the industry where the company operates. The debt ratio sensitivities to the explanatory variables differed significantly between the five industries studied. This paper has been used as a **benchmark** for this study.

3. CAPITAL STRUCTURE HYPOTHESES

3.1. *Capital Structure and the Selected Industries*

Every industry experiences its own set of economic conditions. For instance, if a company is operating in an industry with very volatile earnings, it tends to have more equity as a buffer against possible bankruptcy (Balakrishnan and Fox, 1993).

Additionally, industries are subject to different challenges within technology development, environmental regulations, etc. The construction and automobiles industries is known as being sensitive to general market conditions, since building projects are associated with high initial expenses. Building plans are often cancelled in periods of economic downturn. The food industry is assumed to be more stable, owing to the fact that food is a basic need. Simultaneously, this is supposed to be an industry with relatively hard competition. Automobiles production is also a capital-intensive industry with, at present, very high operating margins. As a representative for a mature industry with a relative neutral growth outlook, the chemical industry has been chosen. The information technology (IT) industry is a representative for the new economy. The IT firms have a relatively small amount of fixed assets compared to the other industries (mostly human capital), and they have a strong market outlook. Titman (1984) has shown that capital structure can be used to commit the investors to liquidate only in those states where the net gain of liquidation exceeds the costs to customers.

The customer's cost rises from the inability to obtain the product, parts or service for already acquired products. The industry dummies may measure the extent of interaction between product market characteristics and the debt levels. Firms where this effect is pronounced, such as computer and automotive firms are expected to have less debt, ceteris paribus, than firms where this effect is less important, such as industries with homogenous goods.

3.2. *Hypothesis Formulation*

Hall et al. (2000) find industry differences in unquoted small- and medium-sized UK enterprises. In addition, Talberg et al. (2008) find differences between industries in their study.

Through this empirical study, the study of Talberg shall be continued in the Indian Markets and answer to these hypotheses shall be sought by means of statistical hypothesis testing:

H_0: There is no significant difference in capital structure between industries.
H_1: There is a significant difference in capital structure between industries.

The null hypothesis, as every other statistic in this study, will be evaluated at a 5% significance level. The determinants that drive the debt ratio, the various capital market imperfection hypotheses and incomplete contracts theory, are by definition unobservable. Agency costs of management cannot, for instance, be measured directly. The other variables used will in some cases contain several hypotheses in each variable, for instance profitability will contain both the bankruptcy cost hypothesis of Warner (1977), and the free cash flow hypothesis of Jensen (1986). Both hypotheses predict a positive relation between debt ratio and profitability.

The size variable will likely contain both the asymmetric information hypothesis and bankruptcy costs hypothesis, since a larger firm is more transparent and less likely to go bankrupt. A more transparent firm will find equity capital less costly, with reduced expected bankruptcy costs. It is therefore difficult to set up conclusive a priori conjectures about predictions for the independent variables.

However, the previous studies like Talberg et al. (2008), Hall et al. (2000), and Harris and Raviv (1990) can be used to predict the signs of the regression coefficients. As it is difficult to decide which of the debt ratio factors connected with company size that is most effective, there is uncertainty about the size sign. The predicted significant coefficients are collateral (+), profitability (+/−), growth (−), size (+/−) and age (−).

4. BACKGROUND INFORMATION AND METHODS

4.1. *Data Sources*

The BSE (www.bseindia.com), NSE (www.nseindia.com) and Money Control (www.moneycontrol.com) websites, which contain financial and company data for every company listed on BSE, and NSE, are employed to gather the information required. Every company reporting financial data to BSE/NSE has to present its figures in compliance with the Indian-GAAP IAS. This standard is well-established and makes certain that the financial data are presented in a similar and fair way for each company studied.

4.2. *The Sample*

There are several standards classifying industries. The industry definitions from the National Industrial Classification (NIC) 2008 shall be used in this work. Money Control offers classification of industries by sector. All the companies listed on the BSE and NSE falling in the Industries chosen, as provided by Money Control, shall be taken into the research as the sample. The industries shall be chosen on the logical bases of uniformities and dissimilarities among them in terms of Market Capitalization, Size, Age, Maturity, Profitability and Revenue Structure.

The details and data for the companies listed on the BSE and NSE including their ticker symbols, for all the industries studied, shall be found on the classifying website (www.moneycontrol.com) itself.

The banking and finance sector is not taken into account because of the Basel II agreement which regulates the capital structure in this industry. Within Construction, companies from the Home Construction sub-sector have also been taken into account because they are assumed to experience the same business environment as companies from the sector Construction & Materials.

Outliers shall not been deleted from the data sample as deletion might reduce the dataset noticeably. Thus, according to divisions defined by NIC, the following industries as given in Table 1 were studied.

