Determining the Nexus between Debt and Human Capital by Employing GMM Estimation
Tan Mei Ting

Abstract
This study tries to explore relation between debt financing and human capital while including several determinants of debt. Data of 150 non-financial firms, which are listed on Karachi Stock Exchange, have been employed in this study for the period of ten years, i.e. 2003 to 2012. This study is among the rare studies in developing economies which attempts to investigate the determinants of debt financing by including human capital and employing dynamic panel data estimation into it. Overall results of total debt show that there is significant negative relationship between size, tangibility, profitability and uniqueness. However, more importantly, human capital also remained negatively significant with overall debt financing.

Keywords: capital structure, human capital, debt financing, leverage, dynamic panel data estimation

1. Introduction

Decisions on the subject of capital structure are of great importance for every business corporation. In most cases, in the business organization structure, it is the job of the management to take the decisions about the capital structure in such a way that the firm’s value is maximized and operations are carried out smoothly (Jahanzeb et al., 2015a). Even though, value maximization of the firm is an intricate assignment because it requires the selection of debt and equity securities in the same ratio while keeping the different costs and benefits in mind coupled with these securities. In the selection process, an inaccurate decision will probably lead to the financial distress of a firm and eventually result in bankruptcy. The connection between the value of a firm and capital structure decisions has been extensively researched in the past few decades. A corporation is generally capable of getting hold of funds using the financial market for the purpose of funding its investments in the following two manners: by providing corporate stocks (equity market) or through granting a debt instrument (bond or credit markets). In connection with the point previously mentioned, the term “capital structure” signifies the way where a corporation finances its investments using a number of combinations of equity and debt. Albeit, debt and equity are purely dissimilar, they harmonize each other as the bases of finance for corporate investment projects. Hence, the stratagem for all investments is finding out the best possible amalgamation of both. If a firm has large amounts of debts, it might exceed its likelihood to fix the debt and might be exposed to downturns of business and interest rates variation, and for this reason would be viewed as financially risky. On the other hand, equity found in greater quantities exhibits the external control of a firm, deteriorates the ownership interest, and usually indicates that the cash is being inefficiently used by the business to obtain business assets. This may be stressful for investors, because it connotes a lesser profit amounts being distributed to them.

It is indicated by Wald (1999) that institutions might considerably assert an influence over the capital structure decision of firms and that monitoring and agency problems, whereas staying in all countries might generate different results. Although the greater part of the research outcomes is being obtained from the expertise of the developed economies that encompass various institutional similarities (Wald,
1999; Bevan & Danbolt, 2002; Rajan & Zingales, 1995), diminutive work is being done for the purpose of advancing our knowledge about capital structure in developing countries that encompass dissimilar institutional structures.

Titman (1984) in his study explains that debt possesses a baffling nature, which still remains the same (Jahanzeb et al., 2015b). It has been attempted by authors in the form of this study, to investigate the factors which are affecting capital structure in Pakistan, by employing human capital into it. It is a well known fact that human capital plays a vital role for any organization. Hence, it becomes important issue to be investigated that what role it is playing for financial decision making while dealing with debt financing. In this regard, there are quite a few studies available internationally which tried to explore such findings. Outcomes of this study will assist the managers and investors to comprehend the complex nature of capital structure.

2. Literature Review

An essential matter in corporate finance involves understanding of how firms choose their financing choices and it is apparent that there is no consensus on theories that explains a firm's perfect capital structure (Seifert & Gonenc, 2010). Modigliani and Miller (1958) initiated the first study on capital structure which hashes out that the capital structure is immaterial in a corporate world without taxes, transaction costs or other market imperfections.

