What Explains the Declining Corporate Debt Maturity of Pakistani Firms? The Analysis of Demand and Supply-Side Factors

Muhammad Afraz
Institute of Management Sciences, Peshawar
Attaullah Shah
Assistant Professor, Institute of Management Sciences, Peshawar

Abstract
The debt maturity of listed firms in Pakistan has shown significant decline over the last decade. In this study, we investigate changes in both the demand-side and supply-side factors that are responsible for this decline. For this purpose, we study 364 firms for a period of seventeen years, i.e. 1996 to 2012. Analysis of the demand-side factors reveals that the decrease in debt maturity is significantly explained by agency and maturity matching theories while information asymmetry theory has limited explanatory power. Further, analysis of the supply-side factors such as loans granted to private sector explains much of the reason of decrease in debt maturity structures. Overall, both demand and supply-side factors are responsible for the declining debt-maturity structures of Pakistani firms; however, much of the decrease is attributed to supply-side rather than firms' own characteristics or demand-side factors.
Keywords: debt maturity, demand-side factors, supply-side factors, agency theory, maturity matching, signalling, information asymmetry.

Investigating the temporal dynamics of debt maturity structure of Pakistani firms is relatively an unexplored avenue. There are few studies that investigate general determinants of debt maturity structure in Pakistan (see, e.g., Shah & Hijazi, 2004; Shah & Khan, 2009). However, these studies do not pay attention to the temporal changes in debt-maturity patterns. Our data shows that debt maturity of Pakistan firms has decreased significantly throughout the 17 years from 1996 to 2012. Though, such a decline is in line with the international evidence; for example, Custodio, Ferreira, and Laureano (2013) report that US firms experienced a significant decrease in debt maturity in recent times, still analysis of the factors responsible for it warrants careful analysis. Such an analysis might be important for policy formulation by regulators and corporate managers. The current study is an attempt to investigate whether the decrease in debt maturity is because of firms' own characteristics which may be termed as the 'demand-side factors', or is it because of the supply-side pressure, i.e. the market. Knowing these reasons are important because both the theory and empirical evidence have shown that excessive use of short-term debt leads to high liquidity risk (Diamond, 1991) and can even instigate a financial crisis (Buch & Lusinyan, 2000). This paper contributes to the extant literature in the following aspects.

First, it considers two aspects, "demand-side factors" and "supply-side factors" which affect the debt maturity. The demand side factors are influenced by various theories tested previously and are also

tested here. Supply side factors are also important in determining the debt maturity of firms (Custodio et al., 2013). Second, in addition to previous theories backing the debt maturity choices of firms, current study also tests some new aspects such as managerial ownership, dividend payments, profitability, and cash holdings as determinants of debt maturity. Third, the study also conducts a series robustness tests which include Tobit model, and Fama and MacBeth (1973) regressions. Fourth and last, this study considers a sample period of 17 years, i.e. 1996 to 2012, unlike previous studies that used limited data sets.

The scheme of the paper is as follows: Section 2 gives an account of extant literature on the topic, research hypotheses and theoretical framework. Methodology of the study is presented in Section 3 which includes population description, data collection sources, variables explanation and models used. Section 4 presents analysis of the study. This includes debt maturity graphs, and demand and supply-side regression results. Study concludes its findings in section 5.

Literature Review

In this section, we briefly discuss the theories that have implications for debt-maturity structure of firms.

Agency (Cost) Theory

The separation of control and ownership results in agency costs (Ishtiaq & Abdullah, 2015). Debt maturity minimizes these costs such as underinvestment (Myers, 1977), asset substitution (Jensen & Meckling, 1976), and overinvestment or free cash flow problem (Jensen, 1986; Ullah & Kamal, 2017). Speaking of underinvestment, Myers (1977) argues that a firm's future investment opportunities are like options. When a firm has much debt in its capital structure, the returns from undertaking a profitable project are split between debt holders and stockholders so much so that sometimes debt holders take much of the returns from the project, leaving less for the stockholders. Therefore, stockholders avoid investing in such profitable projects, known as underinvestment. In order to reduce this issue, Myers (1977) suggest many ways, one of which is to have short-term debt in firms' capital structures. This is because such debt will mature before the investment opportunities are undertaken, hence reducing the burden on firms. Usually, this phenomenon is evident in high growth firms

Agency theory is also related to a firm's debt ratio, i.e. leverage. This is because agency costs of debt are higher for highly levered firms and vice versa (Custodio et al., 2013). Leverage is considered either as an additional independent variable (Garcia-Teruel & Martinez-Solano, 2007; Scherr & Hulburt, 2001) or as an endogenous variable (Datta, Iskandar-Datta, & Raman, 2005; Arslan & Karan, 2006). Capital structure is an important determinant of debt maturity (Stohs & Mauer, 1996). Similarly, Leland and Toft (1996), Barclay and Smith (1995), and Johnson (2003) provide strong evidence that capital structure and debt maturity decisions

are interactive. Studies which have shown a positive relationship between leverage and debt maturity are Leland and Toft (1996), Mauer and Ott (2000), and Custodio et al. (2013). There are certain reasons for this positive relationship. Morris (1992) argues that firms which are highly levered may borrow on longer terms because they want to show that they would have earned enough money to repay their creditors. Whereas, Diamond (1991) argues that highly levered firms are more likely to issue long-term debt because of their high liquidity risks. However, there are also studies such as Scherr and Hulburt (2001) which have shown a negative relationship between leverage and debt maturity. They argue that even though firms which are highly in debt will opt for long-term debt to avoid the risk of insolvency, still banks will prefer to give short-term debt to such firms which are overly in debt. This argument supports the supply side factor. These arguments lead us to develop and test the following hypotheses:

Hypothesis: Debt maturity is negatively related to growth opportunities.
Hypothesis: Debt maturity is positively related to firm size.
Hypothesis: Debt maturity is either positively or negatively related to leverage (capital structure).

