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HOW TAX HYPOTHESIS DETERMINES DEBT MATURITY IN INDIAN CORPORATE SECTOR

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A B S T R A C T

Trade-off theory states that the optimum debt maturity is determined by a dynamic trade-off between the tax advantages of debt and deadweight cost of bankruptcy as the firms recapitalize with debt depending upon the term structure of interest rate and asset volatility. Therefore, the corporate tax rate, term structure, and asset variance jointly determine corporate debt maturity. This paper empirically examines how the tax hypothesis determines debt maturity in the Indian corporate sector using a panel data of 266 companies drawn from BSE 500 for the period 2000-2010. Our research findings unequivocally establishes that the tax rate, term structure and asset variance profoundly influence the debt maturity structure in Indian corporate sector. The statistically significant and negative coefficient on tax rate clearly indicates that optimal debt maturity is determined by the trade-off between the tax benefits of debt against the cost associated with financial distress and bankruptcy risk. The coefficient on term structure shows that in the periods of declining term structure and higher corporate tax rate, the firms maximize market value by increasing the proportion of short-term debt in the capital structure. The statistically significant but positive regression coefficient on asset variance rejects the tax hypothesis that debt maturity is inversely related to asset variance. The complex tax regime, high rate of corporate tax and dysfunctional corporate bond market have adversely affected the growth and development of the business and industry. Therefore, comprehensive reforms are required in tax code, and initiatives are to be taken for developing the corporate bond market by introducing diverse products, which can provide avenues for financing, investment, and risk diversification.

Keywords: Capital structure, Debt maturity, Leverage.

INTRODUCTION

The research in financial management gathered momentum with the release of Modigliani and Miller's (1958) seminal paper on the irrelevance theorem of capital structure. The irrelevance theorem establishes that under the perfect capital market conditions, optimal capital structure and optimal debt maturity decisions are irrelevant and cannot augment the market value of the firms. (Stiglitz (1974) and Miller (1977). The irrelevance theorem ignited extensive discussions and researches in financial management literature, which paved way for the emergence of static trade-off theory, pecking order theory and dynamic trade-off theory. The static trade-off theory states that the firms will seek to maintain optimal capital structure and debt maturity by balancing the interest tax shield of debt against the cost of financial distress that associated with increasing levels of debt. (Modigliani and Miller (1963), Kraus and Litzenberger (1973), Warner (1977), Jensen and Meckling (1976), Myers (1977), and DeAngelo and Masulis (1980).

The pecking order theory states that firm's financing deficit and information asymmetry determine the nature and maturity of securities issued in the market. In order to mitigate adverse selection and underinvestment problems, in an asymmetrically informed market, the managers seek to finance new projects with securities that are not undervalued by the market. The pecking order theory predicts that new investments are financed by internal funds first, followed by low risk debt and hybrid securities and equities as the last resort. (Myers (1984), Myers and Majluf (1984) and Shyam Sunder and Myers (1999). The

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dynamic trade-off theory states that the optimum capital structure and optimum debt maturity is determined by a dynamic trade-off between tax advantages of debt and deadweight cost of bankruptcy as the firms react to adverse shocks immediately by rebalancing capital structure and maintain high levels of debt to take the advantage of tax savings and interest rates. (Brennan and Schwartz (1984), Kane, at el (1985), and Brick and Ravid (1985).

These concepts have been synthesized to tax hypothesis, which gives rational explanations to the corporate debt maturity decisions. The debt maturity literature postulates that optimal debt maturity is determined by the trade-off between the tax benefits of debt and the costs associated with financial distress and bankruptcy. Therefore, the corporate tax rate, term structure and asset volatility determine corporate debt maturity. The primary objective of this paper is to examine empirically how tax hypothesis determines debt maturity decisions in Indian corporate sector. It is recognized that there exists a complex tax regime in which Indian companies are subjected to high rate of corporate tax rate, which is a major impediment to the growth and development of business and industry. The complex tax regime, complex industry structure, and dysfunctional corporate bond market offer a rare opportunity to study the relation between tax hypothesis and corporate debt maturity. Hence, this paper investigates how corporate tax rate, term structure and asset variance, and the imperfections prevail in the corporate debt market determine debt maturity in Indian corporate sector.

This paper empirically examines how the tax hypothesis determines debt maturity in the Indian corporate sector using a panel data of 266 companies drawn from BSE 500 for the period 2000-2010. The statistically significant and negative coefficient on tax rate clearly indicates that optimal debt maturity is determined by trading off the tax benefits of debt against the cost associated with the financial distress and bankruptcy risk. The research findings on term structure show that in the periods of declining term structure and higher corporate tax rate, the firms maximize market value by increasing the proportion of short-term debt. The regression coefficient on asset variance is statistically significant and positive as against the empirical research hypothesis that debt maturity is inversely related to asset variance. Thus, our research findings on tax hypothesis unequivocally establishes that the corporate tax rate, term structure and asset variance have profound influence on the debt maturity structure in Indian corporate sector.

This paper is divided into five sections. First section, introduction, briefly explains the rationale of this paper. The second section, review of literature, gives a review of theoretical and empirical works on the debt maturity. Third section, research methodology, describes the methodology adopted for examining the tax hypothesis and debt maturity. Fourth section, empirical investigation, examines the relation between tax hypothesis and debt maturity using descriptive statistics, correlation analysis and, regression analysis. The fifth section, analysis of empirical results, critically evaluates the regression results in the background of Indian corporate debt market. The last section, conclusion, concludes the research paper.

