Journal of Management and Sustainability; Vol. 8, No. 1; 2018
ISSN 1925-4725 E-ISSN 1925-4733
Published by Canadian Center of Science and Education

Determinants of Capital Structure: Empirical Evidence from Turkey

Merve Gizem Cevheroglu-Acar[1]

[1] Department of Management, Bogazici University, Istanbul, Turkey

Correspondence: Merve Gizem Cevheroğlu-Açar, Department of Management, Bogazici University, Istanbul, Turkey.

Received: September 18, 2017 Accepted: December 20, 2017 Online Published: February 3, 2018

doi:10.5539/jms.v8n1p31 URL: https://doi.org/10.5539/jms.v8n1p31

Abstract

The primary aim of this study is to identify the firm-specific determinants of the capital structure of non-financial firms in Turkey and to test whether the determinants offered by financial theory are able to provide convincing explanations for non-financial firms in Turkey. Because the relationship between liquidity and capital structure is not well examined for Turkish market in the context of capital structure theories, we include liquidity as independent variable in our models in addition to profitability, growth, non-debt tax shields, size, tangibility, and risk. We use panel regression as econometric model and cover the period from 2009 to 2016. Our results show that profitability, non-debt tax shield, size, tangibility, and liquidity are significant determinants of the capital structure, size being the most robust one. On the other hand, growth and volatility are not significantly related with the leverage. Moreover, we conclude that capital structure decisions of non-financial firms in Turkey are mostly consistent with the hypothesis of pecking order theory rather than trade-off theory.

Keywords: capital structure, panel data, pecking-order theory, trade-off theory, Turkey

1. Introduction

In the past six decades, the linkage between the capital structure and the firm value has been largely investigated. Several financial theories on capital structure have been developed; each of them having their own perspectives for determining the optimal capital structure. For example, the pecking order theory is based on asymmetry in information; free cash flow theory put an emphasis on agency cost; while trade-off theory underlines the tax benefit of leverage. Since each theory differs in its relative emphasis, the optimal capital structure provided by each of them is different. Therefore, they do not actually arrive at a consensus or, as Myers (2001) puts, there is no universal theory for optimal capital structure. Together with this, each of them provides great benefits in identifying the possible determinants of the capital structure.

Once the theoretical framework for capital structure has been established, the empirical studies start testing whether the data fits the theories well. Vast majority of empirical literature on capital structure is on developed markets. Empirical studies which aims to identify the determinants of capital structure in the developing markets are few; increasing during the last decade though.

In this study, we examine the firm specific determinants of capital structure for Turkey which is an emerging market. There are three main purposes of this paper: First and most important aim is to examine whether established capital structure theories are able to explain the capital structure of the Turkish companies or not. Secondly, we aim to compare our results with the other empirical studies on Turkey so that we can determine whether the results are robust over time. Besides, since the relationship between liquidity and capital structure is not comprehensively examined for the Turkish firms, our study will also provide further insights in this regard.

The rest of the paper is organized as follow: Section two summarizes the literature on capital structure theory. Section three introduces the capital structure determinants offered by the literature and gives proxies that we will use in our analysis for each of the attributes. Section four presents data and the proxies. Section five elaborates the methodology. Section six gives the empirical results of the analysis and section seven discuss the results on the basis of the research objectives. Finally, section eight concludes the study and offers suggestions for further research.

2. Related Literature: Theories on Capital Structure

The modern capital structure theory has its origin in the irrelevancy proposition theorem of Modigliani & Miller

(1958). The authors show that the value of a firm is independent from the capital structure policy that management adopts. However, their conclusion holds for perfect capital markets and is valid under strict assumptions. Some key assumptions of Miller-Modigliani work are (1) there is no tax, (2) there is no transaction cost, (3) there is no bankruptcy cost, and (4) there is no information asymmetry in the market. Although these assumptions are very strict and do not hold in reality, they do not make irrelevancy proposition theorem useless. Perhaps, the strongest part of the irrelevancy proposition theorem is that it is a very-well defined theorem which is correct under its assumptions. Thus, if the managers in the real life spend considerable time for determining the optimal debt to equity ratio, then it means that at least one of the assumptions of Miller-Modigliani is violated in real life. Therefore, the obvious starting point for examining the determinants of optimal capital structure is to relax the Miller-Modigliani assumptions.

Relaxing no tax assumption, Miller & Modigliani (1963) show that it is optimal for a firm to borrow as much debt as possible once they integrate the tax benefits of leverage to their theorem. They offer that the value of levered firm is larger than the value of unlevered firm because the interest payments are tax deductible. Considering that leverage has tax benefit but equity does not, a major amount of the companies should have use 100% debt financing or at least we should observe very high debt to equity ratios in general. Because this is not the case in real life, the other side of the coin is also examined. As the leverage ratio increases, the probability of bankruptcy and the cost of financial distress increase as well. In other words, firms with higher leverage ratios are more likely to have financial distress and are more likely to default on their debt, which allows creditors to take over the firm (bankruptcy). However, it is argued that measurement of bankruptcy cost is more problematic than the measurement of tax benefit. In the literature, the cost of bankruptcy is examined in two different forms: Direct bankruptcy costs are those that can directly be linked with bankruptcy such as fees for lawyer and other professionals. Indirect bankruptcy cost are loss in sales and profit, less chance for firm to get credit or issue debt. Studies show that while direct costs are usually low (Warner, 1977) (Note 1), the total bankruptcy cost (the combination of both direct and indirect cost) is considerably high which may potentially influence the optimal capital structure of a firm (Altman, 1984) (Note 2).