TABLE 1 – INDUSTRY DEFINITIONS

Industry	Sector (As classified by moneycontrol.com)
Automobiles	Auto – 2 & 3 Wheelers
	Auto – Cars & Jeeps
	Auto – LCVs/HCVs
	Auto – Tractors
	Auto Ancillaries
	Bearings
	Castings & Forgings
	Fasteners
	Tyres
Chemicals	Chemicals
	Detergents
	Dyes & Pigments
	Fertilizers
	Paints/Varnishes
	Pesticides/Agro Chemicals
Computers	Computers – Hardware
	Computers – Software
	Computers – Software – Training
Construction	Cement – Major
	Cement – Mini
	Cement – Products/Building Materials
	Ceramics/Granite
	Construction & Contracting – Civil
	Construction & Contracting – Housing
	Construction & Contracting – Real Estate
Food & Beverages	Aquaculture
	Breweries & Distilleries
	Cigarettes
	Edible Oils & Solvent Extraction
	Food Processing
	Vanaspati/Oils

Source: www.moneycontrol.com

Five industries were chosen by grouping together similar sectors as per the provided classification.

4.3. *Dependent Variable Definition*

Short-term debt (current liabilities) will not be taken into consideration, since it fluctuates with the operations of the firm. Further, firms do not achieve tax-reducing interest costs with every type of short-term debt (e.g. on outstanding credit). The dependent (response) variable in the regression model used is total long-term debt ratio

(TLTD).

$$TLTD = \frac{Long\ Term\ Debt + Other\ Liabilities + Deferred\ Liability\ Charges}{Total\ Liabilities + Total\ Equity}$$

Note that book values in the calculation of the debt ratio are used.

4.4. *Independent Variable Definition*

Many factors affect the capital structure of a firm. It is thus a considerable challenge to construct a regression equation where these (industry-specific and firm-specific) factors are included in a mathematical and meaningful way. The paper makes use of independent regression variables (regressors) mainly defined in Talberg et al. (2000).

A problem that occurs when running regression analysis is that the independent variables should not be too correlated. Multi-collinearity will give high coefficient standard errors and thus cause problems with statistical inferences and make hypothesis testing less conclusive. Variables with too much correlation (0.5 used as limit) are therefore not useable as regressors. Annexure 1 contains the table of correlation coefficients of the variables.

As defined in the benchmark study from Talberg et al. (2008), the paper shall make use of the ratio fixed assets divided by total assets (named asset structure variable, ASV) as an independent regression variable in this paper.

$$\mathbf{ASV} = \frac{\mathbf{Fixed\ Assets}}{\mathbf{Total\ Assets}} = \frac{\mathbf{FA}}{\mathbf{TA}}$$

A growth variable similar to Talberg et al. (2008), i.e., the market to book (MB) ratio, is employed. It is defined as the company market value (equals current share price multiplied by the number of stock) divided by the book value of each company's equity. Hence, MB brings the prospective growth expectations of the company in the capital market into the model. Nevertheless, MB shall be classified as an industry-specific variable in the sense that every company within an industry can take part in the future growth opportunities.

Note that the current market capitalization of the company as the market value and not the market value of the firm at the end of their fiscal year is employed. The current market values are selected for two reasons: First, the historical market values were difficult to obtain. Second, as Myers (1977) argues, a significant part of the market value consists of the present value of future growth opportunities.

Thus, the market capitalization of a firm is partially nothing else than a continuous estimation of the present value of the growth opportunities of that firm from the investors' point of view. It is therefore difficult to say that a specific market value is more correct than another. Formally, the market value at the end of the fiscal year of course would be preferable.

$$\mathbf{MB} = \frac{\mathbf{Market\ Value}}{\mathbf{Total\ Equity}} = \frac{\mathbf{MV}}{\mathbf{TE}}$$

In order to capture some of the firm-specific debt ratio variations, three other independent variables are employed in the regression model. Similar to the benchmark paper (Talberg et al. (2008)), a profitability (PRO) variable defined as EBIDT (Earnings before Interest, Depreciation and Tax) divided by total revenue, is used. This definition is analogous to MacKay and Phillips (2005):

$$\mathbf{PRO} = \frac{\mathbf{EBIDT}}{\mathbf{Total\ Revenue}} = \frac{\mathbf{EBIDT}}{\mathbf{TR}}$$

Accordingly, company size (SIZE) and company age (AGE) variables are applied to the regression model which is analogous to the benchmark paper, as total assets and as 2006 less the year of incorporation/foundation, respectively. Observe that the natural logarithm of total assets and age are taken:

$$\mathbf{SIZE} = \ln(\mathbf{Total\ Assets}) = \ln(\mathbf{TA})$$
$$\mathbf{AGE} = \ln(\mathbf{Age})$$