REVIEW OF LITERATURE

Debt Maturity (DEBTMAT): The debt maturity may be defined as the composition of short-term and long-term debt in the debt capital structure of firms. The proportionate relation between debt instruments with varying maturities in the debt capital is called debt maturity. The definition of debt maturity is the most controversial issue in the debt maturity literature because there are significant differences among the researchers over the measurement of debt maturity. However, the balance sheet approach is preferred method for measuring debt maturity among finance researchers. The debt maturity (DEBTMAT) is defined as the ratio of long-term debt (LTD) to total debt (TD). The long-term debt (LTD) is defined as that part of total debt, which matures in more than one year, excluding the portion of long-term debt that matures in current year.

$$DEBTMAT = \frac{Long\ Term\ Debt\ (LTD)}{Total\ Debt\ (\ TD)} \quad (1)$$

Tax Hypothesis: The theoretical and empirical literature on tax hypothesis establishes that the corporate tax rate, term structure, and asset variability are important factors that influence the firm's capital structure and debt maturity choice. The empirical literature has identified three proxies for testing tax hypothesis.

i. Tax Rate
ii. Term Structure
iii. Asset Variance

Corporate Tax Rate (TAXRATE): Kane, at el (1985) argue that the optimal debt maturity involves the trade-off between tax advantage of debt, bankruptcy cost, and debt issue flotation cost. Higher the transaction cost associated with the debt issue, the greater is the optimal debt maturity since more time is required to amortize the debt flotation cost. Because, at lower tax advantage, a longer debt maturity is required to amortize flotation cost incurred in issuing debt. Thus, the firms lengthen debt maturity as the tax advantages of debt decreases to ensure that the remaining tax advantage of debt and net bankruptcy costs is not less than the amortized flotation cost. Therefore, corporate tax rate inversely relates to debt maturity.

Lewis (1990) argues that, debt maturity strategy is irrelevant to the firm value because the taxable income is determined at both corporate and personal levels with respect to interest expenses and the aggregate expense is considered while determining the taxable income. Moreover, there is no tax distinction between short-term and long-term debt and different default risk levels assume to have no additional bankruptcy cost ramification.

The tax hypotheses establish that corporate tax rate negatively relates to debt maturity. We test the empirical hypothesis that tax rate and debt maturity are inversely related. The tax rate measured as the ratio of the tax paid to taxable income.

$$Tax\ Rate\ = \frac{Tax\ Paid\ (TP)}{Pre\ Tax\ Income\ (PTI)} \quad (2)$$

Term Structure (TERM): Brick and Ravid (1985) provide a tax based rationale for the optimum debt maturity and establish that debt maturity directly relates to term structure. The tax advantages to corporate borrowing and a non-flat term structure of interest rates, firm value may increase for long-term debt when the term structure increases. The reason is that the firm can accelerate interest tax shield on debt by increasing the proportion of debt payments allocated to long-term debt. In contrast, the firms can increase the present value of debt benefits by increasing short-term debt if the term structure is decreasing.

Newberry and Novack (2000) prove that debt maturity and term are directly related. The periods that are characterized by larger term premiums, firms issue bonds with longer maturity because the term structure effects of long-term bond provides acceleration of interest deductions significantly into the early years of bond obligations.

Ju and Yang (2006) demonstrate that the long-run mean of interest rate process determines optimal capital structure and optimal debt maturity in a stochastic interest environment. In an upward sloping term structure, firm optimally adjusts downwardly the coupon and principal of debt and in a downward sloping term structure, firm adjusts upwardly the coupon and principal of debt.

Gordon and Lee (2007) find that the net tax gain from the use of corporate debt is proportional to nominal interest rates so that behavioural response of firms should be larger when interest rates are higher. Hence, the firms should shift towards more long-term debt as long-term interest rates rise in relation to short-term rates.

The empirically testable research hypothesis is that debt maturity and term structure are positively related. The term structure of interest rate is measured as the difference between the month-end yields on 10-year government bond and 6-month government bond matched to the firms fiscal year end.

Term Structure (TERM) = (Month end yield on 10 year Govt. Bond)– (Month Yield on 6 month Govt. Bond matched to firm's fiscal year end). (3)

Asset Variance (ASSETVAR): Kane, at el (1985) demonstrate that the optimal debt maturity inversely relates to volatility in the firm value. The decreasing firm value volatility reflecting the fact that with less volatile the asset variance, firms rebalance their capital structure less frequently. A low asset variance causes firms to avoid rebalancing their capital structure frequently due to the concerns about expected bankruptcy costs. Such firms are expected to issue long-term debt rather than short-term debt. In other words, any changes in the firm value at high levels would induce the firms to issue short-term debt periodically due to the concerns of capital structure adjustments.

Wiggins (2001) argues that higher asset risk induces an increase in the optimal debt maturity. The risk and optimal maturity can be positively related because the sensitivity of the tax deductible default premium per unit time to risk increases with maturity, and tax shields on default premium can be earned before bankruptcy are forced at maturity of the debt.

Ju and Yang (2006) suggest that the debt maturity is determined by the trade-off between transaction cost and tax gains from optimally adjusting the future debt

levels. A firm rebalances capital structure frequently due to the high volatility in the firm value. However, a higher transaction cost associated with the rebalancing capital structure yields higher debt maturity because it is costly for firms to rebalance capital structure with short-term debt. If the tax rate and firm value volatility are very high, it is more valuable to rebalance the firm's capital structure with short-term debt that results in optimal short debt maturity. Thus, the firms dynamically adjust capital structure to obtain an optimal debt maturity by trading-off the tax benefits and recapitalization cost.