Maturity Matching Principle

Myers (1977) and Stohs & Mauer (1996) suggest that firms match maturity of their assets with that of their debts. Myers (1977) argue that at the end of an asset's life, new reinvestment decisions lay in front of firms. Issuing debt that matures at the same time helps firms to re-establish investment incentives whenever new investment is required. Whereas Stohs and Mauer (1996) say that if a firm has longer maturity of assets than its debt, it will have no funds to pay back its debt. On the other hand, if a firm has shorter maturity of assets than its debt, it will have idle cash in periods of low activity. Maturity matching argument is also indirectly related to agency cost theory discussed earlier. Myers' (1977) argument of maturity matching is actually a solution of underinvestment and asset substitution or risk shifting problem mentioned by Jensen and Meckling (1976). Asset substitution issue arises when shareholders of a firm which is having debt, have benefits in replacing low risk projects with high ones, i.e. change in investment strategy. This way shareholders try to maximize their wealth at creditors' expense (Jensen & Meckling, 1976). Again small firms mostly do this as they are highly levered because raising equity is difficult for them (Lopez-Gracia & Mestre-Barbera, 2013) and they have assets with short maturity, i.e. current assets (Myers, 1977). Consequently, because of more flexibility in such assets, they bear higher monitoring costs because of higher risk of change in investment strategy. For this reason, Fama (1985), Stohs and Mauer (1996), and Ozkan (2000) show that firms with more fixed assets will opt long-term debt financing. With these arguments, study proposes its second hypothesis:

Hypothesis: Debt maturity is positively related to maturity of assets.

Signaling Theory

This theory states that debt maturity choice can signal private information to the market and outside investors (Flannery, 1986). Diamond (1991) says that the use of short-term debt reduces the borrowing costs whenever good news is announced. Similarly, Flannery (1986) and Mitchell (1991) argue that short-term debt exposes a firm to frequent monitoring, so only good quality firms will opt for such kind of debt unlike bad quality firms. This also holds true for the transaction costs of debt. As short-term debt is rolled over, not all firms can refinance it over and over, leaving only high quality firms to do so. Similar to this quality notion, Huang, Tan, and Faff (2015) showed that debt maturity decreases with CEO overconfidence and high short-term borrowing is not deterred even if the firm is exposed to high liquidity risk. However, studies such as Guedes and Opler (1996), Stohs and Mauer (1996), and Custodio et al. (2013) have shown non-monotonic relationship between debt maturity and firm quality. This is because of the trade-off between signalling and liquidity risk as heavy use of short-term debt may lead a firm towards liquidity risk (Diamond, 1991). This trade-off suggests that both high quality firms as well as low quality firms will opt for short-term debt, whereas medium quality firms will opt for long-term debt (Custodio et al., 2013). With these arguments, we develop a third hypothesis:
Hypothesis: Debt maturity is negatively related to firm quality.

Information Asymmetry Principle

Information asymmetry refers to a scenario where information about a firm is not equally distributed between itself and the market in which it runs, i.e. when either of the parties knows more than the other (Ross, Thompson, Christenson, Westerfield, & Jordan, 2004). In relation to debt maturity, Custodio et al. (2013) argue that debt maturity falls highly for low tangible and research and development intensive firms. Firms choose a debt maturity which minimizes the effect of private information on cost of financing. By this argument, they suggest that firms with higher information asymmetry will prefer short-term debt to avoid locking cost of financing with long-term debt because they will expect to borrow at more favourable terms in future. This relationship of short-term debt with high information asymmetry is also showed by Barclay and Smith (1995), Berger, Espinosa-Vega, Frame, and Miller (2005), and Custodio et al. (2013). Also, Goyal & Wang (2013) add another dimension to this phenomenon. They show that a borrower's choice of debt maturity depends upon its private information about its default probabilities, i.e. borrowers with favourable information are more likely to issue short-term debt whereas borrowers with unfavourable information will prefer long-term debt. Information asymmetry is more pronounced in small size firms because they are more likely to produce less information about themselves

due to economies of scale in production and distribution of information (Pettit & Singer, 1985). For this reason, many studies such as Scherr and Hulburt (2001), Ozkan (2002), and Lopez-Gracia and Mestre-Barbera (2013) have used size as a measure of information asymmetry. Following these arguments, study tests the following hypothesis:
Hypothesis: Debt maturity is negatively related to information asymmetry.

Other Control Variables

In this section, other factors which influence debt maturity choice are described, other than the theories mentioned.

Managerial Ownership

Jensen and Meckling (1976), Jensen (1986), and Stulz (1990) argue that debt has a significant role in reducing agency problems between owners and shareholders. Keeping in view this fact, Datta et al. (2005) argued that all previous studies on debt maturity assume a perfect alignment of manager-shareholder interests which is not always the case, rather the conflict over corporate debt structure between managers and shareholders is based on the inherent preference of self-interested managers for less frequent monitoring. With this argument, short-term debt seems promising in reducing agency costs by subjecting managers to more frequent monitoring by external bodies. With these arguments, study proposes the following hypothesis:
Hypothesis: There's an inverse relationship between debt maturity and managerial stock ownership.

Dividends, Profitability and Cash

Moreover, Custodio et al. (2013) argue that firms who do not pay dividends are financially constrained and therefore are less likely to opt long-term debt. Profitability is also related to debt maturity choice. Custodio et al. (2013) find significant decrease in debt maturity among less profitable firms but insignificant decrease among profitable firms. Likewise, cash holdings are a determinant of firm debt maturity. Stohs and Mauer (1996) argue that mismatch between asset and debt maturities exposes the firm to liquidity risk. This means that firms with more short-term debt should have more liquid assets because short-term debt increases the prospects of liquidity risk and there should be a cash buffer to refinance this kind of debt (Shah, 2011). From above arguments, study proposes following hypotheses:
Hypothesis: Debt maturity is positively related to dividend payments.
Hypothesis: Debt maturity is positively related to profitability.
Hypothesis: Debt maturity is negatively related to cash holdings.