A very specific characteristic for each industry is the workforce needs. Some industries are very labor intensive, while other industries do not need much labor in order to generate revenue. This provides as basis to design an independent variable called revenue per unit employee cost (RPEC) as:

$$\mathbf{RPEC} = \frac{\mathbf{Total\ Revenue}}{\mathbf{Total\ Employee\ Cost}} = \frac{\mathbf{TR}}{\mathbf{E}}$$

This ratio tells how much revenue is generated per unit of employee cost, and should hence represent an interesting characteristic of companies and industries. It should also be able to represent the managerial competency of the firm and the agency costs incurred therein.

4.5. *Descriptive Statistics*

The data material used in this study is presented for key figures in Table 2. It is found that Automobiles has the highest magnitude for debt-ratio (0.4767) while Chemicals has the lowest (-0.0739). The low value for Chemicals is due to presence of an Outlier (Jensen Nicholson) with a Total Equity of -385.23. Excluding this outlier, Chemicals gives a mean of 0.5581 for TLTD, even higher than Automobiles. Hence, Chemicals as an industry does hold a low debt-ratio. The next lowest debt-ratio is for Computers (0.3462).

The market to book value is highest for the Automobiles industry (3.1484) indicating it as a growth industry in the Indian markets. The industry also has most tangible assets (ASV = 0.5148) with Chemicals (0.4150) and Food & Beverages (0.4062) on the following places.

Not surprisingly Computers, since it is based on the newest technology, has the lowest average age of only 23.1 years, while the others are on average older, ranging from 28.0 to 38.3 years.

At the calculated data averages, the industry ranking shows more variation. The Automobiles industry has some of the highest values while the lowest of RPEC. This can be seen in light of the high Employee Costs in the manufacture and service of Automobiles. The Computers industry has the lowest values for TLTD, ASV and AGE, owing to the factors already discussed, while the highest of PRO. For Food & Beverages and Construction, there are no obvious trends as they swap places randomly in these datasets, while Chemicals stays near the average for almost all the variables except TLTD.

Furthermore, the RPEC variable shows high industry variation, indicating that some industries generate more revenue per unit employee cost than others. Here, Food & Beverages has the highest value with 89.1489 and Automobiles has the lowest at only 18.4866. Intuitively, the high value for Food & Beverages can be evidence of the high food inflation at the moment and the low employee density this industry sector has.

The PRO variable shows similar results. Computers, being new and technology based, has the highest average profitability at 0.4574 while Food & Beverages shows average losses to the tune of -0.1941. This may again be attributed to rising material costs due to high rates of food inflation and thus the adverse impact on profitability. The other industries also show very high levels of variation for PRO, with Construction next with 0.2763 and Chemicals at 0.0737.