2.1 Modigliani-Miller Theorem

This ground-breaking study was presented by Modigliani and Miller (1958) on an assumption that there is the existence of market perfection in capital market. Therefore, the market operates without transaction costs and bankruptcy costs, and information is available for everyone in the market. Modigliani and Miller (1958), in other words, asserted that financing decisions of firms are undertaken with identical interest rate and without tax. As a result, cost of equity is same for firms which are, both, leveraged and non-leveraged. For the non-leveraged firm, premium is included for financial risk. Ultimately, these assumptions are pointing out that value of the firm is independent to its capital structure. Modigliani and Miller (1958) first began this groundbreaking work on capital structure in the field of Corporate Finance. According to MM Theorem, in perfect capital markets no impact of leverage can be seen on firm value. This theorem documented that firm’s value is not affected by debt-equity ratio.

2.2 Trade-Off Theory

Trade-off theory by focusing on cost and benefit analysis of debt predicts that there is an optimal debt ratio which helps to maximize the value of a firm. Optimal point can be hit when the benefits of debt issuance countervails the increasing present value of costs related to more debt issuance (Myers, 2001). Major benefit of debt is to minimize the interest payments. Such benefits stimulate firms to use debt. Miller (1977) explains this simple effect gets complicated with the existence of personal taxes and sometimes with non-debt tax shields (DeAngelo & Masulis, 1980). Moreover, equity issuance means to move away from optimum therefore this can be considered as a bad news. Myers (1984) further documented that they would opt to issue equity if they feel it is mispriced in market. On the contrary, investors become conscious that the equity issuance is fairly priced or mispriced. Consequently, equity issuance leads investors to react negatively and management doesn’t show any interest to issue equity.

2.3 Pecking Order Theory

Pecking order theory, proposed by Myers (1984), explains that firms most likely prefer to finance new investments, first with internally raised funds, i.e. retained earnings, then with debt, and issue equity as a final resort. This theory explains the financial decision making of the firms. According to Shyam-Sunder and Myers (1999), pecking order theory anticipates the impacts of profits correctly. Whereas,
according to Fama and French (2002) and Frank and Goyal (2003), the theory has few other complications as well. As currently, it is not that much helpful in managing firms financial resources.

2.4 Human Capital Theory
Adam Smith defined human capital as the skills (intellectual, physical and psychological), and the way an individual adapts to judge about different things (Smith, 1937). It is developed from both the experience and formal schooling (Nasimosavi et al., 2013). Shulutz (1961) and Becker (1964) presented the concept of human capital in the mainstream academic research during 1960s. Since then, it has fuelled considerable debate among researchers.

It has been argued by Zingales (2000) that the importance of human capital has emerged as an important asset in the modern technologically oriented economy. It is no longer a reasonable approach to represent a firm by its physical capital. With respect to understanding the modern developments, it is thereby necessary to think about the other resources that help maximizing the value of a firm and how capital structure is managed. A very few studies have tried to investigate the relation between human capital and leverage, i.e. Chammanur et al. (2013) and Akyol and Verwijmeren (2013), who looked into the impact of leverage on employee wages (human capital).

3. Independent Variables

3.1 Size
Debt financing provides opportunities to smaller businesses to grow, while on the contrary, it alleviates problems for medium-sized businesses (Sobekova-Majkova et al., 2015). It appears that an agreement is present between theories regarding the positive impact of size over the capital structure of firm even if their explanation varies. From the trade-off theory's viewpoint, corporations trade-off takes place between the leverage benefits for example alleviation of problems of agency or tax savings in opposition to the costs of leverage for example the bankruptcy costs. It is argued by Rajan and Zingales (1995) that the large companies tend to experience bankruptcy less frequently because they have a tendency to be more diversified. Therefore, a practical positive dependence is anticipated between the size of the firm and leverage. On the other hand, due to the information asymmetries, undersized firms have a propensity to experience higher costs to acquire external funds. Furthermore, it is argued by Bevan and Danbolt (2002) that because of the credit rating, larger firms are more prone to encompass the right to use non-bank debt financing. This, in turn, would also advocate a positive association between debt and size.

To measure the size of a firm, natural logarithm of sales will be used in this study, this measure is also consistent with many previous studies (e.g. Rajan and Zingales, 1995; Titman and Wessels, 1988; Hernádi & Ormos, 2012). This measure makes the variations smooth in the figure over the time period.