Supply-side Factors

In addition to demand-side factors, we also attempt to investigate whether the decreasing debt maturity ratios can be explained by supply-

side factors. Supply-side factors are also important in determining the debt maturity of firms (Custodio et al., 2013). Also, Lorente, Didier, and Schmukler (2016) posit that demand-side or firm level characteristics rely on balance sheet data, which, though important, however fail to realize the importance of market. Given this, we incorporate supply-side factors which can explain the decrease in debt maturity among non-financial firm. For this purpose, the current study measures supply-side element using a single variable, "loans granted to private sector firms by banks", because of unavailability of data regarding measures used by the above studies. As tight credit-supply conditions can explain the decrease in debt maturity, therefore study expects a positive relationship between loans granted to firms and their debt maturity, i.e. study proposes the following hypothesis: *Hypothesis: Debt maturity is positively related to loans granted to firms.*

Research Methodology

Initially, all listed non-financial firms were selected from Pakistan Stock Exchange (PSX). These firms were 406 in number and categorized in 28 non-financial sectors. However, we removed outliers and influential observations. For example, we dropped firms with negative equity. Finally, a sample of 364 firms with 5839 firm-year observations was left with us. Primary source of this data is "Balance Sheet Analysis of Non-Financial Firms" for a period of 17 years, i.e. 1996 to 2012. Some of the data is collected from other sources, such as managerial ownership, and research and development (*RnD*) expenses were collected from the annual reports of the firms.

Definitions of Variables

Following existing studies in Pakistan (see., Shah, 2011), debt maturity (*DEMA*) is the dependent variable of the study in all regression models. Debt maturity is calculated as the ratio of total fixed liabilities to total liabilities. Firm size is measured as the natural logarithm of total assets following Khan, Ijaz, and Aslam (2014). Growth opportunities is the geometric mean of annual percentage changes in total assets (*GWTH*). We also use a second proxy for growth, i.e., market-to-book equity ratio and capital expenditures-to-total assets (*CAPEX*) in our robustness tests. Asset maturity is calculated by taking the natural log of fixed assets over accumulated depreciation (denoted by *ASMT*). We use earnings as a proxy to measure firm quality. For this purpose, we define a dummy (*Quality*) variable which takes value as "1" if a firm has positive earnings consecutively for three years, and "0" otherwise. Information asymmetry is measured with the proxy of research & development expenses (*RnD*). We create a dummy variable to differentiate between firms who incur RnD expenditures and those who do not. Dummy takes the value "1" if a firm has RnD expenditures in a given year and "0" otherwise. Managerial ownership is measured as the percentage of shares held by the firm's board of directors in total shares outstanding (*MGO*). Leverage is measured as

total liabilities over total assets (*LEV*) following Ullah and Shah (2014). Following Custodio et al. (2013), we create a dummy variable (*Dividends*) which takes value as "1" if a firm pays dividends and "0" otherwise. Profitability is measured as firm's earnings before interest and taxes (*ROA*) over total assets. Cash is calculated as total cash over total assets.

Model Specification

We use panel regression model for testing our hypotheses. Dependent variable in all the regressions is the debt maturity (*DEMA*). Models are specified as under:

Demand-side Regressions

$$DEMA_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 GWTH_{it} + \beta_3 LEV_{it} + \beta_4 ASMT_{it} + \beta_5 Quality_{it} + \beta_6 RnD_{it} + \varepsilon_{it}$$

Supply-side Regressions

$$DEMA_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 GWTH_{it} + \beta_3 LEV_{it} + \beta_4 ASMT_{it} + \beta_5 Quality_{it} + \beta_6 RnD_{it} + \beta_7 LTPS_{it} + \varepsilon_{it}$$

Table 1 shows the summary statistics of all variables. It shows that average long-term debt to total debt ratio is 20% of the total debt. This ratio shows that long-term debt is a small portion of firms' total debt.

Table 1. *Summary Statistics*

VARIABLES	(1) N	(2) Mean	(3) Standard Deviation	(4) Minimum	(5) Maximum
DEMA	5,529	0.2025	0.2118	0.0000	1.0000
SIZE	5,543	7.0086	1.6327	0.0000	12.758
GWTH	4,303	0.1401	0.2234	-1.0000	2.0000
M/B	3,196	1.3513	2.6522	0.0000	21.000
CAPEX	2,296	0.0630	0.0737	0.0000	0.5632
LEV	5,543	0.5678	0.2213	0.0000	0.9996
ASMT	5,478	2.6406	0.7467	-5.9586	5.7038
Sales Growth	3,817	0.1523	0.2240	-0.8626	1.0000
Abnormal Earnings	5,114	-0.1675	3.7286	-20.000	18.000
RnD Expenses	5,843	0.0002	0.0057	0.0000	0.4295
Tangibility (PPE)	2,358	0.4591	0.2195	0.0000	0.9581
MGO	2,787	0.2314	0.2517	0.0000	0.9042
Dividends (D)	5,843	0.4398	0.4964	0.0000	1.0000
Profitability (ROA)	5,506	-0.1377	0.4911	-2.0000	0.8500
Cash	5,541	0.0514	0.1247	0.0000	2.9521

Analysis: Demand-Side Factors

In this section, we investigate whether the decrease in debt maturity is influenced by demand-side factors (i.e. firm characteristics). Chow, Breusch-Pagan, and Hausman tests are used before regression analysis to see whether pooled OLS, fixed, or random effects model is appropriate. Results of the three tests are presented in the following table.

Table 2. *Model Selection Tests*

		Results		Conclusion
Chow Test	Between Pooled OLS & Fixed Effects	F test all u_i	0.000	Fixed
		F(373, 3733)	7.740	
		Prob > F	0.000	
Breusch-Pagan Test	Between Pooled OLS & Random Effects	sigma_u	0.111	Random
		sigma_e	0.145	
		rho	0.373	
Hausman Test	Between Random Effects & Fixed Effects	Chi2 (6)	143.3	Fixed
		Prob > Chi2	0.000	

Based on two out of three tests, results reveal the appropriateness of fixed effects model for the study.