TABLE 2 – DESCRIPTIVE STATISTICS

Industry		TLTD	ASV	MB	PRO	SIZE	AGE	RPEC
Automobiles	Mean	0.4767	0.5148	3.1484	0.0464	5.3538	3.5380	18.4866
	N	159	159	159	159	159	159	158
	Std. Deviation	0.2961	0.2489	9.8557	1.3779	1.6100	0.4917	31.3721
	Median	0.5177	0.5116	1.2759	0.1220	5.1812	3.4965	12.0417
	Minimum	-1.2806	-0.7643	-2.9525	-15.8125	1.7561	1.0986	0.1838
	Maximum	2.1227	1.1542	87.9863	3.5710	10.4888	4.4998	313.6667
	Variance	0.0877	0.0619	97.1348	1.8987	2.5921	0.2418	984.2074
Chemicals	Mean	-0.0739	0.4150	1.7890	0.0737	4.7969	3.4561	41.7119
	N	177	177	177	177	177	177	175
	Std. Deviation	8.4621	0.7888	2.6123	4.1106	1.7372	0.4934	115.4964
	Median	0.4152	0.4017	1.0029	0.1146	4.7308	3.3673	18.5467
	Minimum	-111.3120	-9.0682	-1.1085	-42.5000	0.7129	1.9459	0.6667
	Maximum	6.6226	3.1037	17.6207	34.0000	8.9511	4.7875	1356.3333
	Variance	71.6073	0.6223	6.8239	16.8967	3.0179	0.2434	13339.4153
Computers	Mean	0.3462	0.2295	1.9833	0.4574	5.6619	3.0115	62.3077
	N	76	76	76	76	76	76	76
	Std. Deviation	0.3293	0.1993	2.1627	1.3613	1.9593	0.5590	367.6081
	Median	0.2761	0.1657	1.3004	0.2013	5.5957	3.0678	3.7175
	Minimum	0.0000	0.0000	-0.2299	-0.4899	1.6845	0.6931	1.2138
	Maximum	2.1279	0.8443	12.2824	11.1793	10.1486	4.2047	3209.0000
	Variance	0.1084	0.0397	4.6773	1.8530	3.8387	0.3125	135135.6914
Construction	Mean	0.4512	0.2973	1.4215	0.2763	5.9439	3.1733	49.4393
	N	193	193	193	193	193	193	192
	Std. Deviation	0.2290	0.2881	2.1815	0.6352	1.8418	0.5592	140.6646
	Median	0.4813	0.2248	0.8621	0.1693	6.0972	3.1355	18.9561
	Minimum	0.0000	0.0000	-7.6212	-1.4595	1.3863	1.6094	-0.3146
	Maximum	1.0476	0.9984	17.0859	7.5714	10.3395	4.4998	1385.7000
	Variance	0.0524	0.0830	4.7588	0.4034	3.3924	0.3127	19786.5370
Food & Beverages	Mean	0.4617	0.4062	2.2897	-0.1941	4.7239	3.3140	89.1489
	N	112	112	112	112	112	112	111
	Std. Deviation	0.3210	0.3099	6.8336	2.4036	1.8478	0.4937	156.3953
	Median	0.4348	0.3570	0.9201	0.0783	4.6718	3.1568	27.2266
	Minimum	0.0000	0.0000	-30.3670	-22.0000	0.2151	2.3979	0.4821
	Maximum	1.7810	2.4717	49.0955	4.0000	9.6836	4.6728	1075.1855
	Variance	0.1030	0.0961	46.6982	5.7773	3.4145	0.2437	24459.4833
Total	Mean	0.3177	0.3844	2.0903	0.1210	5.3095	3.3288	48.2356
	N	717	717	717	717	717	717	712
	Std. Deviation	4.2088	0.4654	5.7024	2.4096	1.8427	0.5464	165.3064
	Median	0.4534	0.3565	1.0069	0.1269	5.1799	3.2958	16.9609
	Minimum	-111.3120	-9.0682	-30.3670	-42.5000	0.2151	0.6931	-0.3146
	Maximum	6.6226	3.1037	87.9863	34.0000	10.4888	4.7875	3209.0000
	Variance	17.7142	0.2166	32.5168	5.8061	3.3957	0.2985	27326.2113

Source: Calculated through Data from www.moneycontrol.com

TABLE 3 – COMPARATIVE ANALYSIS OF MEANS

Industry	TLTD	ASV	MB	PRO	SIZE	AGE	RPEC
Automobile	0.4767	0.5148	3.1484	0.0464	5.3538	3.5380	18.4866
Chemicals	-0.0739	0.4150	1.7890	0.0737	4.7969	3.4561	41.7119
Computers	0.3462	0.2295	1.9833	0.4574	5.6619	3.0115	62.3077
Construction	0.4512	0.2973	1.4215	0.2763	5.9439	3.1733	49.4393
F&B	0.4617	0.4062	2.2897	-0.1941	4.7239	3.3140	89.1489

Highest
Lowest

Source: Calculated through Data from www.moneycontrol.com

4.6. *The Separate Regression Model*

A regression model will be calculated separately for each industry, to detect which factors affect the capital structure within each business in the industry.
The expected regression model shall be:

$$DB = \alpha + \beta 1ASV + \beta 2MB + \beta 3\,PRO + \beta 4SIZE + \beta 5AGE + \beta 6RPEC + \varepsilon$$

Where α is regression constant, βi is regression coefficients and ε is random error term.

4.7. *The Pooled Regression Model*

In order to find an answer to the hypothesis problem formulated in section 3.2 a pooled (joint) regression model was constructed with all industries together. Dummy variables are applied to the model to indicate which industry each company belongs to. Since there are five industries, four dummy variables are necessary to uniquely identify each industry. Beyond that, the regression model is equal to the separate industry equation:

$$DB = \alpha + \beta 1ASV + \beta 2MB + \beta 3\,PRO + \beta 4SIZE + \beta 5AGE + \beta 6RPEC + \beta 7Z1 + \beta 8Z2 + \beta 9Z3 + \beta 0Z4 + \varepsilon$$

Where α is Regression constant, βi is regression coefficients, ε is random error term, Zn is dummy variable (group variable) where n = 1 for Automobiles, n = 2 for Chemicals, n = 3 for Computers, n = 4 for Construction, all zero for Food & Beverages.