3.2 Tangibility
Collateralised assets are deemed as an imperative driver that has an influence on the firm’s capital structure decision. Tangible assets might be utilized as collateral. Therefore, the risk of the creditor is inversely proportional to the ratio of tangible assets i.e. creditor’s risk would be lesser if the fraction of tangible assets is greater, and, consecutively, the value of assets is higher in the case of liquidation and bankruptcy. It is stated by Booth et al. (2001) that “The more tangible the firm’s assets, the greater its ability to issue secured debt and less information revealed about future profits”. Experimental researches that provides support to this association are carried out by Titman and Wessels (1988) and Rajan and Zingales (1995). We expect positive relation between tangibility (TANG) and leverage (Rajan & Zingales, 1995; Chen et al., 2013). We use fixed assets over total assets (FA/TA) as a proxy to determine firms’ tangibility, as computed by Chakrabory (2013).
3.3 Profitability

Since, Modigliani and Miller (1958) much hypothetical work is being carried out, no reliable empirical results have been achieved in this regard until now. Considering the trade-off theory’s viewpoint, the level of the profitability of the firm is more if the leverage is higher because of the debt tax deductibility of payment of interest. It is further argued by Rajan and Zingales (1995) that suppliers of debt must be more eager to lend to firms that are profitable. This study expects negative relation between leverage and profitability, empirical evidence has shown that profitability is negatively related to debt ratios (Bevan & Danbolt, 2002). Profitability can be measured as earnings before interest and tax over total assets (EBIT/TA) as previously measured by Booth et al. (2001) and Shah and Khan (2007).

3.4 Growth

It has been pointed out by Myers (1977) that the companies with higher growth rate will abandon investment opportunities with a positive NPV (net present value) to demonstrate increased corporate value and wealth of shareholders. Hence, growth opportunities have positive effect on corporate value (King & Santor, 2008). A negative relationship is stated between financial leverage and growth by Myers (1984) because of restrictive covenants or high rates of interest that depress debt taking. Such a negative relationship is attributed by Titman and Wessels (1988) because of bondholders’ unwillingness to lend to equity controlled firms like the latter have a tendency to invest sub-optimally to confiscate wealth from bondholders. This study also expects the negative association between growth and capital structure. To capture firm’s growth (GROW), geometric average of five-year sales growth to total asset growth will be applied (Hernádi & Ormos, 2012).

3.5 Non-debt Tax Shield

The benefit of tax shields on the utilization of debt finance might either be diminished or even eradicated when an income is reported by a corporation that is constantly low or negative. As a result, the load of payments of interest would be experienced by the firm. It is exhibited by DeAngelo and Masulis (1980) that the alternative of the tax shields on debt financing is non-debt tax shields (NDTS). Experimental answers are mixed regarding this issue. A strong direct association between the relative amount of NDTs and debt is demonstrated by Bradley et al. (1984). In favour of an effect on debt ratios that results from non-debt tax shields, no support is discovered by Titman and Wessels (1988). A considerable negative association is reported by Wald (1999) between NDTs and debt. Viviani (2008) has illustrated a considerable inverse association only between NDTS and short-term debt ratio. A negative yet less considerable association is shown by Bauer (2004) between the measures of leverage and non-debt tax shields. We expect negative correlation between leverage and non-debt tax shield (NDTS) (Hernádi & Ormos, 2012). Following Akhtar and Oliver (2009), we delineate non-debt tax shield as total annual depreciation expense divided by total assets’ book value.

3.6 Firm Age

Taking firm’s age into account as a probable determinant, like in experiential studies, is not common, while a few connected to debt level can actually be revealed (Johansen & Bartholdy, 2011). It may possibly be squabbled that businesses with relationship of several years with bank are going to experience lesser borrowing costs (Michaelas et al., 1999). It is discovered by Petersen and Rajan (1994) that older companies encompass higher debt ratios as they are required to be higher quality companies. From the perspective of Pakistan, this is the first study to compute this determinant of capital structure. Not a much literature has been seen on the firm age (AGE), but still according to the few studies, negative relationship is expected (Michaelas et al., 1999). AGE is measured by following Michaelas et al. (1999) and Akhtar and Oliver (2009) as the years from the date of incorporation.