It is well established now that leverage has tax benefits as well as it causes bankruptcy and financial distress cost. Tax benefits and bankruptcy cost of leverage constitute the basics of the trade-off theory. Considering pros and cons of taking leverage, trade-off theory states that optimal capital structure (i.e., the capital structure that maximized the value of firm) is at the point where the marginal benefit of increasing debt (tax savings) are just offset by the marginal cost of increasing debt (costs of financial distress). Under the settings of the trade-off theory, it is obvious why firms engage in moderate rather than high debt ratio. In this sense, trade-off theory has strong practical and rational appeal.

Later on, the optimal capital structure is examined from the agency theory perspective as well. From agency perspective, there are both agency costs and agency benefits of the leverage. Jensen & Meckling (1976) argue that leverage has agency cost since it causes the agency problems between creditors and the shareholders. They state that shareholders of a financially distressed firm are more likely to use the existing debt to make risky investments. In other words, usage of leverage enables shareholder to replace low-risk assets with riskier ones, which Jensen & Meckling (1976) name as asset substitution problem. Together with this, Jensen & Meckling (1976) also argue that debt financing can have agency benefits because unlike equity financing, financing the company with debt will not reduce the shares of owners. For example, when the firm issues equity, the agency cost of equity is likely to occur due to the dilution of ownership. Myers (1977) agrees that there is agency cost of leverage, but he emphasizes the under-investment problem that leverage causes. For instance, leveraged firm may reject some of the projects with positive NPV which it would accept in the case of no leverage. Thus, leverage may prevent investing in good project which may potentially increase the value of the firm. On the other hand, Jensen (1986) provide a brand new perspective and state that leverage reduces the wasteful investment by absorbing the excess cash flow. Jensen's argument, known as "free cash flow hypothesis" or "control hypothesis", states that when a firm has large excess free cash flows, the managers may use the cash in wasteful investments for the sake of empire building or higher compensation, prestige, and promotion. Thus, the manager is motivated to run the company as efficient as possible only when the cash is tight. He cites two ways to resolve excess free cash flow problem: announcing a permanent increase in dividend or using debt. While in the first case the manager promises to pay the cash flow to the shareholder, in second case he promises to make payments to debt holders. In this sense, the promise to debt holder is more binding since the debt holders have the right to take over the firm in the case of default. Considering all, trade-off theory is extended and agency cost and benefits of leverage are integrated to the trade-off theory. Now, the new optimal leverage level is the point where total marginal cost of the debt (financial distress cost and agency cost) exactly offsets the total marginal

benefit of debt (tax benefits and agency benefits).

However, the optimal capital structure that trade-off theory offers is questioned by some. For example, DeAngelo & Masulis (1980) argue that there are ways to shelter income other than interest, which are called as non-debt tax shield. For example, a firm can shelter its income by means of depreciation, investment tax credits, or tax loss carry forwards. Non-debt tax shield opportunities of a firm play a role in determining the optimal structure of a firm. For instance, the firms with higher non-debt tax shield may find it redundant to borrow debt and may have lower leverage ratio. Another important study that challenges trade-off theory is Miller (1977). Miller (1977) argues that even in a world where interest payments are fully deductible and bankruptcy and agency cost exist, the value of the firm is still irrelevant with its capital structure. In this alternative hypothesis, the author incorporates three different types of taxes: corporate tax rate, personal tax rate on equity, and personal tax rate on interest income. His main argument is that there is a trade-off between tax disadvantage in personal level and tax advantage in corporate level. As the investors vary in their marginal tax rates, there is no optimal leverage ratio for individual-firm level but there is an optimal aggregate corporate debt level for the market.

Another important capital structure theory, which is usually regarded as the alternative for the trade-off theory, is the pecking order theory. The main argument of pecking order theory is that there is an information asymmetry between insiders (managers) and the outsiders. Since mangers are better informed than the outsider investors, their decision policies may signal some information to the market. Literature on information asymmetry argues that managers can reveal information on expected cash flows (Bhattacharya, 1979; Brennan & Hughes, 1991), growth opportunities (Myers & Majluf, 1984), the firm quality (Ross, 1977; Heinkel, 1982) or investment quality (Leland & Pyle, 1977) by using mechanisms such as dividend policy, capital structure decision and so on. Pecking order theory is related with the signaling through the capital structure decision. The underpinnings of the pecking order theory is revealed by Myers & Majluf (1984). Assuming that mangers act in the best interest of existing shareholders, Myers & Majluf (1984) shows that issuing new equity would be considered only when benefits of existing shareholders exceed the benefits of the new shareholders, or in other words when the stock is overvalued. Thus, whenever the firm issue new equity, the investors will assume that the stock is overvalued and the price of the stock will decrease. This leads to the pecking order theory, which states that firm should prefer to use internal financing when possible. If the external financing is required, then it should prefer debt over equity since issuing equity will convey a bad signal to market regarding the firm.

3. Determinants of Capital Structure: Measures and Empirical Studies

Empirical studies serve for testing whether the attributes suggested by the various theories are able to explain the capital structure employed by firms or not. The attributes implied by the related literature are profitability, growth, non-debt tax shields, size, tangibility, volatility (or risk), liquidity, and uniqueness. This section will give the theoretical relevancy and empirical evidence for each determinant as well as the different proxies that are used for measuring each determinant. Besides, we will state the proxies that we will use in our analysis.