The sample size shall be improved considerably by pooling the five industries into one. It is chosen to perform a regression that focuses on changes in the intercept coefficients for each of the five industries and give them all the same estimated coefficients (betas). There is reason to believe that the industries will be affected quite similarly, and that the only real difference therefore would be the intercept. First, all companies are headquartered and listed in India. This gives them the same rules of operation and similar possibilities concerning financing. Next, theory suggests that the regression coefficients (dummy variables excluded) should have certain signs. For instance, there is agreement that the amount of fixed assets should help a company to obtain loans because of the collateral they offer, provided that the asset specificity is not too high.

A regression model, in which the debt ratio slope may vary for each industry, is not carried out, as its estimated coefficients would be the same as for the five separate regressions. Thus, separate industry regressions are a clearer way to analyze capital structure differences across the sample.

5. EMPIRICAL STUDY

5.1. *Separate Industry Regressions*

The separate industry regression equation is applied to every business industry. Regression coefficients and relevant statistics are given in Table 4 below.

TABLE 4 – SEPARATE INDUSTRY REGRESSION RESULTS

	Automobiles				Chemicals				Computers				Construction				Food & Beverages			
Variable	**B**	**Std. Error**	**T**	**Sig.**	**B**	**Std. Error**	**t**	**Sig.**	**B**	**Std. Error**	**t**	**Sig.**	**B**	**Std. Error**	**t**	**Sig.**	**B**	**Std. Error**	**t**	**Sig.**
(Constant)	.147	.178	.826	.410	-1.289	1.648	-.782	.435	.862	.217	3.978	.000	-.012	.104	-.118	.906	.392	.210	1.870	.064
Asset Structure Variable	.539	.086	6.285	.000	9.970	.287	34.693	.000	.479	.181	2.651	.010	.041	.057	.729	.467	.247	.095	2.590	.011
Market to Book	-.002	.002	-1.050	.295	.263	.089	2.960	.004	-.023	.017	-1.331	.188	-.002	.007	-.220	.826	-.013	.004	-3.043	.003
Profitability	-.048	.017	-2.816	.006	-.067	.054	-1.235	.219	-.001	.026	-.049	.961	-.030	.025	-1.201	.231	.005	.012	.425	.672
Size	-.020	.014	-1.452	.149	.119	.139	.856	.393	.005	.020	.243	.809	.046	.008	5.498	.000	.050	.016	3.009	.003
Age	.053	.046	1.154	.250	-1.199	.475	-2.522	.013	-.200	.063	-3.173	.002	.062	.029	2.150	.033	-.068	.060	-1.148	.254
Revenue Per unit Employee Cost	-.001	.001	-1.464	.145	.005	.002	2.603	.010	.000	.000	-.588	.558	.000	.000	-.718	.474	.000	.000	-.240	.811
R^2		0.257				0.884				0.232				0.191				0.205		
Adjusted R^2		0.228				0.88				0.165				0.165				0.159		
F-Statistic		8.709		.000		214.018		.000		3.474		.005		7.303		.000		4.476		.000
Regression SS		3.543				11144.391				1.887				1.889				2.305		
Residual SS		10.237				1458.019				6.246				7.926				8.925		
No. of Observations		159				177				76				193				112		

Note: Dependent Variable is Total Long Term Debt (TLTD) for all industries

5.2. *Separate Industry Regression Discussion*

5.2.1. Automobile Industry

The regression model did not perform very well on the automobile industry, with an R2 of 25.7% and an F-statistic of 8.709. Furthermore, the constant and four out of the six variables are insignificant. The only variables with significance levels of less than 5% are ASV with a coefficient of 0.178, and PRO with a coefficient of -

0.048. Even though the significance levels are not satisfactory, the sign corresponds to the findings in Hall et al. (2000) for unquoted SMEs.

The coefficient of MB is negative at −0.002. This is in line with the findings of Fan et al. (2003) and can be seen in light of the pecking order theory. As previously stated, the MB ratio is used as our growth variable, and with the negative sign, it implies that more growth gives a smaller debt ratio. Growing firms are likely to have more internally generated funds available to fund new projects, and do not need debt financing to the same extent.

The PRO variable coefficient also supports the findings of the MB coefficient being negative at -0.048 and is significant at 5% level.

The SIZE coefficient is also negative at -0.02 in line with the findings of Barclay and Smith Jr's (1995) argumentation of large enterprises obtaining foreign short term debt instead of long term debt, but contrary with their 'economy of scale' effect. This suggests that larger companies have lower debt ratios.

The coefficient for AGE has a value of 0.053 and thereby implies that older companies obtain larger debt. This result can be explained with the growing reputation and existing equity base of older firms making it easier for them to obtain cheaper loans.

Finally, the RPEC variable has a very low value at -0.001 and is also significant at 5% levels. This shows that the revenue per unit employee cost does not have much effect on the level of debt of the firm. This may be seen in the light of relatively less relevance of Agency Costs in obtainment of debt.

