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The determinants of corporate debt maturity structure: A case study of Pakistan

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The study investigates the determinants of corporate debt maturity structure for a sample of 23 banks listed in the “Karachi Stock Exchange (KSE)”. This paper covers the six years period from 2005 to 2009. An overview of the theories related to the debt maturity structure of companies is presented in the literature review section. The practical section represents an econometric model that shows that long-term debt increases with asset maturity while decreases with company size and operating cycle. Tax rate was found to have a direct positive association with the maturity of debt in the pooled model but insignificant in the fixed effect. The impact of firm quality and leverage proved statistically insignificant.

Key words: Maturity structure of debt, Karachi stock exchange, stockholder, bondholder.

INTRODUCTION

There are two main areas of interest in corporate finance, as far as decision making is concerned. First one is capital structure which involves decision making between debt and equity. The second area covers maturity structure of debt, where a choice has to be made between short term and long term debt. The importance of debt maturity structure is the same as that of capital structure, but is usually not the focus of financial research, and there is limited empirical research in this field. Morris (1975) wrote the first paper in this field in which he focused on US companies. Mitchell (1993), Scherr and Hulburt (2001), Stohs and Mauer (1996) and Barclay and Smith (1995) also cover mainly US firms. While Ooi (1999) and Ozkan (2002, 2000) studied UK firms. In this paper we will find the determinants of debt maturity structure of Pakistani banks listed in “Karachi Stock Exchange (KSE)”, to fill this gap. Companies in developing countries usually find it difficult to obtain debt of long maturity, because capital markets are less developed and interest rates are unstable in developing countries. But as far as developed countries are concerned, the firms can easily choose between short term debt and long term debt, and both types of debt are available because capital markets as well as banking industry is developed and competitive. In this paper, we will empirically determine the factors that influence debt maturity structure of Pakistani banks.

So far in Pakistan, there is limited research conducted on debt maturity structure and one of the studies is carried out by Shah and Khan (2009), which empirically examined the determinants of debt maturity structure of non financial companies of Pakistan Shah and Hijazi (2004) found that there is a greater proportion of short term debt in total liabilities of Pakistani non financial firms. In developing countries there is higher percentage of short term debt as exhibited by the studies of Booth et al. (2001) and Demiriguc-Kwnt and Maksimovic (1999). So, we will have to answer the questions like what are the determinants of maturity structure of debt and how greater is the percentage of short term debt in KSE listed banks. Contributing to the empirical literature we will provide evidence on how Pakistani banks make a choice between short and long term debt.

LITERATURE REVIEW

Firms have to make a choice whether to issue equity or to borrow from lenders when they are seeking external
finance. Therefore, they have to choose debt maturity, if they want to issue debt. Firms will achieve target optimal debt maturity structure in existence of market imperfections such as financial distress, asymmetry of information and agency cost. However, in the framework of Modigliani and Miller’s (1958), there is no advantage to be taken from opportunistically switching between debt of short and long maturity. It is predicted in studies done before that firm characteristics determine optimal debt maturity subject to minimize the overall cost of capital. In their paper Antoniou et al. (2006) find the determinants of French, German and UK firms’ debt maturity structure. They sum up that firm specific factor’s determine the debt maturity choice. In another paper for a penal of non financial firms on four Asian countries for the period 1993-2001, Deesomak et al. (2009) study the determinants of debt maturity structure and finds that firm specific factors determine target optimal debt maturity structure of these companies. Minimizing the cost of capital is the main objective behind any capital structure decision. The maturity of debt can play an important role in minimizing the cost associated with debt financing as suggested by corporate finance literature.

### Maturity matching

Liabilities employed by a firm to finance its assets should be repayable at the time those items can generate sufficient cash flows to pay off the debt service it is called maturity matching principle. In the presence of risky debt firms need to pass up some profitable investment opportunities (Myers, 1977). This is called the problem of under investment.