3.7 Uniqueness

The selling expenditures and Research and Development (R&D) are at the starting and the closing stages of the production value chain. Unique goods in fact encompass more selling expenses and
R&D, since they are not a replica of formal monotonous things, and as they have particular demands and specific consumers. Similarly, producer of distinctiveness goods is likely to face more risk of bankruptcy; therefore, they have to pay attention towards induced expense of bankruptcy, by means of issuing debt. Because of the constraints in attaining the R&D expense data, this research like the majority of the earlier studies attempts to make use of selling expense, as a substitute for R&D; therefore uniqueness is described by selling expense divided by net revenue from sales. In line with the trade off theory, firms in the midst of unique products encompass lesser debt in their capital structure (Titman & Wessels, 1988). Hence, this study also expects negative relation.

It’s hard to find any study in context of Pakistan, which has investigated this determinant with capital structure; this study might be the first to present empirical findings on this association. Empirical findings on uniqueness are still rare. Following Sporleder and Moss (2004), Yang et al. (2010) and Jahanzeb and Bajuri (2014), this study uses selling expense over sales (SE/S).

3.8 Business Risk
As stated by Bauer (2004), volatility or business risk may be considered as the proxy for firm’s risk. Leverage ratio can be less if a firm has less risky position. Therefore, generally, there is a presumption of inverse relation between capital structure and volatility. On the basis of the results presented by Hsia (1981), Huang and Song (2002) state, “As the variance of the value of the firm’s assets increases the systematic risk of equity decreases. So the business risk is expected to be positively related to leverage”. Huang and Song (2002) and Kim and Sorensen (1986) also confirm this association. However, Titman and Wessels (1988) and Bradley et al. (1984) demonstrated the negative relation. This study also expects the negative relation between business risk (RISK) and debt (Dang et al., 2012). Standard deviation of return on assets over three years has been used as the proxy to measure business risk (Booth et al., 2001; Hernadi & Ormos, 2012).

3.9 Liquidity
Net effect of liquidity on capital structure is unidentified and it has both the positive and negative impacts (Mouamer, 2011). Firms having high liquidity ratio may have high debt level because of their need to meet debt obligations. This suggests a positive relation between liquidity and capital structure. On the other hand, having more liquid assets, shows that these assets would be utilized as the financing source in future. Hence, this suggests negative relation between liquidity and debt. This study hypothesizes negative relationship between the liquidity and capital structure (de Jong et al., 2008). To measure liquidity, this study employs the ratio of current assets over current liabilities (Mouamer, 2011).

3.10 Human Capital
Although, the theoretical and empirical literature on the relation between human capital and capital structure is still rare, but there are quite a few recent studies available. The main finding of study presented by Akyol and Verwijmeren (2013) is that there is a positive correlation between leverage and wages paid to the employees, which means companies having higher leverage, must disburse higher wages to their employees. Chemmanur et al. (2013) conclude that a significant and positive association is present between leverage and average employee.

This study investigates the reverse relationship, i.e. impact of human capital on leverage. This kind of relation has not been tested yet, as there is no any evidence available regarding this relation in literature. In this regard, there is only one study available that was conducted by Hovakimian and Li (2011), which failed to determine the relation between employee wages and leverage. This study measures human capital by total salaries and wages of a firm (Ting & Lean, 2009; Hovakimian & Li, 2011; Jahanzeb & Bajuri, 2014).
4. Methodology

Independent variables and dependent variable have been selected in accordance with the academic literature. Consequently, methodology has been described here to test different hypotheses and analyze those variables empirically. To construct the model, panel data techniques have been used. Panel data consists of both the time-series elements and cross-sectional elements; time-series elements reflect the time period of the study (2003-2012) and cross-sectional elements reflect (150) non-financial companies.