3.1 Profitability

Two important capital structure theories trade-off theory and pecking order theory, predict different direction of relationship between leverage and profitability. According to classical trade-off theory, profitability should be positively related with the leverage since the firms with higher profit should borrow more to shelter their income. Besides, according to Jensen (1986) debt is a discipline mechanism that prevent wasteful investment. In this regard, higher the profitability or free cash flow that a firm generates, higher leverage ratio it should attain. Therefore, agency-based theories also relate profitability positively with the leverage.

On the other hand, pecking-order theory predicts that firms first use internal financing and then move to debt and finally they issue new equity when necessary Therefore, pecking order theory suggests that there is a negative relationship between debt and profitability which is a source of internal funds.

The empirical studies mostly find a negative linkage between profitability and leverage as pecking order theory predicts (Bauer, 2004; Booth et al., 2001; Chen, 2004; Friend & Lang, 1998; Huang & Song, 2006; Jong et al., 2008; Kester, 1986; Rajan & Zingales, 1995; Serrasqueiro & Rogao, 2009; Titman & Wessels, 1988; Tong & Green, 2005; Toy et al., 1974; Wald, 1999; Wiwattanakantang, 1999; Zou & Xiao, 2006). The empirical evidence shows that profitability and leverage have inverse relationship for Turkish firms as well (Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Karadeniz et al., 2009; Sayılgan et al., 2006). The proxies used for measuring profitability are generally EBIT scaled by total asset, ROA, or ROE. In our study, our profitability measure will be EBIT/Total Asset. Then, we will use ROA and ROE for robustness check.

3.2 Growth

Myers (1977) proposes that there are two types of asset: assets that can be regarded as call options, in the sense that their ultimate values depend, at least in part, on further discretionary investment by the firm (VG) and assets whose ultimate value does not depend on further discretionary investment (VA). The author argues that, other things equal, because of agency conflicts between shareholders and debt holders, the debt supported by firms which heavily rely on VG (growth opportunities) are less than those rely on VA (asset in place). Therefore, from agency theory perspective, growth and leverage should be inversely related. However, pecking-order theory predicts that growth is positively related with the leverage because only internal financing may not be adequate for high growth firms.

Empirical studies report conflicting results for the relationship between growth and leverage. While some studies find negative relationship as agency related theories predict (Booth et al., 2001; Deesomsak et al., 2004; Eriotis et al., 2007; Wald, 1999; Zou & Xiao, 2006), some studies find positive relationship and confirm pecking order theory (Frank & Goyal, 2009; Kester, 1986). Titman & Wessels (1988) report that relationship between growth and leverage is inconclusive because the directions of the relationship changes as the proxy of growth changes. Studies on Turkey generally favor pecking order theory and report a positive relationship between leverage and growth (Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Sayılgan et al., 2006).The proxies used for measuring the growth opportunities are average sales growth, capital investment over total asset, market-to-book ratio of equity, Tobin's Q, and sales growth rate. In our study, we will use the percentage change in the sales as a proxy for growth.

3.3 Non-Debt Tax Shields

DeAngelo & Masulis (1980) argue that that non-debt tax shields are the substitutes of the tax shields on debt financing. Therefore, a firm having higher non-debt tax shield is expected to use lower leverage in comparison with a firm having lower non-debt tax shield. The empirical evidence generally confirms this hypothetical inverse relationship between leverage and non-debt tax shields (MacKie-Mason, 1990; Wald, 1999). On the other hand, Titman & Wessels (1988) report no significant effect of the non-debt tax shield on leverage. The only exceptional study that finds a positive relationship between leverage and non-debt tax shield is Bradley et al. (1984). However, given that non-debt tax shield and intangibility are strongly correlated and they do not include any variable for measuring intangibility in their model, their result do not seem robust (Huang & Song, 2006). Studies on Turkish market generally report the negative relationship as well (Bayrakdaroglu et al., 2013; Durukan, 1997; Sayılgan et al., 2006). As a proxy for non-debt tax shield, we will use Depreciation/Total Asset which is the most widely used proxy for measuring non-debt tax shield.

3.4 Size

Size is cited among the considerable determinants of the capital structure for several reasons. For example, as Warner (1977) and Altman (1984) report, the larger firms have lower bankruptcy cost. Thus, according to trade-off theory, larger firms are more likely to issue more debt. Besides, larger firms are highly diversified, have larger economies of scale, their cash flows are less volatile and they can easily access capital markets. Considering all, they are more tolerant to higher leverage ratio, which means that there should be a positive linkage between size and debt ratio. On the other hand, it is argued that larger firms have less asymmetric information because they tend to provide more information to the market (Fama & Jensen, 1983; Rajan & Zingales, 1995). In this sense, large firms should borrow less because they can issue informationally sensitive securities like equity without giving a bad signal. Thus, pecking order theory predicts that as size increases leverage ratio decreases.

The results of empirical studies are conflicting. While most studies find positive linkage (Booth et al., 2001; Bauer, 2004; Deesomsak et al., 2004; Eriotis et al., 2007; Jong et al., 2008; Marsh, 1982; Rajan & Zingales; 1995; Serrasqueiro & Rogao, 2009; Zou & Xiao, 2006), some studies find negative relationship (Chen, 2004). Wald (1999) report that the relationship between size and leverage is positive for firms in USA, UK, and Japan; negative for firms in Germany and French. The studies on Turkish firms support the positive relationship between size and leverage (Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Sayılgan et al., 2006). For measuring the size, generally the natural logarithms of total asset or market capitalization are used. In our study, we employ natural logarithms of total asset rather than natural logarithms of market capitalization because market capitalization may be influenced by some market conditions.