By matching the maturity of a firm debt to that of its assets can overcome the problem of underinvestment (Myers, 1977). Furthermore he found that there is a positive association between asset maturity and maturity of debt. Firm’s must used debt of long maturity to finance assets of long maturity and the short term assets must be financed by short term debt. “The maturity matching principle is the most important determinant of the choice of debt maturity (Graham and Harvey, 2001). Firms with assets of long maturity use long term debt (Stothe and Mauer, 1996). They clearly mention that if firms finance long term assets by short term debt or even if they finance short term assets by long term debt then they will face the problem of liquidity insufficiency. Debt of long maturity is used to fund fixed assets to conduct the maturity matching of Czech firm’s balance sheet (Korner, 2007). Asset maturity has a significant impact on debt maturity in the case of Chinese firms (Cai et al., 2008). Similarly in a study conducted by Correia (2008) on a sample of UK based non financial firms, he finds that the managers in those firms follow the principle of maturity matching.

\[ H_1: \text{There is direct positive correlation between asset maturity and debt maturity.} \]

### Debt maturity and signaling theory

According to this theory when firm use a specific type of financing option then they generate signals to the outside world about their credit policy or their cash flows. The cost of asymmetric information between managers and investors can be reduced by debt maturity (Flannery, 1986). He theoretically proves that good firms will issue short term debt and will consider their long term debt to be under priced if bond market investors cannot isolate good firms from bad ones in contrast bad companies will sell overpriced bonds. He further says that good quality firms will be more willing to use debt of short maturity because short term debt subjects a firm to more frequent monitoring therefore debt maturity serves as a signaling device. Good quality firms are better equipped to face refinancing risk and the interest risk of short term debt therefore, they can use more of short term debt (Jun and Jen, 2003). Due to the transaction costs associated with debt of short maturity small companies will not use short term debt which may not be the case for high quality firms.

\[ H_2: \text{There is negative association between firm performance and debt maturity.} \]

Large companies possess low risk because they present a low degree of asymmetry of information. Both low risk and high risk firms prefer debt of short maturity (Diamond, 1991). Negative association between firm size and debt maturity was found by Heyman et al. (2003) and Scherr and Hulburt (2001). On the contrary, Morris (1976) finds direct positive association between size and maturity of debt because it is difficult for smaller firms to make excess to the capital markets due to the fixed flotation cost associated with long term securities. Thus, following Heyman et al. (2003) and Scherr and Hulburt (2001) we expect negative association between size and dependent variable maturity of debt.

\[ H_3: \text{Large firms will have less amount of long term debt.} \]

### Debt maturity and leverage

Firms with high debt ratio will have high amount of long term debt (Morris, 1976). He further said that in order to postpone their exposure to bankruptcy risk high levered companies will try to increase their debt maturity (Morris, 1992). Theoretically firms with higher leverage tend to choose longer debt maturity (Leland and Toft, 1996). Leverage has a significant positive relationship with maturity structure of debt for Czech companies (Korner,
2007). But the agency theory states that high levered companies will have less long term debt. To overcome the conflict between stockholder (equity holder) and bondholder (debt holder) high levered firms will use more of short term debt in spite of the fact that it will subject them to high transaction cost. Thus we assume in this paper that firms will go for long term debt in order to delay the default risk.

H₄: leverage has a positive association with maturity of debt.

**Tax based model**

According to Shah and Khan (2009) a firm will use long term debt after adjusting for the default risk and when the rate of interest is expected to increase, the reason is that long term debt reduces the estimated tax expense. This is called the tax based model presented by Brick and Ravid (1995). The decision of capital structure is made before the decision of maturity of debt and this is the basic assumption of tax based model. When the two decisions of corporate finance capital and debt maturity structure are made at the same time then the value of the firm is not affected by taxes (Lewis, 1990). The optimal debt maturity increases with, increasing flotation costs, decreasing corporate debt tax shield and decreasing the volatility of the company value (Kane et al., 1985).

H₅: Tax rate is negatively related with debt maturity.

**DATA AND MEASUREMENT OF VARIABLES**

The paper tests different firm specific characteristics that affect maturity structure of debt. The sample consists of listed banks in KSE during the period 2006-2009. Data has been taken from financial statements of banks. These financial statements represent the most recent source of data available at the time of the study. Also data has been extracted from KSE and Bloomberg business week. The study sample consists of 23 banks from a population of 28 listed banks. Inclusion in the study sample required that banks meet the following screening criteria: (1) the bank has to be listed in the KSE during the period 2006-2009. (2) Availability of complete information on all variables. Applying these criteria’s, the resulting sample consists of 23 banks.

**Dependent variable**

We use dependent variable of debt maturity (DEMA) in our model. Different studies have used different measures for example debt maturing in five years, one year to total debt (Ozkan, 2000). Moreover the ratio of debt maturing in more than three years has been used by Barclay and Smith (1995) and Varouj et al. (2005). Following Shah and Khan (2009) we proxy debt maturity as debt maturing in more than one year divided by total debt, as our data source does not provide data on different maturities of debt.