The empirically testable research hypothesis is that debt maturity is inversely related to asset variability. The asset variability (ASSETVAR) is proxied to the standard deviation of the first difference in earnings before interest and taxes and depreciation and amortization (EBITDA), scaled by the average book value of asset (BV).

$$Asset\ Variance = \frac{\sigma\ EBITDA}{Book\ Value\ of\ Asset\ (BV)} \quad (4)$$

CONTROL VARIABLES

Growth Option: The agency cost hypothesis suggests that debt maturity structure is one of the instruments that firms extensively exploit to mitigate the agency problems caused by conflicts of interest between shareholders and bondholders, including underinvestment and risky asset substitution. The empirical literature suggests that the leverage, short-term debt maturity, long-term debt with call and sinking fund provisions, secured debt, private bank debt are alternative solutions for resolving the agency problems of debt associated with information asymmetry and growth options. (Jensen and Meckling (1976), Myers (1977), Barnea, Haugen, and Senbet (1980), Stulz and Johnson (1985), Fama (1985).

The empirical literature on agency cost hypothesis predicts that debt maturity and growth options are inversely related. The growth option is proxied to the ratio of market value of asset to book value of asset (MV/BV). The market value of the asset is estimated as the book value of the asset plus the difference between the market value and book value of the equity shares.

$$Growth = \frac{Market\ \ Value\ of\ Asset\ (MV)}{Book\ Value\ of\ Asset\ (BV)} \quad (5)$$

Firm Size (SIZE): The debt maturity literature has identified firm size as one of the important determinants of corporate debt maturity structure because the firm size is a proxy that represents agency cost hypothesis, signaling hypothesis and liquidity risk hypothesis. The agency cost hypothesis predicts that smaller firms have high growth options and subject to high information asymmetry. Such firms are more likely to experience severe conflicts of interest between various stakeholders. Because of the agency conflict between the shareholders and managers, and the additional risk of financing growth opportunities, the debt holders tend to reduce the risk of lending to smaller firms by restricting the length of debt maturity. The empirical hypothesis suggests that debt maturity directly relates to firm size.

The firm size is measured as the natural logarithm of the estimated market value of the firm (MV) at constant 1993-1994 prices. The wholesale price index (WPI) serves as the deflator.

$$Firm\ Size (Size) = Natural\ Log\ of\ MV\ of\ the\ firm \quad (6)$$

Firm Quality: The signaling hypothesis establishes that the debt maturity is an appropriate and valid signal to the asymmetrically informed market about the quality of the firm. Leland and Pyle (1977), Ross (1977) and Flannery (1986) suggest that the managers would adjust the firm's debt maturity structure to signal their assessment about the true firm quality in an asymmetrically informed financial market. Therefore, debt maturity inversely relates to firm quality. Flannery (1986) prescribes the abnormal earnings or the firm QUALITY as the proxy for insiders' information about the firm quality. We estimates the firm quality as the difference between next year's and this year's earnings per share (EPS), scaled by this year's stock price (SP).

$$Firm\ Quality = \frac{EPS_{t+1} - EPS_t}{SP_t} \quad (7)$$

Bond Rating (BOND): The liquidity risk is the most important determinant of debt maturity choice since the relation between debt maturity and credit risk is rather complex. Johnson (2003) suggests that the economic relationship between growth options and debt maturity is determined by the trade-off between decreased agency cost and increased bankruptcy cost associated with the short-term debt. Diamond (1991) argues that the debt maturity choice is a trade-off between the borrower's preferences for short-term debt due to private information about future credit ratings and liquidity risk. Diamond establishes that debt maturity and credit risk are non-monotonically related and the firms with highest and lowest credit ratings prefer to issue short-term debt and firms with intermediate ratings issue long-term debt.

Owing to the lack of adequate data on bond rating for corporate debt instruments, we have adopted the equivalent bond ratings or emerging market model for constructing bond ratings, as proposed by Altman (1968). Firstly, we calculated Altman's Z-score for sample companies and then generated equivalent bond rating (AAA, AA, A, BBB, BB, B, CCC, D) for various Z-score intervals for the sample period 2000-2010. The equivalent bond ratings converted into cardinalized bond ratings, AAA=1, AA=2, A=3, BBB=4, BB=5, B=6, CCC=7, and D=8. Finally, these cardinalized bond ratings assigned to bond ratings (BOND) and the squared bond ratings (BOND) assigned to square bond (SQBOND). The bond ratings (BOND) and the squared bond ratings (SQBOND) test the Diamond's prediction of non-monotonic relation between debt maturity and credit ratings. The empirically testable proposition is that debt maturity positively relates to BOND and negatively relates to SQBOND.

Asset Maturity: The asset maturity (ASSETMAT) is the proxy for representing matching hypothesis. The matching hypothesis is based on the conventional maxim on debt maturity structure where long-term assets are financed with long-term debt and short-term assets are financed with short-term debt. The debt maturity decision involves a risk return trade-off between the costs and benefits of matching maturity of assets and debt. The maturity matching is a hedging mechanism and risk management strategy that can be effectively followed by firms to control the agency cost problems, information asymmetry and adverse selection, and liquidity risk. Therefore, debt maturity positively relates to asset maturity.