3.5 Tangibility

The financial theories on capital structure generally hypothesize a positive relationship between tangibility and

the leverage. For example, Jensen & Meckling (1976) argues that if the firm shift riskier investment after it have issued debt, then there will be agency conflict between debt holders and equity holders since usage of leverage enable shareholder to replace low-risk assets with riskier ones. However, if the tangible asset of a firm is sufficiently high, then they can be used as collateral and agency cost of leverage can be reduced. Similarly, Myers (1977) also argue that firms with higher assets-in-place can tolerate higher level of leverage. There should be a positive linkage between tangibility and leverage from the perspective of pecking order theory as well. Because it is tough for an outsiders to evaluate the value of intangible asset, lower rate of tangibility increases the information asymmetry. Therefore, firms with lower tangibility avoid issuing risky debt in order not to give a bad signal to the market. Considering all, firms are likely to issue higher level of debt as the ratio of tangible assets increases.

Although the theoretical linkage is strongly straightforward, the empirical evidences are mixed. Some studies support the theoretical relationship and report a positive linkage (Chen, 2004; Friend & Lang, 1988; Huang & Song, 2006; Jong et al., 2008; Marsh, 1982; Rajan & Zingales, 1995; Serrasqueiro & Rogao, 2009; Viviani, 2008; Wald, 1999; Zou & Xiao, 2006). On the other hand, some studies find a negative relationship (Bauer, 2004; Booth et al., 2001; Ferri & Jones, 1979; Mazur, 2007; Titman & Wessels, 1988). For Turkish firms, the studies generally report a negative relationship (Bayrakdaroglu et al., 2013; Booth et al., 2001; Gonenc, 2003; Sayılgan et al. (2006). Following the previous empirical studies, we will use Fixed Asset / Total Asset for measuring the tangibility of firms in Turkey.

3.6 Volatility (Risk)

High volatility in earnings can be regarded as an indicator that the firm suffers from the financial distress. As the volatility increases, firm is more likely to fail to fulfill its contractual claims as they come due. Therefore, the financial theories hypothesize an inverse relationship between volatility in earnings and leverage ratio. Several studies support this negative relationship (Booth et al., 2001; Bradley et al., 1984; Fama & French, 2002; Jong et al., 2008).

The previous literature offer various proxies for measuring volatility such as standard deviation of the return on sales (Booth et al., 2001), standard deviation of the first difference in operating cash flow scaled by total assets (Bradley et al., 1984; Chaplinsky & Niehaus, 1993; Wald, 1999), standard deviation of the percentage change in operating income (e.g., Titman & Wessels, 1988), coefficient of variation in ROA or ROE (Chang et al., 2009). In this study, we will use standard deviation of the percentage change in EBIT. Then, as we change the profitability measure as ROA and ROE for robustness check, we will employ standard deviation of percentage change in ROA and ROE as the proxy for volatility respectively.

3.7 Liquidity

According to trade-off theory, the firms with higher liquidity should borrow more debt because they are able to fulfil their obligations on time. Moreover, Jensen (1986) argue that leverage prevents the agency problems especially for firms having high liquidity but low growth rate. On the other hand, pecking order theory predicts a negative relationship between liquidity and leverage because firms with higher liquidity should use its internally generated cash rather than borrowing debt.

Empirical studies usually support pecking-order theory and report that liquidity and leverage are inversely related (Deesomsak et al., 2004; Mazur, 2007; Viviani, 2008). To the best of our knowledge, only Ata & Ag (2010) test the relationship between liquidity and leverage for Turkish firms and find a negative relationship. Similarly to the previous empirical studies, we will use Current Asset/ Current Liability as a proxy for liquidity in our study.

3.8 Uniqueness

According to Titman (1984) if the products of a firm possess a high level of uniqueness, then the liquidation cost of the firm is larger because it is tough to find substitutes for its products. Because this firm will be exposed to a heavier liquation burden in the case of bankruptcy, it would prefer to use less debt to reduce the probability of financial distress. Therefore, a negative relationship is expected between leverage and uniqueness, which is confirmed by various empirical studies (Berger et al., 1997; Chang et al., 2009; Titman & Wessels, 1988). The most common proxy for uniqueness is ratio of research and development to the total assets. To the best of our knowledge, no study examines the effect of uniqueness on capital structure decisions for Turkish firms. Since research and development cost are not easily accessible, unfortunately we are not able to include uniqueness variable in our study.

4. Data and Measures

This study examines the firm specific determinants of capital structure for companies listed on Borsa Istanbul during 2009-2016 (Note 3). We obtain all data from Thomson Reuters DataStream terminals. Because of their specific nature of financial statements, we do not include finance, insurance, and real estate firms. Therefore, our sample includes only non-financial firms. Besides, we exclude the firms which do not have complete observation throughout 2009 and 2016 to overcome the missing data problem. Consequently, our sample consists of a balanced panel of 111 firms over a period of eight years, which makes 888 firm-year observations in total.

The determinants used in the study and their proxies are extensively adopted from existing literature, for the sake of making meaningful comparison of our results with prior empirical studies. Therefore, our dependent variable is leverage ratio and our independent variables are profitability, growth, non-debt tax shields, size, tangibility, volatility, and liquidity (Note 4). The proxies for independent variables are already discussed in the section three. As for dependent variable, we employ three different proxies for assessing leverage ratio: Long-term debt / Total Asset, Short Term Debt / Total Asset, and Total Debt /Total Asset. Table 1 summarizes the proxies for each of the variables as well as the hypothetical relationship between dependent and independent variables.