DEMA = debt maturing in more than one year/total debt

**Explanatory variables**

**Size**

We expect a negative relationship between variable size and dependent variable following Heyman et al. (2003) and Scherr and Hulburt (2001). There are different measures of size. Following Shah and Khan (2009) we measure size by taking natural log of total assets.

**Asset maturity**

The cash flow of a firm asset will not be enough to meet its debt obligations, if its debt maturity is shorter than its assets maturity (Stohs and Mauer, 1996). Thus, following Myres (1977), Stohs and Mauer (1996), Korner (2007), Khemaies (2010) and Shah and Khan (2009) we expect positive relationship between asset maturity of debt. In this paper we use two proxies for assets maturity;

Assmat= fixed assets/annual depreciation

Oppcycle= sales/ fixed assets

As far as the first measure is concerned it will capture the maturity of fixed assets whereas the second will capture the yearly fluctuations in operational activities. The firm will use short term assets to finance sales when it has a high operating cycle ratio.

**Firm quality**

Our next explanatory variable is firm quality. Following Khemaies (2010) and Shah and Khan (2009), we expect that the association of firm performance with dependent variable is negative. We proxy firm quality as:

Quality= net income before taxes/total assets

**Tax rate**

The optimal debt maturity structure is determined by a trade off that exists between three factors, flotation costs, bankruptcy costs and the benefits of tax shields (Kane et al., 1985). They further say that with the benefits of tax shield the maturity of debt decreases while increases with flotation costs. Following Shah and Khan (2009) we have taken annual tax expense and divide by pretax income to measure variable tax rate.

**Leverage**

To investigate the relevance of the effects of leverage on the choice of maturity structure of debt, we proxy leverage as:

Leverage= total debt/total assets

**Regression equation**

We regressed debt maturity on six explanatory variables size, asset maturity, operating cycle firm quality, tax rate and leverage that reflect firm specific characteristics. The regression equation can be written as:

\[ D1/TD = \alpha + \beta_1 \text{SIZE} + \beta_2 \text{AssMat} + \beta_3 \text{OppCycle} + \beta_4 \text{Quality} + \beta_5 \text{TAX RATE} + \beta_6 \text{LEV} + \epsilon \]

Where; D1 = debt maturing in more than 1 year, TD = total liabilities,
Table 1. Descriptive statistics for six years period.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Skewns</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEMA</td>
<td>0.0001</td>
<td>0.2226</td>
<td>0.047999</td>
<td>0.0392</td>
<td>2.378</td>
<td>7.199</td>
</tr>
<tr>
<td>Size</td>
<td>7.48</td>
<td>13.76</td>
<td>11.5498</td>
<td>1.4735</td>
<td>-0.876</td>
<td>0.545</td>
</tr>
<tr>
<td>Asset maturity</td>
<td>0.8113</td>
<td>136.701</td>
<td>9.2614</td>
<td>21.4898</td>
<td>4.864</td>
<td>24.231</td>
</tr>
<tr>
<td>Operating cycle</td>
<td>-4.2818</td>
<td>11.7912</td>
<td>1.8907</td>
<td>2.1773</td>
<td>1.611</td>
<td>5.464</td>
</tr>
<tr>
<td>Firm quality</td>
<td>-0.1037</td>
<td>0.2585</td>
<td>0.014624</td>
<td>0.0532</td>
<td>2.245</td>
<td>9.127</td>
</tr>
<tr>
<td>Tax rate</td>
<td>-3.1977</td>
<td>2.2327</td>
<td>0.251898</td>
<td>0.5196</td>
<td>-3.206</td>
<td>25.101</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.5023</td>
<td>1.1619</td>
<td>0.863215</td>
<td>0.0994</td>
<td>-1.229</td>
<td>2.732</td>
</tr>
</tbody>
</table>

α = intercept, β1 = unknown parameters, εt = error term. We use panel data techniques to estimate this model. Panel data enables us to find some effects that cannot be detected by the use of time series analysis, it also enhance the quality and quantity of data. Panel data regression provides three estimators. The first which takes α as the same across all cross section units is a pooled estimator. The second one is fixed effect model which takes αi to be a group specific term. Whereas third one takes αi as a group specific disturbance. However in this paper we have only used pooled and fixed effect model.