The asset maturity (ASSETMAT) is estimated as the ratio of the net property, plant, and equipment (PPE) divided by annual depreciation expense (DEP).

$$Asset\ Maturity\ = \frac{Plant,\ Property,\ Equipment\ (PPE)}{Depreciation\ (DEP)} \quad (8)$$

Leverage: The empirical studies on the determinants of debt maturity have treated leverage as control variable while determining the debt maturity. This is especially important when dealing with tax effect, because cross-sectional differences in leverage and associated debt tax shields may accompany cross sectional difference in debt maturity structure. Hence, researchers control for this effect by including measure of leverage in the empirical studies. The empirically testable research hypothesis is that debt maturity is positively related to leverage. The leverage is measured as the ratio of total debt (the sum of long-term debt, long-term debt due within one year, and short-term debt) to the estimated market value of the firm (MV).

$$Leverage = \frac{Total\ Debt\ (TD)}{Market\ Value\ of\ Firm\ (MV)} \quad (9)$$

RESEARCH METHODOLOGY

Data, Sample, and Variables: The empirical investigation of the relation between tax hypothesis and debt maturity utilizes the Panel OLS regression methodology. The data have provided by the PROWESS of Centre for Monitoring Indian Economy (CMIE). The sample is drawn from the BSE 500 index, which represents nearly 93% of the total market capitalization on Bombay Stock Exchange (BSE) and represents 20 industries. The financial firms and the firms with missing observations are excluded from the sample. The actual span of the study is confined to a period of 10 years from 2000-2010. The final sample is comprised of 266 companies representing 19 industries and the panel data has 2660 observations.

Panel Data: The panel data analysis is a method of studying a particular subject within both spatial and temporal dimensions. The panel data allows us to distinguish inter-individual differences from intra-individual difference by providing sequential observation for number of individuals and allows constructing and testing complicated behavioural models. The focus of panel data research is on controlling the impact of unobserved heterogeneity among the cross-sectional units over time in order to draw inferences about the population characteristics. (Hsiao (2003) and Baltagi (2005).

The pooled OLS regression, fixed effect regression, and random effect are important methods of panel data analysis. The Hausman test concludes that fixed effect regression is the preferred model for panel data analysis. The auto-correlation, heteroskedasticity, and cross-sectional dependence are some of the methodological problems related to panel data. The Wooldridge test, modified Wald statistic, and Pesaran CD test reveal that the panel data is subjected to autocorrelation, heteroskedasticity, and cross-sectional dependence. Consistent with the approach of Hoechle and Basel (2008), we apply Driscoll and Kraay non-parametric covariance matrix estimator that produces heteroskedasticity consistent standard errors, which are robust to very general form of spatial and temporal dependence.

Fixed Effect Regression: The fixed effect regression is

a method of panel data analysis, which controls the time invariant unobserved individual characteristics called fixed effects that might be correlated between the cross-sectional units over time, and draw inferences about the population characteristics.

The fixed group effect model examines group differences in intercepts, assuming same slope and constant variance across the companies. The fixed effect models use least squares dummy variable (LSDV) and within effect estimation methods. The fixed effect regression uses the OLS estimator that is based on the time-demeaned variables, called within estimators, or fixed effect estimators, which remove the unobserved time invariant individual fixed effects. The general formulation of the within effect fixed effects linear panel data model is given below:

$Y_{it} = \alpha_i + \beta_1 X_{it} + \varepsilon_{it}$ *i = 1, 2 ,……., N. t = 1, 2 ,……., T. (10)*

where, i = cross section dimension,

t = time series dimension,

Y_{it}*= dependent variable,*

X_{it}*= explanatory variable,*

β_1*= regression parameter,*

α_i*= unobservable time invariant individual fixed effects,*

ε_{it}*= disturbance term*.

Basic Regression Model: Based on the review of literature on the debt maturity, we use the Ordinary Least Square (OLS) regression methodology for the econometric modeling for studying the relation between tax hypothesis and debt maturity. The basic regression model is given below:

$$DEBTMAT = \alpha + \beta_1\left(\frac{TP}{PTI}\right) + \beta_2\left(\frac{\sigma\, EBITDA}{MV}\right) + \beta_3(TERM) + \beta_4\left(\frac{MV}{BV}\right) + \beta_5(SIZE) +$$

$$\beta_6\left(\frac{EPS_{t+1}-EPS_t}{SP_t}\right) + \beta_7(BOND) + \beta_8(SQBOND) + \beta_9\left(\frac{PPE}{DEP}\right) + \beta_{10}\left(\frac{TD}{MV}\right) + u_i \quad (11)$$

OR

$$DEBTMAT = \alpha + \beta_1(TAXRATE) + \beta_2(ASSETVAR) + \beta_3(TERM) + \beta_4(GROWTH)$$

$$+ \beta_5(SIZE) + \beta_6(QUALITY) + \beta_7(BOND) + \beta_8(SQBOND) + \beta_9(ASSETMAT) + \beta_{10}(LEVERAGE) + u_i$$

where, DEBTMAT = Debt Maturity , α = Intercept, β *= Coefficients for Independent Variables,* u_i*= Disturbance Term.*

Methods of Investigation: We have used the usual statistics such as descriptive statistics, Pearson's correlation analysis, and panel regression methodology for analyzing the nature of relation between tax hypothesis and debt maturity in Indian corporate sector.

EMPIRICAL INVESTIGATION

Descriptive Statistics: The descriptive statistics is designed to describe the data in meaningful and precise manner. The usual descriptive statistics such as mean, median, standard deviation, minimum, and maximum are used to explain the basic characteristics of both dependent variable and independent variables. Table 1 contains descriptive statistics for panel data on dependent variable and independent variables for 266 firms for 10 years during the period 2000-2010.

Table 1 shows that the dependent variable DEBTMAT (debt maturity) recorded mean and median of 0.5624 and 0.63, respectively with a standard deviation of 0.334. The high dispersion of debt maturity shows that debt maturity has been extremely varying across the sample for the period 2000-2010. This means that on an average 56% of the debt capital is financed through long-term debt and 44% by way of short-term debt.