Table 1. Variables, proxies, and hypothetical relationships

Variable	Proxy	Symbol	Variable Type	Hypothetical Relationship
Leverage	Long term Debt / Total Asset	LTD/TA	Dependent	_
	Short Term Debt /Total Asset	STD/TA		
	Total Debt / Total Asset	TD/TA		
Profitability	Operating Profit / Total Asset	EBIT/TA	Independent	Trade off theory: Positive
	Net Income / Total Asset	ROA		Pecking order: Negative
	Net Income / Total Equity	ROE		
Growth	[Sales (t) - Sales (t-1)] / Sales (t-1)	GROWTH	Independent	Trade off theory: Negative
				Pecking order: Positive
Non-Debt Tax Shields	Depreciation / Total Asset	NDTS	Independent	Negative
Size	ln (Total Asset)	SIZE	Independent	Trade off theory: Positive
				Pecking order: Negative
Tangibility	Fixed Assets / Total Asset	TAN	Independent	Positive
Volatility	Standard deviation of percentage change in EBIT/TA	σ(ΔEBIT)	Independent	Negative
	Standard deviation of percentage change in ROA	σ(ΔROA)		
	Standard deviation of percentage change in ROE	σ(ΔROE)		
Liquidity	Current Asset/Current Liability	LIQ	Independent	Trade off theory: Positive
				Pecking order: Negative

5. Methodology

Since we have panel data format which includes both cross section and time dimension, we will employ panel regression as econometric analysis. Therefore, empirical expression of the main model in Table 1 is as in equation (1). In the model, i corresponds to the firm and t corresponds to the year:

$$Leverage_{it} = \alpha + \beta_1 Profitability_{it} + \beta_2 Growth_{it} + \beta_3 Non\ debt\ tax\ shield_{it} + \beta_4 Size_{it} + \beta_5 Tangibility_{it} + \beta_6 Volatility_{it} + \beta_7 Liquidity_{it} + \varepsilon_{it} \quad (1)$$

Given that we use more than one proxy for some of the variables, there may be several expressions of this equation; however, we test nine different versions of the given equation. First, we use EBIT/TA for the profitability and σ(ΔEBIT) for the volatility because these two proxies are the commonly employed by previous studies. We regress the three leverage proxies over the specified independent variables and the models will be as follows:

Model 1:

$$LTD/TA_{it} = \alpha + \beta_1(\text{EBIT/TA})_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{EBIT})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (2)$$

Model 2:

$$STD/TA_{it} = \alpha + \beta_1(\text{EBIT/TA})_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{EBIT})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (3)$$

Model 3

$$TD/TA_{it} = \alpha + \beta_1(\text{EBIT/TA})_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{EBIT})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (4)$$

For the robustness considerations, we change the proxy of profitability with first ROA and then ROE. Since we change the profitability measure, we change the volatility proxy with the standard deviation of the percentage change in the new employed profitability measure. More specifically, we make robustness check by first employing ROA as profitability proxy and σ(ΔROA) as volatility proxy and then by employing ROE as profitability proxy and σ(ΔROE) as volatility proxy. Since we have three proxies for dependent variable as well, for robustness check we run 3x2 more regression, which are given below:

Model 4

$$LTD/TA_{it} = \alpha + \beta_1 \text{ROA}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROA})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (5)$$

Model 5

$$STD/TA_{it} = \alpha + \beta_1 \text{ROA}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROA})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (6)$$

Model 6

$$TD/TA_{it} = \alpha + \beta_1 \text{ROA}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROA})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (7)$$

Model 7

$$LTD/TA_{it} = \alpha + \beta_1 \text{ROE}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROE})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (8)$$

Model 8

$$STD/TA_{it} = \alpha + \beta_1 \text{ROE}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROE})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (9)$$

Model 9

$$TD/TA_{it} = \alpha + \beta_1 \text{ROE}_{it} + \beta_2 GROWTH_{it} + \beta_3 NDTS_{it} + \beta_4 SİZE_{it} + \beta_5 TAN_{it} + \beta_6 \sigma(\Delta\text{ROE})_{it} + \beta_7 LIQ_{it} + \varepsilon_{it} \quad (10)$$

Before estimating the coefficients of the models, we test multicollinearity among the variables. Table 2 presents the Pearson correlations among the all proxies of independent variables. As expected, there is a high correlation amogn profitability proxies (EBIT/TA, ROA, and ROE) and two volatility proxies (σ(ΔEBIT) and σ(ΔROA)) (Note 5). Because we never use them in the same model, the high correlation among them give no cause for concern about multicollinearity. On the other hand, correlation between tangibility (TAN) and non-debt tax shield (NDTS) is also high as expected (Huang & Song, 2006; Sayılgan et al., 2006). Thus we examine the multicollinearity further by variance inflation factor (VIF) and tolerance value. VIF value indicates the impact of the remaining variables on the standard error of a regression coefficient while tolerance value is defined as 1/VIF (Hair, Black, Babin, & Anderson, 2010). The lower the VIF and the higher tolerance value, the lower the multicollinearity. Generally the acceptable threshold for VIF is 10 and for tolerance value is 0.10. Since in all nine models, VIF values are below 10 and tolerance values are above 0.10, we can conclude that there is no multicollinearity problem for our models.