Table 3 shows the estimates of panel regressions of debt maturity over its determinants. Standard errors of the coefficients are stated in parenthesis. Signs ***, **, and * show level of significance at 1%, 5%, and 10% respectively. Column 1 presents the results of variables with industry fixed effects. Consistent with agency theory, size of the firm is positively and significantly related to debt maturity. One unexpected result corresponds to the variable growth which possesses a positive but insignificant coefficient. This is in contrast to the theory which says that high growth firms have negative relationship with debt maturity to reduce underinvestment problems. However, studies such as Stohs and Mauer (1996), Datta et al. (2005), and Shah and Khan (2009) also found mixed and similar results related to growth opportunities and debt maturity. Relationship of *LEV* with debt maturity is positive and highly significant, as consistent with much of the literature. Similarly, consistent with maturity matching principle, *ASMT* is positively and significantly related to debt maturity. Signalling hypothesis does not hold true as evident from the coefficient of quality dummy, which is positive and insignificant. Finally, information asymmetry theory is supported from the regression results, showing a negative and significant relationship of RnD expenditures with debt maturity.

Column 2 replicates the model in Column 1 except that it includes trend (t) variable to see the trend in debt maturity across years. Results obtained are similar to the first regression except RnD dummy which is insignificant now. The trend variable is negative and highly significant, showing a yearly decrease of 1.2% in debt maturity of firms.

Column 3 depicts model with firm fixed effects. Quality dummy is positive and significant, again inconsistent with the literature. Rest of the results are similar to Column 2.

Column 4 presents fixed effects model which includes three dummy variables which allow the intercept to shift in period 2000 to 2012 with respect to the period 1996 to 1999 (base). This is because the study wanted to see whether the model intercepts change in a significant way or not and also if the changes in debt maturity are due to the variables included in the model. Results show that two of such dummies (2004-2007 and 2008-2012) are negative and also significant, showing that firm characteristics are not the only reason for the decrease in debt maturity, rather some other factors are also responsible. The coefficient of 2008-2012 dummy is highest among other sub-period dummies in absolute terms (8.8%) which shows that much of the decrease in debt maturity is attributed to this period and that a bigger part of this decrease is not explained by the firms' characteristics included in the model. *GWTH* is also significant, though with a positive sign.

Column 5 presents firm fixed effects model excluding trend (t) variable but including year dummies. Just like the period dummies in Column 4, year dummies also provide an indication of a significant negative trend in debt maturity after controlling for other firm characteristics. Study finds that year dummies coefficients (not reported in Table 2) are negative and significant in 10 out of 17 years.

Column 6 shows panel regression results with pooled OLS. These regressions are run for comparison of results across models only. Results of OLS are like fixed effects models. Coefficient of *GWTH* is positive and insignificant. Quality dummy is insignificant with a negative sign and *RnD* dummy is negative and significant.

Lastly, Column 7 shows regression results with random effects model. Size, *ASMT*, and *LEV* bear the expected sign significantly. Growth is insignificant like previously. *Quality* is positive and significant and *RnD* is insignificant with negative sign. However, the trend variable is negative and highly significant in all models. Coefficient of the trend variable shows a significant decrease in debt maturity of 1% per year in all the models.

Robustness Tests

In this section, the study performs a series of robustness tests to give support to earlier demand-side regressions. It uses the fixed effects model in Column 2 of Table 2 as a benchmark to compare results as fixed effects model is the preferred choice based on model selection tests.

Results of robustness tests are shown in Table 3. Standard errors of the coefficients are stated in parenthesis. Signs ***, **, and * show level of significance at 1%, 5%, and 10% respectively.

Column 1 of Table 3 shows fixed effects model excluding utilities and financial services firms which are 13 in number. The reason they are excluded is because their capital structure is different from other firms and they are mostly heavily levered. Results are exactly similar to Column 2 of Table 2 except *GWTH* and quality dummy which are significant, though with positive signs.

Column 2 reports fixed effects model which incorporates different proxies for assets growth, quality dummy, and RnD variables. It measures growth by market-to-book equity ratio as measured by Barclay and Smith (1995) and Arslan and Karan (2006). Like *GWTH* in benchmark model, coefficient of M/B is positive and insignificant, showing again that underinvestment problem is not avoided by firms. Firm quality, measured by sales growth[1] has negative and significant coefficient unlike the benchmark model. This result is consistent with the signalling theory, i.e. high quality firms (high sales) have lower debt maturity ratios than low quality firms (low sales). Finally, information asymmetry is measured by tangibility[2]. Its coefficient is positive and significant and this result is consistent with the theory of information asymmetry, though inconsistent with the benchmark model. High tangibility (more fixed assets) means less information asymmetry and an increase in debt maturity.

[1] Calculated as the three year rolling average of annual percentage change in sales.

[2] Calculated as the ratio of total fixed assets to total assets.

Table 3. *Panel Regression of Debt Maturity: Demand-side Regressions*

VARIABLES	Predicted Signs	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE	(6) OLS	(7) RE
SIZE	+	0.0157***	0.0242***	0.0241***	0.00994	0.0230***	0.0206***	0.0206***
		(0.00430)	(0.00447)	(0.00709)	(0.00680)	(0.00721)	(0.00196)	(0.00368)
GWTH	-	0.00997	0.00695	0.0185	0.0358**	0.0192	0.00422	0.0126
		(0.0213)	(0.0200)	(0.0157)	(0.0156)	(0.0158)	(0.0136)	(0.0135)
LEV	+ / -	0.288***	0.247***	0.262***	0.278***	0.269***	0.215***	0.257***
		(0.0276)	(0.0272)	(0.0170)	(0.0172)	(0.0181)	(0.0134)	(0.0154)
ASMT	+	0.0650***	0.0761***	0.0485***	0.0479***	0.0482***	0.0912***	0.0607***
		(0.00905)	(0.00927)	(0.00478)	(0.00481)	(0.00482)	(0.00404)	(0.00439)
Quality	-	-0.0135	0.00878	0.0180***	0.0123**	0.0217***	-0.00631	0.0128**
		(0.00860)	(0.00883)	(0.00592)	(0.00617)	(0.00685)	(0.00629)	(0.00577)
RnD	-	-0.0366**	-0.0242	0.0116	0.0125	0.0116	-0.0679***	-0.0113
		(0.0158)	(0.0152)	(0.0158)	(0.0159)	(0.0158)	(0.0135)	(0.0148)
2000-2003 Dummy					-0.0153			
					(0.00937)			
2004-2007 Dummy					-0.0536***			
					(0.0105)			
2008-2012 Dummy					-0.0883***			
					(0.0123)			