Table 1: Descriptive Statistics.

Variables	Median	Mean	Std. Dev.	Minimum	Maximum
DEBTMAT	0.63	0.5624	0.3342	0	1.00
TAXRATE	0.23	0.2192	0.1749	0	3.83
TERM	1.14	1.377	0.8465	0.19	2.71
ASSETVAR	0.1	0.1103	0.0688	0.02	0.54
GROWTH	1.26	1.8432	1.5923	0	16.05
FIRM SIZE	6.79	6.8553	1.5061	0.32	12.13
QUALITY	0.007	0.0595	0.5756	-3.13	18.16
ASSETMAT	12.51	14.0294	8.4356	0	97.92
LEVERAGE	0.19	0.2359	0.2123	0	1.44

The moderate level of debt maturity may be ascribed to the dominance of bank debt, dearth of adequate long-term debt instruments, and underdeveloped state of Indian corporate bond market. As the banks are the major contributors to the corporate debt and most of the bank debts are in the nature of short-term, a moderate level of debt maturity in the Indian corporate sector is not a surprise. The data on debt maturity (DEBTMAT) shows that Indian corporate sector is characterized by a moderate level of debt maturity.

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The table 1 reveals that mean and median values of TAXRATE (tax rate) are 0.219 and 0.23, respectively with a standard deviation of 0.175 disclose the presence of high variation in the tax rate across the sample companies. This shows that the Indian companies are subject to high rate of taxation. The mean and median values of TERM (term structure) are 1.377 and 1.14 with a standard deviation of 0.8465 disclose the high volatility in the term structure of interest. The mean, median, and standard deviation of ASSETVAR (asset variance) are 0.110, 0.1, and 0.0688, respectively. The high levels of dispersion around the mean asset variability reflect the fact that the high asset volatility offers firms to issue more short-term debt in the capital structure. The values of mean and median for LEVERAGE is 0.2359 and 0.19, respectively with standard deviation of 0.212 explain the existence of large variation in the proportion of debt in the capital structure of sample firms. The high dispersion of tax rate and leverage imply that the high corporate tax rate and tax deductibility of interest on debt provides immense scope for the business houses to extensive exploitation of leverage.

The table 1 also shows that mean, median, and standard deviation of growth options (GROWTH) are 1.843, 1.26, and 1.592, respectively. The high dispersion around the mean growth options explains that Indian firms have valuable investment options. The mean and median values of firm size (SIZE) are 6.855 and 6.79, with a standard deviation of 1.50, show the low dispersion of firm size around the mean. The firm quality (QUALITY) has recorded mean, median, and standard deviation 0.0595, 0.007, and 0.5756, respectively, which indicate the incidence of high variation in the future abnormal profit across the firms. The mean and median values of asset maturity (ASSETMAT) are respectively 14.029 and 12.51 with a standard deviation of 8.435 explain that asset maturity varies widely across the sample companies. Since, the sample is comprised of small, medium, and large companies representing 19 different types of industries a wide disparity in the asset maturity across the sample is not a surprise.

Correlation Analysis: Pearson's correlation analysis examines the nature and extent of relations exists between the dependent variable and independent variables on debt maturity and tax hypothesis. Table 2 presents Pearson's correlation coefficients, which establishes the nature of relation between the debt maturity and tax hypothesis.

Table 2 shows that the correlation coefficient on DEBTMAT and TAXRATE is significant and negative. The significant and negative correlation between TAXRATE and DEBTMAT supports the empirical research hypothesis that an inverse relation exists between debt maturity and tax rate. The correlation coefficient between the DEBTMAT and TERM is positive and significant. The significant and positive relation between debt maturity and term structure strongly supports the research hypothesis that debt maturity varies directly with the slope of the term structure. The correlation coefficient on DEBTMAT and ASSETVAR is negative but insignificant. The insignificant correlation coefficient between debt maturity and asset variance rejects the empirical research hypothesis that optimal debt maturity inversely relates to asset variance.

Table 2 shows that the correlation coefficient on DEBTMAT and GROWTH is significant and negative. The significant correlation coefficient on growth options

strongly supports the research hypothesis that short-term debt maturity can mitigate agency problems. The correlation coefficient on DEBTMAT and firm SIZE is positive but insignificant. The insignificant correlation between debt maturity and firm size summarily rejects the empirical research hypothesis that debt maturity positively relates to firm size. The correlation coefficient on DEBTMAT and QUALITY is positive and insignificant. The positive and insignificant coefficient on firm quality and debt maturity rejects the empirical research hypothesis that debt maturity inversely relates to firm quality and debt maturity choice of the firm is valid signal to the asymmetrically informed market about the firm quality.

Table 2 indicates that the correlation between BOND and DEBTMAT is significantly positive. The positive and significant correlation between credit ratings and debt maturity indicates that the firms with higher credit risk use more long-term debt and firms with lower credit risk use more short-term debt. The significant and positive correlation on SQBOND is opposite of the empirical research hypothesis that an inverse relation exists between SQBOND and DEBTMAT. The significant and positive correlation between SQBOND and DEBTMAT shows that as the bond ratings deteriorates further firms use more long-term debt. The findings on debt maturity and bond ratings reject the empirical hypothesis and Diamond's prediction that debt maturity and bond ratings are non-monotonically related. The correlation between the DEBTMAT and ASSETMAT is positive and significant.

The significant and positive correlation coefficient on DEBTMAT and ASSETMAT strongly supports the empirical research hypothesis that debt maturity directly relates to asset maturity. The positive correlation between DEBTMAT and LEVERAGE strongly supports the empirical research hypothesis that debt maturity directly relates to leverage.