Table 2. Correlation matrix

	EBIT/TA	ROA	ROE	GROWTH	NDTS	SIZE	TANG	σ(ΔEBIT)	σ(ΔROA)	σ(ΔROE)	LIQ
EBIT/TA	1.000										
ROA	0.956	1.000									
ROE	0.572	0.509	1.000								
GROWTH	0.185	0.208	0.209	1.000							
NDTS	0.099	0.062	0.028	-0.090	1.000						
SIZE	-0.039	-0.027	0.080	0.050	-0.113	1.000					
TANG	-0.112	-0.120	-0.157	-0.059	0.507	-0.011	1.000				
σ(ΔEBIT)	-0.205	-0.173	-0.274	0.045	-0.031	0.016	0.062	1.000			
σ(ΔROA)	-0.141	-0.113	-0.204	0.051	-0.143	0.008	-0.111	0.719	1.000		
σ(ΔROE)	-0.228	-0.195	-0.278	-0.003	-0.144	-0.094	0.082	0.090	0.044	1.000	
LIQ	0.252	0.235	0.090	-0.040	-0.041	-0.351	-0.173	-0.127	-0.009	-0.158	1.000

Finally, in order to decide whether to present the results of fixed or random effects, we apply Hausman test. Fixed effect estimation assumes that individual specific effect is correlated with the independent variables whereas random effect estimation assumes no correlation. Hausman test serves for selecting between fixed and random effect estimation by exploring whether independent variables are correlated with constant term (alpha) or not. The null hypothesis of Hausman test is that alpha and independent variables are not correlated, which means that there is random effect (Brooks, 2002). Table 3 gives the results of the Hausman test for each of the regression models from 1 to 9 (equation 2 to 10). Since p value is significant for all of the nine models, we reject the null hypothesis of random effect, and use fixed-effect estimation model.

Table 3. Hausman specification test results

Regression Models	Chi-Square Statistics	Degrees of Freedom	P value
(1)	36.37	7	0.000***
(2)	33.06	7	0.000***
(3)	40.76	7	0.000***
(4)	34.99	7	0.000***
(5)	27.32	7	0.000***
(6)	89.40	7	0.000***
(7)	31.58	7	0.000***
(8)	30.33	7	0.000***
(9)	32.38	7	0.000***

6. Results

Before interpreting the coefficients of the regression models, it is worth to examine the summary statistics of the variables. Table 4 indicates the descriptive statistics for proxies of dependent and independent variables. The descriptive statistics of leverage proxies show that, on average firms in Turkey use approximately 22% debt. Long term and short term debts are very close to each other. Average profitability is around 8% when measured by EBIT/TA and ROA; and 4% when measured by ROE. Different proxies for risk (volatility) provides similar results in average. Our descriptive statistics are consistent with the Sayılgan et al. (2006); however, Booth et al. (2001) report a higher average total debt ratio (59.1%) for Turkey in years between 1983 and 1990. Lower total debt ratio in Table 4 may be either because of recent time period used in the study (2009-2016) or due to differences in the firm number included in the analysis. We include 111 firms while Booth et al. (2001) include 45 firms for Turkey

Table 4. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LTD/TA	888	0.111	0.131	0	0.524
STD/TA	888	0.112	0.114	0	0.497
TD/TA	888	0.223	0.185	0	0.673
EBIT/TA	888	0.082	0.082	-0.144	0.338
ROA	888	0.073	0.074	-0.131	0.313

ROE	888	0.037	0.193	-0.796	0.553
GROWTH	888	0.102	0.260	-0.604	1.288
NDTS	888	0.029	.017	0.000	0.079
SIZE	888	13.806	1.541	10.565	17.876
TANG	888	0.328	0.181	0.003	0.770
σ(ΔEBIT)	888	3.150	6.985	0.120	49.500
σ(ΔROA)	888	3.855	10.003	0.142	68.302
σ(ΔROE)	888	3.472	5.657	0.150	25.815
LIQ	888	2.183	1.931	0.350	12.749

After examining the descriptive statistics, next we interpret the results of panel regressions. Table 5 presents the coefficients for each model. In the first three models, EBIT/TA and σ(ΔEBIT) are used as the proxies for profitability and the volatility respectively. When LTD/TA is used as the dependent variable (model-1), all independent variables are significant except liquidity and risk. The coefficient on NDTS is negative and the coefficient on TAN is positive as hypothesized by financial theories. The negative coefficient on EBIT/TA and positive coefficient on GROWTH is consistent with the pecking order theory. Together with this, positive coefficient on SIZE provides support of the trade-off theory. When STD/TA is used as the dependent variable (model-2), GROWTH came out to be insignificant but LIQ becomes significant. Negative coefficients on both EBIT/TA and LIQ are in line with the pecking order theory. The coefficient on SIZE is again significant and positive consistent with trade-off theory. Interestingly, model-2 yields positive coefficient for NDTS and negative coefficient for TAN, which contradicts with the capital structure theories. The adjusted R square of the model-2 is lower than the adjusted R square of the model-1. In model-3 TD/TA is used as dependent variable. Coefficients on all independent variables are significant except GROWTH and NDTS. Again, signs of coefficients on EBIT/TA and LIQ support the hypothesis of pecking order theory and the positive coefficient on SIZE is in line with trade-off theory. TAN has a positive coefficient while σ(ΔEBIT) has a negative coefficient as predicted by capital structure theories. Adjusted R square of model-3 is considerably higher than model-1 and model-2.