Trend t		-0.0120***	-0.0113***			-0.0116***	-0.0111***
		(0.00140)	(0.00106)			(0.000857)	(0.000814)
Constant	-0.232***	-0.182***	-0.155***	-0.125***	-0.334***	-0.197***	-0.156***
	(0.0411)	(0.0401)	(0.0421)	(0.0443)	(0.0550)	(0.0175)	(0.0257)
Observations	4,048	4,048	4,113	4,113	4,113	4,113	4,113
R-squared	0.262	0.297	0.143	0.135	0.146	0.228	
Industry Dummies	Yes	Yes	No	No	No	No	No
Year Dummies	No	No	No	No	Yes	No	No
Number of id			374	374	374		374

Table 4. *Panel Regression of Debt Maturity: Robustness*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	FE	FE	FE	FE log	Tobit	F&M 1996-2002	F&M 2003-2006	F&M 2007-2012
Trend t	-0.00981***	-0.0110***	-0.00971***	-0.0676***	-0.0116***			
	(0.00109)	(0.00135)	(0.00137)	(0.0101)	(0.000857)			
SIZE	0.0158**	0.0316***	0.0443***	-0.0446	0.0206***	0.0277**	0.0301***	0.0120
	(0.00733)	(0.00820)	(0.00870)	(0.0676)	(0.00196)	(0.00482)	(0.00111)	(0.00619)
GWTH	0.0290*			0.524***	0.00422	-0.0652	0.0301	0.0778*
	(0.0173)			(0.155)	(0.0136)	(0.0397)	(0.0229)	(0.0314)
LEV	0.260***	0.258***	0.252***	1.136***	0.215***	0.302***	0.248***	-0.0109

	(0.0173)	(0.0209)	(0.0221)	(0.155)	(0.0134)	(0.0193)	(0.00694)	(0.0959)
ASMT	0.0484***	0.00922*	-0.00503	0.218***	0.0912***	0.128***	0.113***	0.0481**
	(0.00480)	(0.00556)	(0.00706)	(0.0478)	(0.00404)	(0.0113)	(0.00811)	(0.0162)
Quality	0.0209***			0.237***	-0.00634	0.0160	-0.00667	-0.0171*
	(0.00595)			(0.0524)	(0.00628)	(0.0521)	(0.0109)	(0.00799)
RnD	0.0109			0.195	-0.0679***	-0.109***	-0.0552	-0.0506***
	(0.0156)			(0.145)	(0.0135)	(0.0182)	(0.0268)	(0.0100)
M/B		0.00154						
		(0.00170)						
Sales Growth		-0.0233*						
		(0.0133)						
Tangibility (PPE)		0.290***	0.315***					
		(0.0274)	(0.0288)					
CAPEX			0.338***					
			(0.0460)					
Abnormal Earnings			0.000678					
			(0.000894)					
Constant	-0.116***	-0.241***	-0.365***	-2.481***	-0.197***	-0.439***	-0.450***	-0.0770
	(0.0429)	(0.0505)	(0.0558)	(0.414)	(0.0175)	(0.0194)	(0.0107)	(0.123)
Observations	3,968	2,894	2,174	3,292	4,113	1,272	1,300	1,541

R-squared	0.137	0.148	0.202	0.080	0.324	0.315	0.165
Number of groups	361	342	207	365	4	4	5

Column 3 uses two more proxies for growth and firm quality variables. Growth is measured by capital expenditures-to-total assets (*CAPEX*) and results are significant with a positive coefficient. Results with this proxy again provide inconsistent results with the theory, i.e. high *CAPEX* firms (firms with high growth opportunities) have higher debt maturity ratios than low *CAPEX* firms (firms with low growth opportunities). Firm quality is measured by future abnormal earnings[3] instead of earnings dummy and results are insignificant with positive coefficient as the benchmark model.

As debt maturity values are bounded at zero and one (censored data), study uses logarithm of debt maturity as the dependent variable and a Tobit model of debt maturity. Column 4 and 5 use the logarithm of debt maturity as a dependent variable and a Tobit model respectively. Under Column 4, *SIZE* is negative, though insignificant. Growth and quality dummy are also significant with positive signs. Under Column 5 of Tobit model, the coefficient of firm quality is negative but insignificant and *RnD* is significant with negative coefficient. Rest of the variables bear the similar sign as of benchmark model.

Column 6 to 8 incorporate the Fama and MacBeth (1973) methodology of cross-sectional regressions for three sub-periods, i.e. 1996 to 2002, 2003 to 2006, and 2007 to 2012. These regressions are run to further investigate the changes in debt maturity in response to firm characteristics, i.e. whether there is a change in the sensitivity of debt maturity owing to firm characteristics. Results for first sub-period (Column 6) are similar to the benchmark model except RnD dummy. Column 7 shows exactly similar results to that of the benchmark model. The last sub-period (Column 8) gives different results than the benchmark model. Size is positive but insignificant. Growth is again positive and also significant. Leverage becomes negative but the coefficient is insignificant. Quality dummy is significant with negative coefficient. Finally, RnD is significant with negative coefficient. Overall, the results of Fama and MacBeth regressions for the first two sub-periods are quite similar to the benchmark model, suggesting no significant changes in debt maturity due to firm characteristics. Coefficients are insignificant in most of the models, showing that not all of the firm characteristics included are responsible for the decrease in debt maturity. This is also consistent with Column 4 of Table 2 which included three sub-period dummies and results showed that a significant decreased in debt maturity was experienced in two sub-periods (2004-2007, and 2008-2012) which was not explained by the firm characteristics included. Moreover, the trend coefficient in all robustness models (where included) is negative and highly significant, again showing that debt maturity has decreased significantly across the years.