Table 2: Correlation coefficient for the Period of 2000-2010.

Variables	Debt mat
Debt mat	1.0000
Tax rate	-0.0985*
Term	0.0623*
Asset var	-0.0141
Growth	-0.1246*
Firm size	0.0184
Quality	0.0170
Bond	0.1494*
Sqbond	0.1419*
Assetmat	0.1807*
Leverage	0.2498*

*Significant at 10% level,

Regression Analysis: The main objective of the research is to investigate empirically how the tax hypothesis determines debt maturity in the Indian corporate sector. The dependent variable, debt maturity (DEBTMAT) is regressed on the independent variables, the tax rate, term structure, asset variance, growth option, firm size, firm quality, asset maturity, and leverage, using the cross section, pooled OLS, and fixed effect regression specification.

The table 4 presents the cross-sectional regression, pooled OLS regression, and fixed effects regressions of debt maturity on the relevant explanatory variables. The first column of the table lists the independent variables, and second column displays the hypothesized sign for the coefficient estimates and rest of the columns display the regression results for cross section, pooled OLS, and fixed effect regressions. The pooled OLS and fixed effect regression coefficients with auto-correlation, heteroskedasticity and cross-sectional dependence consistent Driscoll-Kraay standard errors and t-statistics are reported in parentheses.

Tax Hypothesis

Corporate Tax Rate (TAXRATE): Table 3 shows the coefficient estimate on TAXRATE is statistically significant and negative in fixed effect regression and is consistent with the empirical hypothesis that debt maturity inversely relates to corporate tax rate. The statistically significant and negative coefficient on tax

rate strongly supports the tax hypothesis that as the corporate tax rate increases, the firms issue more short-term debt and that yields optimal shorter debt maturity. Our research findings on tax rate validate the arguments of Kane, at el (1985) that the optimal debt maturity involves a trade-off between the tax advantages of debt, and the bankruptcy cost and flotation cost of debt issue. The research findings also substantiate the arguments of Brick and Ravid (1985) that the corporate tax implies the existence of optimal debt maturity structure and the optimal debt maturity structure is the result of trade-off between the costs and benefits of debt financing. However, our findings are inconsistent with Terra (2011) Stephan, Talavera, and Tsapin (2011) that corporate tax rate and debt maturity are positively related and firms with high marginal tax rate use effectively the interest tax shield cost by committing to long-term debt obligations.

Table 3: Cross-Section, Pooled OLS, and Fixed Effect Regression of Debt Maturity Structure on Independent Variables for 266 firms during the period 2000-2010.

Independent Variable	Hypothesized Sign	Cross-Section Regression	Pooled OLS Regression	Fixed Effect Regression
Taxrate	-	-0.320** (-2.00)	-0.0926*** (-3.75)	-0.0255*** (-2.84)
Term	+	...	0.0117 (0.82)	0.0240** (2.05)
Assetvar	-	0.612** (2.49)	0.180*** (5.36)	...
Growth	-	0.0338 (-2.40)**	-0.00826** (-2.05)	0.0120** (2.15)
Firm size	+	0.0304*** (2.69)	0.0221*** (9.91)	0.0184 (1.04)
Quality	-	0.00615 (0.09)	-0.00707** (-2.21)	-0.0152*** (-6.30)
Bond	+	-0.0506 (-1.47)	0.00355 (0.66)	0.0318*** (3.49)
Sqbond	-	0.00753 (1.61)	0.000393 (0.45)	-0.00315*** (-2.57)
Assetmat	+	0.00222 (1.04)	0.00467*** (5.39)	0.00446*** (4.15)
Leverage	+	0.317*** (2.76)	0.317*** (4.44)	0.202*** (5.94)
Intercept		0.385*** (3.36)	0.251*** (7.42)	0.215** (2.09)
R^2		0.184	0.090	0.5498
F		6.38***	328.81***	421.34***
N		266	2660	2660

NOTE: –Heteroskedasticity, autocorrelation, and cross-sectional dependence consistent t-statistics are reported in parentheses below parameter estimates.

* Significant at 10% level ** Significant at 5% level *** Significant at 1% level.

Term Structure (TERM): Table 3 shows that the estimated coefficient on term structure (TERM) in the fixed effect regression is positive and significant, which strongly supports the empirical research hypothesis that debt maturity positively relates to term structure. The significant and positive relation between debt maturity and term structure implies that the firms magnify the market value of the firm by optimally adjusting the debt maturity upwardly or downwardly by issuing long-term or short-term debt. The reason is that, during the periods of upward sloping term structure, the firm can accelerate interest tax shield of

debt by committing more long-term debt and during the periods of downward sloping term structure the firm can accelerate interest tax shield of debt by committing more short-term debt. Our empirical findings strongly support the arguments of Brick and Ravid (1991) Newberry and Novack (2000) that if the tax advantages to corporate borrowings, increasing corporate tax rate, and non-flat term structure, the value of the firms will be increasing in the proportion of long-term or short-term debt when the term structure is increasing or decreasing. The findings on term structure are consistent with the results of Highfield (2008), Stephan, Talavera and Tsapsin (2011) and Hajiha and Akhlaghi (2013) that positive association exists between the term structure and debt maturity.