Data were collected from Thomson Reuters Datastream. Financial institutions were excluded from the analysis, because of their different financial policies than those of non-financial firms. The data relates to eight non-financial sectors, i.e. automobile & parts, construction & material, chemicals, textiles, food processors, electricity, oil & gas and household goods. We conducted analysis of 150 listed Pakistani (non-financial) companies from the period of 2003 to 2012 (i.e. 10 years).

In accordance with Drobeta et al. (2013), this study follows the model that is presented by Blundell and Bond (1998) for “System GMM Estimation” and applied “xtdpdsys” STATA estimation.

\[
\Delta DEBT_t = (1 - \lambda) \Delta DEBT_{t-1} + \lambda \beta \Delta X_t + \Delta \epsilon_t
\]

4.1 Dependent Variable

Capital structure is considered a comprehensive term, which has been measured differently by different authors. However, this study measured capital structure with leverage. Following Lemmon et al. (2008) and Mateev et al. (2013), this study measures dependent variable by total debt ratio (TD), that is, total debt to total assets.

Table 1: Descriptive statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>TD</td>
<td>0.5365</td>
<td>0.2309</td>
<td>0</td>
<td>1.56</td>
</tr>
<tr>
<td>SIZE</td>
<td>14.945</td>
<td>1.9112</td>
<td>6.03</td>
<td>20.11</td>
</tr>
<tr>
<td>TANG</td>
<td>0.5082</td>
<td>0.2514</td>
<td>0</td>
<td>1.07</td>
</tr>
<tr>
<td>PROF</td>
<td>0.1052</td>
<td>0.1247</td>
<td>-0.75</td>
<td>0.94</td>
</tr>
<tr>
<td>GROW</td>
<td>0.1119</td>
<td>0.4231</td>
<td>-1.4</td>
<td>1.24</td>
</tr>
<tr>
<td>NDTS</td>
<td>0.0345</td>
<td>0.0316</td>
<td>0</td>
<td>0.12</td>
</tr>
<tr>
<td>AGE</td>
<td>3.0035</td>
<td>0.6153</td>
<td>0</td>
<td>4.18</td>
</tr>
<tr>
<td>RISK</td>
<td>0.0431</td>
<td>0.0241</td>
<td>0</td>
<td>0.18</td>
</tr>
<tr>
<td>UNIQ</td>
<td>0.0445</td>
<td>0.0223</td>
<td>0</td>
<td>0.19</td>
</tr>
<tr>
<td>LIQ</td>
<td>1.0225</td>
<td>0.4934</td>
<td>-0.89</td>
<td>2.63</td>
</tr>
<tr>
<td>HC</td>
<td>0.0512</td>
<td>0.0354</td>
<td>0</td>
<td>0.22</td>
</tr>
<tr>
<td>Obs.</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>
Empirical findings have been demonstrated in Table 1 and Table 2. Table 1 shows the summary statistics of dependent and independent variables. The total debt ratio demonstrates that 53.65% firm assets are financed by debt, during this period of study. However, if we compare this ratio with G-7 or other developing countries, it can be argued that firms in Pakistan seem to be more leveraged than those of Jordan, Brazil, Mexico, Malaysia, Zimbabwe and Thailand (Rajan & Zingales, 1995).