5.2.2. Chemicals Industry

The model performed much better on Chemicals than on Automobiles increasing the R2 to 0.884 and the F-statistic to 214.018. In addition, four of the six variables and the constant are significant at 5% level.

The size of the ASV coefficient is quite interesting at 9.97, but it is also significant. This breaks with much of the theory and the results for the other industries. The only explanation for this has to be high asset specificity. Chemical plants are designed to produce one substance effectively and they cannot be moved without incurring high costs. These large plants offer little collateral since they are so specialized. Thus, if a chemical company builds a new plant, a high amount of dent will have to be taken.

The MB ratio has a significant coefficient of 0.263 which again breaks with much of the theory and the results for the other industries. This shows that firms in the chemical industry acquire more debt as they grow. This may be explained by the high capital intensive nature of the industry.

The PRO variable shows a negative coefficient of -0.067. This is line with the existing theory and the results of Hall et al.

The SIZE variable is positive at 0.119. This suggests that the larger the firm, the higher is the debt of the firm. This can again be explained through the capital intensive nature of the industry.

Furthermore, the values of the two other significant coefficients imply that both AGE (−1.199) and RPEC (0.005) affect the debt ratio in a similar fashion as in the other industries. The RPEC is again too small to have a very significant impact.

5.2.3. Computers Industry

For Computers the model performed quite similar to the Automobile industry on the basis of R2 with a value of 0.232 and the F-statistic, 3.474 significant at 1% level. When significance levels of the coefficients are seen, it can be seen that the constant (0.862) and the coefficient for ASV (0.479) and AGE (-0.2) are significant.

The highest coefficient is for ASV, which is also significant at 5% level. This implies that the availability of collateral plays an important part in the selection of the source of funding.

The MB factor is negative with a value of -0.023. This is in line with the findings of Hall et al. and suggests that growing firms rely on their own reserves than debt for expansion purposes.

The PRO factor has a very small value (-0.001) and also is highly insignificant. This implies that Computer industry does not let their profitability govern their debt ratio in the same way as other industries. An explanation for this could be that the Computers industry in good times will continue its present debt ratio strategy (in accordance with the static trade off theory) to gain tax benefits from the interest paid.

Similarly, the SIZE factor also has a very low value (0.005) and is highly insignificant. This can be understood by the fact that irrespective of the size, the firms will need to fulfill the capital needs through debt financing.

The AGE component has a negative value of -0.2 and is also significant at 5% level. This suggests that firms take lesser debt as they grow older.

The RPEC variable again has a value of 0 and is thus moves out of the equation.

5.2.4. Construction Industry

For Construction the model performed poorest than for any other industry regarding R2. The value for R2 is only 0.191 and for the F-statistic the value is 7.303 significant at 1% level. When the significance levels of the coefficients are looked at, it can be seen that the coefficient for SIZE (0.046) and AGE (0.062) are significant.

ASV has a positive sign at 0.041, while MB and PRO are negative at -0.002 and -0.03 respectively, all in line with the study of Hall et al. This reaffirms the hypothesis that growing firms use lesser debt and firms high profitability use their reserves to finance projects.

Both SIZE and AGE are positive and also significant, implying that older and larger firms use more debt. This can be explained by the capital intensive nature of the industry and machines required include high capital expenses. An explanation of the significant positive SIZE coefficient for Construction, as opposed to the currency hedging argumentation from Barclay and Smith Jr (1995) can be the fact that this industry seems to be more domestically focused.

RPEC again has a value of 0 and is hence unusable as a regressor.

5.2.5. Food & Beverages Industry

The Food & beverages industry regression model has a R2 of 0.205 and an F-statistic of 4.476, significant at 5% level. The coefficients for ASV (0.247), MB (-0.013) and SIZE (0.05) are significant at 5% level, while the constant (0.392) is significant at 7% level.

The results of ASV and MB are consistent with the benchmark study bearing positive and negative signs respectively.

The PRO variable has a positive value (0.005) but is insignificant. It is not surprising to see a different result for the coefficient of profitability since the Food & Beverage industry is not prone to the same shifts in consumer behavior as the other industries like Construction or Automobiles. Food is a basic necessity. Therefore, this industry would not need to build up a large equity buffer (to minimize bankruptcy costs) as Construction which is a more cyclic industry.

The SIZE variable is again positive and also significant, similar to the construction industry. The same argument of size of investments and capital expenditures in expansion is also valid here.

The AGE variable is again negative at -0.068, similar to the Chemicals and Computers industries, suggesting that older firms take lesser debt and use their own reserves or equity for financing projects.