[3] Calculated as: Future Abnormal Earnings = Earnings $_{t+1}$ – Earnings $_{t}$ / Earnings $_{t}$

Study also attempted to treat debt maturity and leverage as jointly endogenous as one of its robustness tests because studies like Datta et al. (2005), Arslan & Karan (2006), and Shah and Khan (2009) have shown such simultaneity between debt maturity and leverage. However, the results of the Hausman test of simultaneity (not reported here) declared the absence of endogeneity between the two variables in the study.

Overall, demand-side regressions and robustness tests reveal that agency theory, and maturity matching theories significantly apply among non-financial firms of Pakistan. Information asymmetry theory is also found to be existing but not as significantly as agency and maturity matching theories. Whereas growth proxy of agency theory and signalling theory are found with mixed results. Growth and debt maturity show a positive but insignificant relationship in actual regressions and in most of the robustness models. Growth is further measured by book-to-market equity and *CAPEX* ratios and similar results are obtained. All these findings are also consistent with Stohs and Mauer (1996) and Shah and Khan (2009) who found mixed evidence for the effect of growth opportunities on debt maturity. Signalling theory of Flannery (1986) also not found to explain the decrease in debt maturity as robustly like other theories. Firm quality, as measured by a quality dummy is insignificant with a positive coefficient in the base or benchmark model. The dummy also shows significant positive relationship in other fixed effects models but none of the demand-side regressions show a significant negative coefficient as suggested by the theory. Study also found mixed results for firm quality in its robustness tests. Again, these results are similar to Shah and Khan (2009) who also did not find support for signalling theory in Pakistan. Study can relate the positive relationship between quality and debt maturity to the trade-off between maintaining quality and increased liquidity risk. As Diamond (1991) argues that higher use of short-term debt leads to liquidity risks also. This might be possible that high quality firms prefer lower debt maturity to avoid liquidity risk. Also, from supply-side perspective, such positive relationship can mean that high quality firms have access to high debt maturity ratios as opposed to low quality firms. Thus, the study gathers mixed results for firm quality. Finally, information asymmetry theory seems to follow in benchmark model but not in other fixed effects models. *RnD* dummy also shows consistent results with theory in most of the robustness models.

Other Control Variables influencing debt Maturity

Previous sections showed that a larger part of decrease in debt maturity is not explained by firm characteristics. In this section, the study considers few other variables to see if they can explain the decrease in debt maturity as stated in the literature. These variables are managerial ownership, dividends, profitability, and cash holdings. These variables are considered separately because most of them are not backed by existing

theories, though can also affect debt maturity as proven from the literature. Regression model for these variables is given below:

$$DEMA_{it} = \alpha_{it} + \beta_1 MGO_{it} + \beta_2 Dividends_{it} + \beta_3 ROA_{it} + \beta_4 Cash_{it} + \varepsilon_{it}$$

Table 6 shows the regression results of debt maturity and these variables. Standard errors of the coefficients are stated in parenthesis. Signs ***, **, and * show level of significance at 1%, 5%, and 10% respectively.

Table 6. *Panel Regression of Debt Maturity: Other Control Variables*

	(1)	(2)	(3)	(4)
VARIABLES	FE	FE	FE	OLS
MGO	0.0204	0.0217	0.0227	-0.0252
	(0.0428)	(0.0408)	(0.0409)	(0.0154)
Dividends (D)	-0.0646***	-0.0224*	-0.0195	-0.103***
	(0.0128)	(0.0133)	(0.0134)	(0.00798)
Profitability (ROA)	0.0558***	0.0695	0.0666	0.0670***
	(0.0120)	(0.0576)	(0.0576)	(0.00944)
Cash	-0.262***	-0.203***	-0.208***	-0.295***
	(0.0501)	(0.0541)	(0.0544)	(0.0312)
Age (Growth)	0.0493*	0.0610***	0.0627***	0.0964***
	(0.0250)	(0.0217)	(0.0219)	(0.00946)
Age (Mature)	-0.0185	0.00205	0.00262	0.00709
	(0.0192)	(0.0179)	(0.0180)	(0.00948)
2000-2003 Dummy			-0.000259	
			(0.0124)	
2004-2007 Dummy			-0.0414**	
			(0.0171)	
2008-2012 Dummy			-0.105***	
			(0.0209)	
Trend t	-0.0101***	-0.0125***		-0.00984***
	(0.00181)	(0.00216)		(0.000990)
Constant	0.319***	-0.216***	-0.286***	0.350***
	(0.0417)	(0.0790)	(0.0826)	(0.0139)
Observations	2,630	1,996	1,996	2,674
R-squared	0.313	0.420	0.419	0.188
Industry Dummies	No	No	No	No
Year Dummies	No	No	No	No

Column 1 reports industry fixed effects including only these variables. *MGO* is positively related with debt maturity with an insignificant coefficient. This finding is inconsistent with the literature which shows that managerial ownership is negatively related with debt maturity. Also, contrary to the literature, study finds that dividend paying

firms have negative relationship with debt maturity which is also significant. Profitability coefficient is positive and significant which is consistent with the theory that highly profitable firms have longer debt maturity ratios. Cash is also negative and significant, as consistent with the literature. Finally, study finds that growth firms (age 1-19) and have a positive and significant relationship with debt maturity, whereas mature firms (age 20-35) show a negative insignificant relationship. Growth firms have higher debt maturity ratios than stagnant firms (age 36 and onwards).