RESULTS AND DISCUSSION

Descriptive statistics

Table 1 consists of the descriptive statistics for the dependent variable debt maturity and six explanatory attributes. The sample includes 23 banks listed in KSE. The research covers the period of 2006-2009. Debt maturity has a mean value of 0.047999; with the variation of individual data set vary from the mean of 0.0392435. The results indicate that Pakistani banks have only 5% debt of long maturity. So a large portion of total liabilities consists of debt of short maturity. Thus it indicates that banking sector is less dependent on long term debt. The value 2.378 indicates that the distribution of debt maturity is positively skewed and the kurtosis of 7.199 shows that the distribution is leptokurtic sharper than a normal distribution, with values concentrated around the mean and thicker tails. Long-lived assets have a share of 9.26 in total assets. The firms in the banking sector are more levered; they are more reliable on debt as compare to equity 86%. The independent variables denoted by Size, operating cycle, firm’s quality, tax rate and leverage have mean values of 11.5498, 1.890762, 0.014624, 0.5196, and 0.863215, respectively.

Correlation matrix

Table 2 consists of the correlation matrix for explanatory variables. As it can be seen in the table that explanatory variables has a generally low coefficient of correlation. However there exist some moderate correlations as well. The association of variable size with asset maturity is negative whereas positive with quality and leverage which means that larger firms have fewer amount of long lived assets but on the other hand they are more profitable and rely on debt. Leverage increases with size of a firm because large companies are more diversified and bear less risk, therefore lenders are willing to give them loans as compare to smaller firms. Banks with large amount of long lived assets will have longer operating cycle. Leverage is negatively correlated with asset maturity, which means that firms do not use their long lived assets as collateral to obtain debt financing.

Regression results

Table 3 and 4 presents the regression results. We have used two estimators of panel data pooled and the fixed effect. In the pooled least square the R-square value shows that only 26% of the variation in the dependent variable debt maturity is explained by the independent variables. But in fixed effect a high 56% of the variation in debt maturity decision of the firm is explained by the independent variables. The remaining variation is due to other factors not studied in this article.

We found that size has a significant negative impact on the debt maturity structure, which means that larger firms tend to have less long term debt. Our result supports the findings of Heyman et al. (2003) and Khemias (2010). In contrast, Shah and Khan (2009) and Korner (2007) found significant positive association between size and debt maturity structure. The positive coefficient of the variable asset maturity indicates that it is positively related to maturity of debt and this association is statistically significant. Thus our result supports the maturity matching principle. Thus, we can say that there is an existence of conformity between asset life cycle and the maturity of debt.

Furthermore the result indicates that for the purpose of guaranteeing some concurrence between debt services and cash flow generated by the underlying asset, firms in the banking sector of Pakistan finance their long lived assets by debt of long maturity. The problem of underinvestment can be resolved by the association between maturity of debt and the asset life cycle (Myers, 1977). Morris (1976), Shah and Khan (2009), Cai et al.
Table 2. Correlation matrix of explanatory variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Size</th>
<th>Asset maturity</th>
<th>Operating cycle</th>
<th>Firm quality</th>
<th>Tax rate</th>
<th>Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset Maturity</td>
<td>-0.552**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Cycle</td>
<td>-0.168</td>
<td>0.511**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm Quality</td>
<td>0.341**</td>
<td>0.070</td>
<td>0.239*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax Rate</td>
<td>0.065</td>
<td>-0.053</td>
<td>-0.123</td>
<td>-0.077</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Leverage</td>
<td>0.528**</td>
<td>-0.410**</td>
<td>0.004</td>
<td>0.115</td>
<td>0.007</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 3. Regression results of pooled least square.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. error</th>
<th>t-statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.0879</td>
<td>0.0469</td>
<td>1.8752*</td>
<td>0.0642</td>
</tr>
<tr>
<td>Size</td>
<td>-0.0070</td>
<td>0.0036</td>
<td>-1.9153*</td>
<td>0.0588</td>
</tr>
<tr>
<td>Asset maturity</td>
<td>0.0005</td>
<td>0.0002</td>
<td>2.3177**</td>
<td>0.0229</td>
</tr>
<tr>
<td>Operating Cycle</td>
<td>-0.0016</td>
<td>0.0021</td>
<td>-1.9458*</td>
<td>0.0548</td>
</tr>
<tr>
<td>Firm quality</td>
<td>0.0513</td>
<td>0.0795</td>
<td>0.6452</td>
<td>0.5206</td>
</tr>
<tr>
<td>Tax rate</td>
<td>0.0164</td>
<td>0.0071</td>
<td>2.2898**</td>
<td>0.0245</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.0325</td>
<td>0.0455</td>
<td>0.7148</td>
<td>0.4767</td>
</tr>
</tbody>
</table>