The study employs the data of 150 listed companies (1500 observations) for the period of 10 years, i.e. 2003-2012, from eight different non-financial sectors. In accordance with Table 3, most of the results remained significant. However, second order serial correlation remained significant in Model 1 of STD (short-term debt), therefore; we limit our analysis to Model 2 of LTD (long-term debt) and Model 3 of TD (total debt). Sargan test also validates the results of Model 2 and Model 3. Results of Model 2 show that profitability, growth and firm age remained negatively significant, which demonstrates that profitable, growing and older firms usually are choosing long-term debt in the perspective of non-financial Pakistan firms. Findings of Model 3 demonstrate that smaller firms with

### Table 2: Results of two-step GMM-system estimation1,2,3,4

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Model 1 (STD)</th>
<th>Model 2 (LTD)</th>
<th>Model 3 (TD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADEBT</td>
<td>0.4212**</td>
<td>0.5490**</td>
<td>0.5159**</td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.0008</td>
<td>0.0025</td>
<td>-0.0180**</td>
</tr>
<tr>
<td>TANG</td>
<td>-0.1131**</td>
<td>0.1376**</td>
<td>-0.0708*</td>
</tr>
<tr>
<td>PROF</td>
<td>0.0701</td>
<td>-0.0813**</td>
<td>-0.2146**</td>
</tr>
<tr>
<td>GROW</td>
<td>-0.0367**</td>
<td>-0.0188**</td>
<td>-0.0176</td>
</tr>
<tr>
<td>NDT5</td>
<td>-0.5723**</td>
<td>-0.4123</td>
<td>-0.4211</td>
</tr>
<tr>
<td>AGE</td>
<td>0.0060</td>
<td>-0.0516**</td>
<td>0.0203</td>
</tr>
<tr>
<td>RISK</td>
<td>-0.2947**</td>
<td>0.0136</td>
<td>-0.2248</td>
</tr>
<tr>
<td>UNIQ</td>
<td>-0.2702**</td>
<td>-0.1995</td>
<td>-0.3353*</td>
</tr>
<tr>
<td>LIQ</td>
<td>-0.0691**</td>
<td>0.0109</td>
<td>-0.0232</td>
</tr>
<tr>
<td>HC</td>
<td>0.2366*</td>
<td>-0.0779</td>
<td>-0.1218*</td>
</tr>
<tr>
<td>Constant</td>
<td>0.2691**</td>
<td>0.1428*</td>
<td>0.6029**</td>
</tr>
<tr>
<td>Correlation 1</td>
<td>0.0000</td>
<td>0.0001</td>
<td>0.0000</td>
</tr>
<tr>
<td>Correlation 2</td>
<td>0.0010</td>
<td>0.0586</td>
<td>0.2379</td>
</tr>
<tr>
<td>Sargan – Prob &gt; X²</td>
<td>0.0787</td>
<td>0.0761</td>
<td>0.0755</td>
</tr>
</tbody>
</table>

1. * and ** indicate significant levels at 5% and 1% respectively.
2. ADEBT in Model 1, Model 2 and Model 3 is lagged variable of short-term debt, long-term debt and total debt respectively.
3. For Arellano-Bond test Ho is: no autocorrelation. Rejecting the null hypothesis (p-value < 0.05) of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders implies that the moment conditions are not valid.
4. For Sargan test Ho is: overidentifying restrictions are valid. If p-value > 0.05, we confirm the null hypothesis that the overidentifying restrictions are valid. Rejecting the null hypothesis implies that we need to reconsider our model or our instruments.

### 5. Empirical Results and Conclusions

Empirical findings have been demonstrated in Table 1 and Table 2. Table 1 shows the summary statistics of dependent and independent variables. The total debt ratio demonstrates that 53.65% firm assets are financed by debt, during this period of study. However, if we compare this ratio with G-7 or other developing countries, it can be argued that firms in Pakistan seem to be more leveraged than those of Jordan, Brazil, Mexico, Malaysia, Zimbabwe and Thailand (Rajan & Zingales, 1995).

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less profitability, firms which spend less on their selling expenses, and firms with less tangible assets, keep their debt ratios higher for their business expansion and growth. Such findings support trade-off theory. More importantly, human capital remained significant in Model 3, which illustrates that firms which are spending more on their human capital are keeping their debt higher to pay higher, because they might not want to lose their skilled and experienced employees. Further studies may be conducted by categorizing the data into sectors, which will assist the investors and managers to apprehend the complications related to any particular sector, and to investigate whether different sector behaves differently towards debt financing.

References