Table 5. Regression results

Models	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Variable	LTD/TA	STD/TA	TD/TA	LTD/TA	STD/TA	TD/TA	LTD/TA	STD/TA	TD/TA
alpha	-0.630***	-0.022	-1.218***	-1.020***	-0.326***	-1.325***	-0.997***	-0.285**	-1.286***
EBIT/TA	-0.145***	-0.223***	-0.354***						
ROA				-0.111***	-0.216***	-0.329***			
ROE							-0.018	-0.086***	-0.106***
GROWTH	0.011*	-0.003	0.002	.006*	-0.004	-0.001	0.004	-0.003	-0.002
NDTS	-1.149***	0.668**	0.210	-0.888***	1.066***	0.199	-0.803**	1.073***	0.283
SIZE	0.051***	0.013***	0.111***	0.077***	0.035***	.113***	0.076***	0.032***	0.109***
TAN	0.223***	-0.060**	0.171***	0.230***	-0.039	0.191***	0.234***	-0.043	0.191***
σ(ΔEBIT)	0.001	0.000	-0.0021***						
σ(ΔROA)				0.006	-0.004	-0.006			
σ(ΔROE)							-0.001	-0.005*	-.008**
LIQ	-0.001	-0.015***	-0.014***	-0.001***	-0.013***	-0.014***	-0.001*	-0.015***	-.0158***
R^2	0.261	0.153	0.338	0.255	0.146	0.345	0.250	0.151	0.312
Adj R^2	0.255	0.146	0.333	0.249	0.139	0.340	0.244	0.144	0.307
N	888	888	888	888	888	888	888	888	888

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

In the remaining six models (from model-4 to model-9), we change the proxies for profitability and volatility in order to see whether the results are robust to change in these proxies. Initially, from model-4 to model-6, we employ ROA and σ(ΔROA) as proxy for profitability and volatility respectively. The results obtained from model-4, model-5, and model-6 are very identical to the results obtained from the first three models. The sign, effect sizes, and the significance of the attributes are almost the same except for the effect size of NDTS. Besides, the pattern of adjusted R squares assessed from model-4 to model-6 is very comparable to the pattern assessed from model-1 to model-3. One difference between these two sets of regression models is that σ(ΔROA) is not significant for any of the model while σ(ΔEBIT) is significant in model-3 (i.e. when TD/TA is used as the dependent variable). Another difference is TAN is not significant in model-5 unlike model-2 (i.e. when STD/TA

is used as the dependent variable). Finally, LIQ is significant with a negative coefficient which is in line with the pecking order theory.

Next, from model-7 to model-9, we use ROE for measuring profitability and σ(ΔROE) for measuring the volatility. ROE is not significant when LTD/TA is used as leverage proxy. Besides, effects sizes of ROE is smaller in comparison with EBIT/TA and ROA. σ(ΔROE) is significant for model-8 and model-9 and its coefficients are negative as hypothesized by capital structure theories. Size is again significant for all three models with a positive coefficient. Coefficients and significance of NDTS and TAN are very similiar with those assessed from model-4 to model-6. LIQ is significant for model-7 and model-9 and its negative coefficients support pecking order theory. Adjusted R squares again similar with the pattern in the previous two sets of regression models.

In this section, we interpret the statistical results of the regression models. Next section will discuss the results in the context of the theory and also compare them with the results of the other empirical studies.

7. Discussion

The primary objective of this study is to examine whether established capital structure theories are able to explain the capital structure of the non-financial Turkish companies. Thus, in this section, we first discuss the explanatory power of determinants offered by the financial theory on the capital structure. We also compare our results with the other studies on the basis of our secondary research objective.

Table 6 summarizes the hypothetical relationship predicted by financial theories and the empirical relationships that we have found. According to our results, EBIT/TA and ROA are statistically significant and have negative coefficients in the very model that they are included. However, ROE is not significant for model-7 and it has smaller coefficients than coefficients of EBIT/TA and ROA. This is probably because the features of ROE is not perfectly proper for measuring the profitability implied by the financial theories. The lower correlation of ROE and σ(ΔROE) with the other profitability and volatility proxies also imply the different features of ROE. The negative coefficients on profitability proxies indicate that the relationship between the leverage and profitability is negative as predicted by the pecking order theory. In other words, non-financial firms in Turkey use internal financing when possible and only prefer issuing debt when they need external financing. Our result is consistent with the several other studies that find a negative relationship between leverage and profitability (Bauer, 2004; Booth et al., 2001; Chen, 2004; Friend & Lang, 1998; Huang & Song, 2006; Jong et al., 2008; Kester, 1986; Rajan & Zingales, 1995; Serrasqueiro & Rogao, 2009; Titman & Wessels, 1988; Tong & Green, 2005; Toy et al., 1974; Wald, 1999; Wiwattanakantang, 1999; Zou & Xiao, 2006). For Turkish markets Sayılgan et al. (2006) and Bayraktaroğlu et al. (2013) also report an inverse relationship.

Table 6. Comparison of the test results with the expectations of theories

Determinants	Hypothetical Relationships	Empirical Relationships
Profitability	Trade off theory: Positive Pecking order: Negative	Negative and Significant
Growth	Trade off theory: Negative Pecking order: Positive	Positive and Insignificant
Non-Debt Tax Shields	Negative	Negative and Significant for LTD/TA Positive and Significant for STD/TA
Size	Trade off theory: Positive Pecking order: Negative	Positive and Significant
Tangibility	Positive	Positive and Significant
Volatility	Negative	Negative and Insignificant
Liquidity	Trade off theory: Positive Pecking order: Negative	Negative and Significant

As for growth, given that it is only significant for two out of nine regressions, it can be concluded that it is not a considerable determinants for the capital structure of firms in Turkey. Our results are in the line with results of Bayraktaroğlu et al. (2013) but contradict with results of Sayılgan et al. (2006) who find a strong relationship between leverage and growth. However, they also find two different direction of relationship as they employ two different proxy for the growth.