Column 2 replicates Column 1 including all other firm characteristics (coefficients not shown). *MGO* is again positive and insignificant, showing that *MGO* does not influence debt maturity ratio. Coefficient of dividends dummy is negative and significant, unlike the theory. Profitability is positive but insignificant, unlike Column 1 and theory. Cash is still negative and significant. Finally, the coefficients of growth firms and mature firms are positive but significant for only growth firms, showing that these two groups have a higher debt maturity ratio than stagnant firms.

Column 3 reports model with all other variables and also includes three sub-period dummies. Results are similar to Column 2 except dividends dummy which is negative and insignificant. 2008-2012 sub-period dummy still bears a high value of coefficient in absolute terms (10.5%) than other sub-period dummies, showing that a larger portion of decrease in debt maturity is still not fully explained by the variables included in the model.

Finally, Column 4 shows results with pooled OLS. Managerial ownership is negatively related with debt maturity but the coefficient is insignificant. Dividends show inconsistent results with the theory like fixed effects models. Profitability and cash show consistent results with the theory.

Overall, results of these regressions show that managerial stock ownership is not related to debt maturity. This result contradicts the theory which argues that managerial ownership plays a role in decreasing debt maturity. Study's results are in contrast to Datta et al. (2005) but consistent with the findings of Custodio et al. (2013). Dividends paying firms have lower debt maturity ratios unlike theory. Profitability also did not show a vivid relationship with debt maturity. Its coefficient is positive and significant (as consistent with the theory) when considered only along with these other aspects in a model but loses its significance when all variables (demand-side factors) are included. Cash is negatively and significantly related to debt maturity in all models as consistent with theory.

Actual and predicted Debt Maturity

The study also investigated the difference between actual debt maturity and the predicted debt maturity. It was conducted to determine the change in debt maturity unrelated to firm characteristics. Predicted

debt maturity was calculated first by running the Fama and MacBeth regressions for a period of 5 years, i.e. 1996 to 2000; then the coefficients of these regressions were used to predict the yearly debt maturity from 2001 to 2011. As the debt maturity related with firm characteristics is assumed to be fixed at its base values, changes in predicted debt maturity would occur as a result of changes in firm characteristics after 2000. The difference between actual and predicted debt maturity would therefore explain the change in debt maturity not related to firm characteristics. Un-tabulated results of mean differences between actual and predicted debt maturity showed that predicted debt maturity exceeded actual debt maturity in all years; and this difference became large throughout the 11 years' time span, i.e. from 1.8% in 2001 to 15% in 2011. The t-statistic between the two groups of debt maturity was also significant in all years. These results confirmed the earlier findings that firm characteristics are not the only factors for the decrease in debt maturity, rather other factors too are responsible for such decrease.

Supply-side Regressions

In this section, the study further investigates the reasons for decrease in debt maturity by looking at supply-side factors, for they also have a significant role in influencing debt maturity of firms as shown by Faulkender and Peterson (2006), Leary (2009), Lemmon and Roberts (2010), and Custodio et al. (2013). For this reason, the study collects data regarding the total loans granted by banks to private sector (denoted by *LTPS*) businesses as a supply-side factor or variable. This is because the debt maturity of firms is also dependent upon loans being granted to them. The study is interested to investigate whether the decrease in debt maturity of firms is because of the reluctance of banks to grant loans of higher debt maturity. A trend comparison of debt maturity with loans showed that average loans in 2006 were 16 percent of the total loans granted to firms and the average debt maturity of firms was 19%. In 2012, when loans decreased to 9%, the debt maturity also decreased to 12%.

Loans data is collected from "Credit / Loans Classified by Borrowers" sheet available on the official website of State Bank of Pakistan under Economic Data panel. However, there were two issues in collection of loans data. One was that data was available sector wise instead of firm wise and second, such data is available only for year 2006 and onwards and not before this period. For this reason, the supply-side regressions run by the study covers a period of seven years only, i.e. 2006 to 2012. Variable regarding loans is named as "*LTPS*" and is calculated as total loans divided by gross domestic product (GDP). Table 5 shows the estimates of panel regressions of debt maturity on its determinants. Standard errors of the coefficients are stated in parenthesis. Signs ***, **, and * show level of significance at 1%, 5%, and 10% respectively. It replicates Table 2 in all its models except that all models now include a new variable, i.e. loans granted (*LTPS*). Results show that loans granted

positively and significantly affects debt maturity in all the models. Moreover, the important thing to note is the magnitude of this variable. In all the models, the coefficient of *LTPS* bears the highest value (in absolute terms) among all other variables, even reaching to 69% in one of the models. This shows that the supply-side factor has a much pronounced effect than demand-side factors on debt maturity and the decrease in debt maturity is more because of supply-side variable than the firm characteristics. Also, the coefficient of 2008-2012 dummy in Column 4 has become insignificant and its magnitude is also decreased by a significant amount (in absolute terms) from 8.8% (when supply-side factor was not included) to only 0.04% (when supply-side factor is included). Coefficient of this dummy has also lost its negativity, endorsing the fact that supply-side factor has the most significant impact over debt maturity. These results are consistent with the findings of Faulkender and Peterson (2006), Leary (2009), Lemmon and Roberts (2010), and Custodio et al. (2013). Overall, supply-side factor has proved itself to be the major aspect in this study explaining the pronounced decrease in debt maturity of firms.

Rest of the results are as under: *SIZE* is positive and significant in all models. *GWTH* is positive in all models and significant also, unlike demand-side regressions. Leverage and asset maturity are positive and significant in all models as consistent with demand-side regressions. Quality dummy is found with mixed results again as in demand-side regressions. Lastly, *RnD* dummy is negative and significant in most of the models. Random effects model is not run for supply-side regressions.