R-squared 0.2617, Mean dep var 0.0476
Adjusted R-squared 0.2090, S.D. dep var 0.0393
S.E. of regression 0.0349, Sum squared resid 0.1028
F-statistic 4.9640, DW stat 1.5398
Prob (F-Statistic) 0.0002

**significant at 5% level, *significant at 10% level.

Table 4. Regression results of fixed effect model.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. error</th>
<th>t-statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>-0.0269</td>
<td>0.0129</td>
<td>-2.1728**</td>
<td>0.0323</td>
</tr>
<tr>
<td>Asset maturity</td>
<td>0.0028</td>
<td>0.0006</td>
<td>4.2544**</td>
<td>0.0001</td>
</tr>
<tr>
<td>Operating Cycle</td>
<td>-0.0055</td>
<td>0.0031</td>
<td>-1.8615*</td>
<td>0.0731</td>
</tr>
<tr>
<td>Firm quality</td>
<td>0.1766</td>
<td>0.2123</td>
<td>0.8315</td>
<td>0.4088</td>
</tr>
<tr>
<td>Tax rate</td>
<td>0.0092</td>
<td>0.0080</td>
<td>1.1419</td>
<td>0.2579</td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.0529</td>
<td>0.0575</td>
<td>-0.9199</td>
<td>0.3612</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.5694</td>
<td>Mean dep var</td>
<td>0.0476</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.3750</td>
<td>S.D. dep var</td>
<td>0.0393</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.0311</td>
<td>Sum squared resid</td>
<td>0.0600</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>16.4016</td>
<td>DW stat</td>
<td>1.8056</td>
<td></td>
</tr>
<tr>
<td>Prob (F-Statistic)</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**significant at 5% level, *significant at 10% level.

(2008), Dennis et al. (2006), Arslan and Karan (2006), Korner (2007), Khemaies (2010) and Heyman et al. (2003) also finds the same result. Operating cycle has a significant negative impact on debt maturity. Thus this association confirm our hypothesis that when sales and production activities increases firms will prefer debt of
short maturity. Here our results support the findings of Shah and Khan (2009). The variable Firm’s performance is positively related to debt but it could not significantly influence the debt maturity structure. It means that firm’s performance is not the key factor to determine the decision of debt maturity structure. The result is against the signaling hypothesis presented by Flannery (1986) which says that when information asymmetry between firm managers and investors with respect to quality of the firm is higher than short term debt serves as a signaling device. However this result is similar to the findings of Khemaies (2010) and Shah and Khan (2009).

Tax rate has a significant positive impact on debt maturity in the pooled model but the result become insignificant in the fixed effect model. Korner (2007) in a study of Czech firm does not find any statistically significant impact of tax rate on the debt maturity structure. In contrast, Shah and Khan (2009) find significant negative association between tax rate and debt maturity. The association between leverage and dependent variable is statistically insignificant in the pooled as well as fixed effect model. A research done on data taken from French and Tunisian firms, Khemaies (2010) find significant positive association between leverage and maturity of debt for French firms as compared to Tunisian firms where the relationship was insignificant. Korner (2007) also find that Czech firms with higher leverage tend to have more long term debt while firms with less amount of leverage tend to have less long term debt.

Conclusion

In this research paper, we have used two methods of panel data pooled and the fixed effect model to measure the determinants of debt maturity structure of 23 banks listed in the “KSE”, for the duration of six years from 2005-2010. The proxy used in the study for the dependent variable was debt maturing in more than one year divided by total liabilities as a proxy for our dependent variable maturity of debt. Firms with high operating cycle ratio will use short term financing. Thus, our result supports the maturity matching principle. Moreover the association of size variable with the dependent variable is negative and there is enough evidence in support of this relationship. Thus we can say that large firms in the banking sector of Pakistan use debt of short maturity as compare to long term debt. Our result supports the findings of Heyman et al. (2003) and Khemaies (2010). We proxy firm quality as net income before taxes divided by total assets and this proxy is insignificant in both models. Flannery (1986) suggested the signaling hypothesis which says that good quality firms will generate positive signals to the outside world by using more of short term debt; our result does not support this hypothesis. In the model pooled least square the variable tax rate which is measured as annual tax expense divided by pretax income has significant direct positive correlation with maturity of debt however the relationship is insignificant in the fixed effect model. Thus, our result does not support the tax hypothesis which predicts negative correlation. Finally, we did not found any significant evidence between the explanatory variable leverage and the dependent variable in both models. Thus the result do not confirmed our hypothesis that high levered firms will use high long term debt.

REFERENCES