Asset Variance (ASSETVAR): Table 3 indicates that the coefficient on asset variance (ASSETVAR) from the pooled OLS regression is positive and statistically significant. The statistically significant and positive asset variance (ASSETVAR) as against the empirical hypothesis summarily discards the empirical research hypothesis that debt maturity and asset variance are inversely associated. The findings on asset variance also rejects the empirical predictions of tax hypothesis that higher asset variance gives firms greater value for options to recapitalize by issuing short-term debt that result in an inverse relation between debt maturity and term structure. The research findings on asset variance strongly support the arguments of Wiggins (1990) that the higher firm value volatility induces firms to lengthen the debt maturity. Because the tax deductibility of default premium on debt increases with maturity and the tax shield of interest payments on long maturity debt is incrementally higher than that of short-term debt that can be earned before bankruptcy cost are faced at maturity.

However, our findings are inconsistent with the arguments of Kane, at el (1985) that optimal debt maturity is inversely related to the asset variance because, the low asset variance causes firms to avoid rebalancing their capital structure frequently with short-term debt due to the concerns about expected bankruptcy risk. The empirical findings summarily reject the arguments of Ju and Yang (2006) that the firm's flexibility to rebalance capital structure is like an option and higher the asset variability the greater is the value for the option to adjust the capital structure with short-term debt in future.

Control Variables

Growth Options: Table 3 shows that the estimated coefficient on growth options (GROWTH) options in fixed effect regression is significant and positive as against the empirical prediction of agency cost hypothesis. The regression coefficient on GROWTH is positive and significant but opposite of the empirical research hypothesis that debt maturity inversely relates to growth options. The significant but positive coefficient on GROWTH also repudiates the agency cost hypothesis that debt maturity and growth options are inversely related and firms with high growth options borrow short-term debt to mitigate agency cost problems including risky asset substitutions and underinvestment. The findings on growth options summarily reject the arguments by Jensen and Meckling (1976) and Myers (1977) that short-term debt can curtail agency problems. However, our result is consistent with the findings of Stohs and Mauer (1996) and Alcock, Finn and Tan (2008) that debt maturity positively relates to growth options as against the prediction of Myers (1977).

Firm Size: Table 3 shows that the coefficient on firm size (SIZE) is positive and insignificant as against the empirical hypothesis of agency cost hypothesis that debt maturity is positively related to firm size. The insignificant but positive coefficient on firm size (SIZE) summarily discards the agency cost hypothesis that the smaller firms tend to have more growth options and more likely to experience conflict of interest between shareholders and debtholders and the debtholders tend to reduce the risk of lending to smaller firms by restricting the length of debt maturity. The insignificant coefficient on firm SIZE establishes that firm size is not an important determinant of debt maturity structure in Indian corporate sector.

Firm Quality (QUALITY): Table 3 indicates that the firm quality (QUALITY) has statistically significant and negative impact on the corporate debt maturity structure. The statistically significant and negative coefficient on QUALITY strongly supports the empirical research hypothesis that debt maturity inversely relates to firm quality. The results on firm quality substantiate the signaling hypothesis that debt maturity structure is the managers' signal to the asymmetrical informed market about the quality of the firm. The significance of signaling hypothesis proves the arguments of Flannery (1986) that the debt maturity inversely relates to firm

quality and the debt maturity choice is a valid signal to asymmetrically informed market about the quality of firm. The findings also substantiate the arguments of Goyal and Wang (2009) that the borrower's willingness to subject financing costs to new information is the result of a trade-off between the favourable information about credit ratings and refinancing risk.

Bond Ratings (BOND): Table 3 presents the regression results on debt maturity and bond ratings, which provide strong support for the liquidity risk hypothesis. The coefficient estimate on BOND in fixed effect regression is statistically significant and positive, which confirms the liquidity risk hypothesis that firms with highest credit risk (lowest credit ratings) use more long-term debt and firms with lowest credit risk (high credit ratings) issue more short-term debt in the capital structure. The regression coefficient on SQBOND is negative and statistically significant in fixed effect regression. The statistically significant and negative coefficient on SQBOND proves that when the liquidity risk deteriorates further, the debt maturity increases but at a decreasing rate. Thus, the research findings on BOND and SQBOND strongly support the liquidity risk hypothesis that the debt maturity non-monotonically relates to bond ratings; firms with highest and lowest credit ratings prefer short-term debt and intermediate rated firms issue long-term debt.

Asset Maturity (ASSETMAT): Table 3 indicates that the estimated coefficient on asset maturity (ASSETMAT) is statistically significant and positive in fixed effect regression. The statistically significant positive coefficient on ASSETMAT is consistent with the empirical research hypothesis that debt maturity positively relates to asset maturity. This research finding on asset maturity empirically proves that Indian companies have been adopting the golden rule of finance, 'matching the maturity of assets and liabilities'. The research findings strongly support the arguments of Morris (1976), Myers (1977), Bougatef (2010) and Stephan, Talavera and Tsapin (2011) that maturity matching is hedging and risk management strategy that can safeguard the firms from the bankruptcy risk due to the non-synchronization of cash inflows and outflows from the assets.

Leverage: Table 3 shows that the estimated coefficient on LEVERAGE is statistically significant and positive in fixed effect regression. The positive and statistically significant coefficient on leverage (LEVERAGE) strongly supports the empirical hypothesis that leverage is directly related to the debt maturity. The positive relation between debt maturity and leverage implies that as the liquidity risk overwhelms the agency cost problems, the Indian firms employ more long-term debt in the capital structure. Our findings support the findings of Billett, King, and Mauer (2008) and Dang (2011) that the liquidity risk and financial flexibility are the important aspects of leverage and debt maturity choices, and firms with valuable investment growth opportunities control the agency problems by reducing the leverage and not by shortening the debt maturity.

ANALYSIS OF EMPIRICAL RESULTS

This section critically evaluates regression findings on the debt maturity structure with respect to the corporate borrowing strategies and corporate debt market functioning.