Conclusion

The study attempted to investigate the reasons for the decrease in debt maturity of non-financial firms of Pakistan for a period of seventeen years, i.e. 1996 to 2012. The analysis shows that corporate debt maturity has decreased significantly throughout the span of 17 years, i.e. from 28% in 1996 to 12% in 2012. Study also showed a significant decreasing trend in debt maturity across different groups of firms. Taking the lead from existing models/theories of debt maturity, study first attempted to see whether the demand-side factors are responsible for this decrease or not. It considers four of such theories, i.e. agency theory, maturity matching theory, signalling theory, and information asymmetry theory. Based on model selection tests results, study opted fixed effects model as its main regression model and also as a benchmark for its robustness tests. However, study also ran pooled OLS and random effects regressions for comparison of results across models.

Study finds that agency, and maturity matching theories significantly explain the decrease in debt maturity of firms in all models. Information asymmetry theory is also found to be existing but not as significantly as agency and maturity matching theories. Whereas growth proxy of agency theory and signalling theory are found with mixed results across models, i.e. based on fixed effects model which is the preferred

regression model of the study, signalling theory does not seem to apply among Pakistani firms.

Growth proxy of agency theory also showed mixed results. Growth and debt maturity show a positive but insignificant relationship in all of the models. Growth is further measured by book-to-market equity ratio (M/B) and *CAPEX* ratio and similar results are obtained. Saving growth, however, other proxies of agency theory like firm size and leverage show conforming results with the theory. Like growth, signalling theory was not found to explain the decrease in debt maturity as robustly like other theories. Firm quality did not show a significant negative coefficient in any of the base regressions. Whereas, information asymmetry theory seems to follow in one of the fixed effects models and in most of the robustness tests.

The trend coefficients in all models (where included) are found to be negative and highly significant which shows that the trend in debt maturity is significantly decreasing with time even after controlling for other firm characteristics. This was further endorsed by time period dummies which the study included in one of its fixed effects models. One sub-period dummy, i.e. 2008 to 2012 showed a high coefficient value of about 8.8% (in absolute terms). The coefficient was negative and highly significant which showed that a larger portion of decrease in debt maturity is not explained by the variables included in the model.

Study also considered few control variables which are not backed by the existing theories but they too affect the debt maturity as shown by various studies. These variables included managerial ownership, dividends, profitability, and cash. Study did not find a significant negative relationship between managerial ownership and debt maturity in any of the models. Contrary to the theory, study finds a negative and significant relationship between firms who pay dividends and debt maturity. Profitability also did not show a vivid relationship with debt maturity. Its coefficient is positive and significant (as consistent with the theory) when considered only along with these other aspects in a model but loses its significance when all variables (demand-side factors) are included. Cash is found to maintain a significant negative relationship with debt maturity in all models.

Lastly, the study attempted to investigate the reason for this decrease in debt maturity from another perspective, i.e. the supply-side factor. Consequently, results showed a highly significant and positive relationship between *LTPS* and debt maturity in all of the models, showing that the supply-side factor has a much pronounced effect than demand-side factors on debt maturity and the decrease in debt maturity is more because of supply-side variable than the firm characteristics.

Overall, the study concludes that agency theory, and maturity matching theories significantly explain the decrease in debt maturity of Pakistani firms. Information asymmetry theory explain such decrease in debt maturity but not as significantly as agency and maturity matching

theories. Whereas signalling theory do not explain the decrease in debt maturity among firms. Moreover, both the demand and supply-side factors are responsible this decrease but the influence of latter is much more than the former in this decrease.

Study did not find significant evidence for signalling and information asymmetry theories among non-financial firms of Pakistan. It therefore asks for future researches in order to investigate the reasons for such inapplicability of these theories. Also, study considered only one variable as a proxy to measure the supply-side factor. Further investigation is required to identify more of such supply-side and credit supply factors which can affect the debt maturity of firms.

Table 7. *Panel Regression of Debt Maturity: Supply-side Regressions*

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	FE	FE	FE	FE	FE	OLS
Size	0.0162***	0.0176***	-0.0371**	-0.0243*	-0.0358**	0.0154***
	(0.00307)	(0.00313)	(0.0165)	(0.0143)	(0.0166)	(0.00275)
GWTH	0.0475***	0.0437**	0.163***	0.147***	0.163***	0.0681***
	(0.0177)	(0.0178)	(0.0305)	(0.0289)	(0.0306)	(0.0181)
LEV	0.123***	0.113***	0.201***	0.193***	0.209***	0.0787***
	(0.0200)	(0.0205)	(0.0286)	(0.0280)	(0.0305)	(0.0198)
ASMT	0.0453***	0.0459***	0.0187***	0.0187***	0.0182***	0.0545***
	(0.00549)	(0.00550)	(0.00688)	(0.00689)	(0.00694)	(0.00544)
Quality	0.00444	0.00229	0.0359***	0.0346***	0.0373***	-0.0113
	(0.00880)	(0.00885)	(0.0105)	(0.0105)	(0.0106)	(0.00868)
RnD	-0.0306*	-0.0305*	0.0274	0.0282	0.0290	-0.0590***
	(0.0163)	(0.0163)	(0.0275)	(0.0275)	(0.0275)	(0.0153)
LTPS	0.690***	0.553***	0.470***	0.412***	0.465***	0.111**
	(0.101)	(0.118)	(0.105)	(0.0967)	(0.107)	(0.0440)
2008 to 2012 Dummy				0.00409		
				(0.00892)		
Trend t		-0.00645**	0.00496			-0.0144***
		(0.00287)	(0.00339)			(0.00257)
Constant	-0.324***	-0.208***	0.105	0.0868	0.148	0.0281
	(0.0371)	(0.0637)	(0.0997)	(0.106)	(0.115)	(0.0435)
Observations	1,848	1,848	1,848	1,848	1,848	1,848
R-squared	0.222	0.224	0.138	0.137	0.140	0.130
Industry Dummies	Yes	Yes	No	No	No	No
Year Dummies	No	No	No	No	Yes	No
Number of id			347	347	347	

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