RPEC is again unusable as a regressor with an insignificant nil value.

5.3. *The Pooled Regression Model*

Table 5 presents the results from the unrestricted (with dummy variables) and restricted pooled (without dummy variables) regression, respectively.

5.4. *Pooled Regression Discussion*

The unrestricted model reaches a very high R2 of 0.666, while the restricted model has an explanatory power of 0.650. The F-statistics of the two regressions are also highly significant.

TABLE 5 – POOLED INDUSTRY REGRESSION RESULTS

	Unrestricted Model (with Dummies)				**Restricted Model (without Dummies)**			
Variable	**B**	**Std. Error**	**T**	**Sig.**	**B**	**Std. Error**	**t**	**Sig.**
(Constant)	-1.522	.670	-2.271	.023	-.556	.632	-.881	.379
Asset Structure Variable	7.487	.203	36.931	.000	7.270	.203	35.790	.000
Market to Book	.025	.016	1.540	.124	.018	.017	1.098	.272
Profitability	-.062	.039	-1.611	.108	-.057	.039	-1.443	.150
Size	.142	.053	2.666	.008	.210	.052	4.032	.000
Age	-.597	.181	-3.298	.001	-.949	.174	-5.443	.000
Revenue Per unit Employee Cost	.002	.001	3.127	.002	.002	.001	3.244	.001
Z1	-.612	.311	-1.968	.049				
Z2	-.377	.301	-1.253	.211				
Z3	1.015	.378	2.687	.007				
Z4	.687	.304	2.257	.024				
R^2		.666				.650		
Adjusted R^2		.661				.647		
F-Statistic		139.781		.000		218.085		.000
Regression SS		8446.821				8242.159		
Residual SS		4236.060				4440.722		
No. of Observations		717				717		

Interpretation of significant industry dummies have proven difficult in the literature. Industry could proxy for growth, tangibility and risk, but since these variables have already been controlled for, they cannot be important. Explanation must therefore be found in the variables that have not been controlled for, like human

capital.

If the assumption that human capital is relatively more important in the Computers industry is accepted, the Computers industry does not want to scare off talent by using a lot of debt. In many ways the Computers industry differs from traditional industry. It has little debt, little tangible assets, average market-to-book ratio and highest average profit.

Mature industries often have more debt. This can be the result of increased trust from the banks and capital markets towards survivors in the market system and better track records of positive earnings. The average age of the firms in Automobiles is 38 years, in Chemicals 35 years and in Food & Beverages it is 32 years. These industries are called mature. They have a debt ratio around 47% (ignoring the outlier Jensen Nicholson as discussed earlier). The youngest Computers industry, however, has relatively small debt with a 35% debt ratio. The old Chemical industry with an average age of 36 years has the highest debt ratio of 55%. Clearly, age plays a part in the explanation here, although linear age was adjusted for, there may be non-linear effects where more mature industries accrue more debt because banks let them borrow relatively more on reasonable terms.

The possibility remains that the asset structure variable used here does not model the tangibility of assets. A bank should be less worried about bankruptcy risk, asymmetric information and agency costs of debt when the debt can be backed by collateral in the tangible assets. Several underlying hypotheses about capital structure determinants point in the same direction in the asset structure variable which is why this variable in this and other studies has proven to explain variation in capital structure.

A separate interpretation of the dummy variable coefficients is interesting, owing to the fact that the difference in debt ratio interception (level) of each industry can be clearly seen. Three out of the four dummy coefficients are significant, and it is observed that the constant is negative (i.e. the y-axis interception is negative). As the other industry's y-axis interception consists of the negative constant plus their respective dummy coefficient, every debt ratio interception is negative in this model. This is not possible, but the regression model estimation is only searching the regression line that best fits the entire dataset.

The ASV coefficient is positive, but only significant in both the models. This result is in accordance with the benchmark study, and also with the theory. The growth proxy, namely the MB ratio, is positive, but only significant at 12% in the unrestricted model. Every industry studied acquires therefore more debt when they are growing. Interpreted together with the negative and strong significant PRO regressor, this is an evident proof that companies use retained earnings (when they are growing) first when they are financing new projects (pecking order).

The SIZE coefficient shows strong significance, and indicates that the debt ratio grows with the size of the firm (measured through the natural logarithm of total assets). This is consistent when comparing with the results of Hall et al (2000) and the economy of scale effect presented by Barclay and Smith Jr (1995).

The AGE regressor is also significant in both the models, and the negative sign gives evidence of the pecking order theory in the sense that older firms probably are more able to accumulate retained earnings for new investments.

The RPEC regressor has a very low coefficient, even though significant. The same is also not significant in any of the separate industry regression models. Thus, the impact of RPEC on the debt structure can be ignored, making it unsuitable as a regressor.