Corporate Tax and Debt Maturity: The research findings on the tax rate validate the empirical predictions of tax hypothesis that debt maturity inversely relates to corporate tax rate and the optimal debt maturity of the firm is determined by the trade-off between the tax benefits of debt against the cost associated with financial distress and bankruptcy.

The data analysis discloses that the corporate tax rate has been showing an upward trend during the period 2000-2010. The descriptive statistics show that the tax rate is highly volatile across the firms during the same period. These observations reveal that in India, there exists a complex tax regime and the corporate sector is subject to high rate of taxation. However, the high corporate tax rate offers immense options to maximize market value of the firms by increasing the interest tax shields by restructuring capital structure with appropriate debt maturity. These results prove that the high corporate tax rate and resulting increased tax shield induce Indian firms to issue more short-term debt that yield optimal short debt maturity. Perhaps the moderate level of debt maturity structure in Indian corporate sector might be due to the prevalence of complex tax regime and incidence of high rate of corporate tax.

The findings on tax hypothesis prove beyond the doubt that the corporate tax rate is an important determinant of debt maturity in the Indian corporate sector. However, the complex structure of tax regime and the high rate of corporate tax are undesirable for the industrial development. Therefore, comprehensive

reforms are required in the direct tax code to rationalize corporate tax rate, which can accelerate the growth and development of business and industry.

Term Structure and Debt Maturity: The significant coefficient on term structure is consistent with the empirical hypothesis that debt maturity positively relates to term structure. The descriptive statistics discloses that the term structure has recorded a sharp declining trend during the period 2000-2010. The declining trend in the term structure reveals that there was a drastic decline in the general interest rate, both on short-term and long-term interest rates. The debt maturity literature suggests that during the period of declining term structure the firms recapitalize with short-term debt for increasing the interest tax shield from short-term interest rates and decreased flotation cost. The positive relation between debt maturity and term structure implies that during the period of declining term structure firms issue more short-term debt.

The findings on liquidity risk and asset variance prove that the Indian corporate sector is subjected to high levels of liquidity risk that stems from the corporate debt market imperfections. The significant and positive relation between debt maturity and term structure proves that as the high liquidity risk outweighs the benefits from the decreasing term structure and high tax rate, the firms borrow long-term debt as safeguard against the refinancing risk and premature bankruptcy during the periods of high asset volatility. This could be the reason for the positive relation between debt maturity and term structure in Indian corporate sector.

Asset Variance and Debt Maturity: Though the statistically significant and positive coefficient on asset variance contradicts with the empirical predictions of tax hypothesis, the findings unambiguously establish that the asset variance is dominant factor in determining debt maturity in Indian corporate sector. The debt portfolio analysis reveals that traditional instruments dominate the corporate debt market and there is acute shortage of short-term debt instruments in the corporate bond market. The shortage of short-term debt instruments has exasperated the liquidity risk problems in the corporate sector. The findings on asset variance also indicate that the Indian companies are subject to high liquidity risk. Therefore, the companies adopt long-term debt strategy instead of short-term debt as a safeguard against the bankruptcy risk because the firms need not have to rebalance the capital structure frequently according to the volatility in the asset value. The acute shortage of short-term debt instruments and other imperfections in the corporate bond market force the firms to adopt long-term debt strategy. The significant and positive relation between debt maturity and asset variance signifies the fact that during the periods of high assert volatility the firms issue long-term debt and abandon the benefits of recapitalizing with short-term debt.

The research findings on asset variance establish that the Indian corporate bond market is characterized by acute shortage of quality short-term debt instruments. Hence, the government should take initiatives for developing an active and vibrant bond market by introducing diverse products that can provide avenues for financing, investment and risk diversification to the corporate sector.

CONCLUSION

The research has attempted to study the relation between debt maturity and tax hypothesis using panel OLS regression methodology by drawing a sample of 266 companies from BSE 500 (Bombay Stock Exchange). The research findings on tax hypothesis unequivocally establishes that the corporate tax rate, term structure and asset variance have profound influence on the debt maturity structure in Indian corporate sector. The statistically significant and negative coefficient on tax rate strongly supports the tax hypothesis that debt maturity inversely relates to tax rate. The upward trend in the corporate tax rate and high volatility in tax rate across the firms reveal that there exists a complex tax regime and the Indian corporates are subject to high rate of taxation. However, the high corporate tax rate offers immense options to increase interest tax shield and maximize the market value of the firms by recapitalize with appropriate debt maturity.

The significant and positive coefficient on term structure is consistent with the empirical hypothesis that debt maturity positively relates to term structure. The research findings show that during the periods of rising term structure and high corporate tax rate, firms maximize the firm value by increasing the proportion of long-term debt in the capital structure. The regression coefficient on asset variance is statistically significant and positive as against the empirical research hypothesis that debt maturity

inversely relates to asset variance. The findings on asset variance indicate that the Indian firms subject to high liquidity risk. The corporate debt market is imbibed with numerous market imperfections, including acute shortage of short-term debt instruments. As a result, the companies adopt long-term debt strategy instead of short-term debt as a safeguard against the bankruptcy risk because the firms need not have to rebalance the capital structure frequently according to the volatility in the asset value.

The complex structure of tax regime, high rate of corporate tax and dysfunctional corporate bond market are some of the imperfections, which have adversely affected the industrial development. The comprehensive reforms in the direct tax code and rationalizing corporate tax, introduction of next generation reforms in the corporate bond market, are the future policy direction, which can provide avenues for financing, investment and risk diversification to the corporate sector.

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