5.5. *Hypothesis Testing*

The mathematical formulation of the hypothesis given in section 1.4 is as follows:
H0: $\beta 7 = \beta 8 = \beta 9 = \beta 0$
H1: The βi ($i = 7, 8, 9, 0$) are not all equal

Since there are four coefficients to be tested simultaneously, an F test shall be used.

$$F = \frac{\left(\frac{RSSr - RSSu}{m}\right)}{\left(\frac{RSSu}{n-k}\right)}$$

Degrees of Freedom = m, (n-k)

Where,
RSSr: Residual Sum of Squares in the restricted model;
RSSu: Residual Sum of Squares in the unrestricted model;
m: number of linear restrictions (m = 3);
n: number of observations (n = 717);
k: number of variables in the unrestricted model (k = 9)

Hence,

$$F = \frac{\left(\frac{4440.722 - 4236.060}{3}\right)}{\left(4236.\frac{060}{717 - 9}\right)}$$

Degrees of Freedom = 3, 708

The F-statistic is 11.402 and yields a p-value of $p < 0.00011$, which means that the null hypothesis is rejected (at 95% confidence level). Thus, there are differences in capital structure (i.e. debt ratio intercept) between the business industries studied.

6. CONCLUSION

In this paper supportive evidence has been found to the hypothesis that there are differences between industry capital structures. The regression on the BSE and NSE data collected, has with little doubt, rejected the null hypothesis of no industry differences. In addition, the independent industry regressions shed further light on what are the causes of these results.

The results are also consistent with the predictions presented earlier. Asset structure and Size are positively related to the debt ratio; profitability and age are negatively related to the debt ratio. Only the growth variable (MB) has a positive sign, in contrast to the predicted negative sign. This suggests that growing firms acquire more debt as they grow, opposite to the argument provided by Hall et al.

Additionally, some of the independent variables used performed quite similarly for all industries, suggesting that some factors have virtually the same impacts. These results can best be seen when looking at the results for the collateral and profitability variables.

The regression models obtained were –

1) Separate Industry Models –

a. Automobiles
TLTD = 0.147 + 0.539 ASV + (-0.002) MB + (-0.048) PRO + (-0.02) SIZE + 0.053 AGE + (-0.001) RPEC

b. Chemicals
TLTD = (-1.289) + 9.97 ASV + 0.263 MB + (-0.067) PRO + 0.119 SIZE + (-1.199) AGE + 0.005 RPEC

c. Computers
TLTD = 0.862 + 0.479 ASV + (-0.023) MB + (-0.001) PRO + 0.005 SIZE + (-0.2) AGE + 0.000 RPEC

d. Construction
TLTD = (-0.012) + 0.041 ASV + (-0.002) MB + (-0.03) PRO + 0.046 SIZE + 0.062 AGE + 0.000 RPEC

e. Food & Beverages
TLTD = 0.392 + 0.247 ASV + (-0.013) MB + 0.005 PRO + 0.05 SIZE + (-0.068) AGE + 0.000 RPEC

2) Pooled Regression Models

a. Unrestricted Model (With Dummies)
TLTD = (-1.552) + 7.487 ASV + 0.025 MB + (-0.062) PRO + 0.142 SIZE + (-0.597) AGE + 0.002 RPEC + (-0.612) Z1 + (-0.377) Z2 + 1.015 Z3 + 0.687 Z4

b. Restricted Model (Without Dummies)
TLTD = (-0.556) + 7.270 ASV + 0.018 MB + (-0.057) PRO + 0.210 SIZE + (-0.949) AGE + 0.002 RPEC

All of the significant coefficients from the separate regressions are in agreement with the theory and 'common sense,' except the coefficients for the constant terms which are negative. From a practical view, this should not be possible since none of the data points on the debt ratio were negative, but the nature of the OLS regression often forces negative values on the constant. Therefore this result would suggest that maybe a non-linear approach to designing a model should be used. A further point that is important in this context is the difference in the SIZE coefficient for the largest companies compared to the smallest. The theory and these findings build a strong case for a non-linear approach, at least for the SIZE variable.

Furthermore, the model did not consider corporate differences, like the corporate culture, which probably has a significant impact on the way an enterprise is run.

Suggestions for Further Research –

Further studies on this subject could include: an expansion of industries, other markets, market comparisons, or

[1] Calculated through http://faculty.vassar.edu/lowry/tabs.html#f at 0434 hrs on Feb 26, 2012

the inclusion of other variables. It may also be recommend the implementation of a variable that can capture the effects of the asset specificity better than just the asset structure variable, given that evidence was found in favor of it being an important factor.

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