Non-debt tax shield is significant in the six out of the nine regression models. Besides, its coefficients are strikingly high in comparison with the rest of the independent variables. Interestingly, Non-debt tax shield is

negatively related with long term debt ratio and positively related with the short-term debt ratio. It does not have any significant relationship with the total debt ratio. The negative coefficients on long-term debt show that as the non-debt tax shield increases, firms in Turkey borrow long-term debt less which is consistent with the hypothesis of DeAngelo & Masulis (1980). In this sense, our results are consistent with other empirical studies on Turkey although they find a lower coefficient on non-debt tax shield (Bayrakdaroglu et al., 2013; Durukan, 1997; Sayılgan et al., 2006). Given that higher non-debt tax shield is positively related with short-term leverage, we may argue that tax benefits of depreciation is realized in the not the short but longer terms. On the other hand, the reason may be also the insufficient long-term capital sources in Turkish markets (Karadeniz et al., 2009).

Size can be cited among the important determinants of capital structure in Turkey because it is significant in the all regression models. Besides, the coefficients on size do not vary in terms of sign and the magnitude. The positive association of size with leverage indicates that the relationship between size and leverage is not negative as predicted by pecking order theory but positive as hypothesized by trade-off theory. In others words, as large firms have less asymmetric information, they prefer to issue debt more often in comparison with the smaller firms. Our results are consistent with the several studies on international markets (Booth et al., 2001; Bauer, 2004; Deesomsak et al., 2004; Eriotis et al., 2007; Jong et al., 2008; Marsh, 1982; Rajan & Zingales, 1995; Serrasqueiro & Rogao, 2009; Zou & Xiao, 2006), as well as studies on Turkey (Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Sayılgan et al., 2006).

Tangibility is significant and positive when LTD/TA and TD/TA is used as proxy for leverage. When STD/TA is used as the measure for leverage, tangibility is insignificant except model-2, in which tangibility has negative and significant coefficient. Given that tangibility and long-term debt has a robust, significant, and positive relationship, it seems that Turkish firms with higher tangibility prefers to borrow long term debt in order to match their maturities. The positive coefficients also shows that the models offered by, Jensen & Meckling (1976) and Myers (1997) are empirically valid for Turkey. Other studies generally report a negative coefficients on tangibility for Turkish firms (Bayrakdaroglu et al., 2013; Booth et al., 2001; Gonenc, 2003; Sayılgan et al., 2006). The studies reporting a negative association between leverage and tangibility generally relate this inverse relationship with the lack of sufficient long-term capital sources in Turkey (Karadeniz et al., 2009) or lack of fixed asset to collateralize (Bayrakdaroglu et al., 2013). However; with a recent data (2009-2016), we see that Turkish firms with a higher amount fixed asset can access higher amount of debt, which is consistent with the capital structure theories.

Volatility provides significant coefficients in only three models. Because of its low effect size and poor state of significance, we conclude that volatility is not among the important determinants of the capitals structure. On the other hand, the negative association between volatility and leverage is consistent with both theory and other empirical evidences on Turkey (Durukan, 1997).

Finally, our results show that liquidity has an inverse and significant relationship with the leverage for Turkish market. Besides, the impact of liquidity is robust because it is significant for eight out of nine regression. This result provides the support for pecking order theory which argues that firms with higher liquidity should use its internally generated cash rather than borrowing debt. Our findings is consistent with the results of Berger et al. (1997), Chang et al. (2009), and Titman & Wessels (1988). The studies testing the relationship between liquidity and leverage for Turkish market are not very large in number. To the best of our knowledge, only Ata & Ag (2010) examine the effect of liquidity on leverage and find a negative relationship. In this sense, our results are in line with their results.

Overall, we can make three main conclusion. First, as it is straightforward from the Table 6, the capital structure decisions of non-financial firms in Turkey are mostly consistent with the hypothesis of pecking order theory rather than trade-off theory. The empirical results support the trade-off theory only in the size context. Secondly, as the higher adjusted R squares and higher level of significant relationship shows, the determinants offered by previous literature and financial theory are able to explain the total debt ratio and long-term debt ratio better than the short term ratio for Turkish firms. Third, liquidity, which is not well examined for Turkish market as a determinants of capital structure, is negatively related with the leverage ratio, which provides further support for the pecking-order theory.

8. Conclusion and Suggestions

In this study, we examine whether the capital structure's determinants offered by the financial theories and previous empirical studies are able to explain the capital structure decisions of non-financial firms in Turkey. For measuring leverage, we use three proxies: long term debt ratio, short-term debt ratio, and total debt ratio. Profitability is measured with EBIT/total asset, ROA, and ROE while volatility is measured using standard

deviation in the percentage change in EBIT, ROA, and ROE. The proxies for growth, non-debt tax shield, are percentage change in sales and deprecation over total asset respectively. Tangibility is measured with fixed asset scaled by total asset and size is measured by the natural logarithms of total asset. Finally, the liquidity is measured by current asset over current liability. We build nine different regression models based on these proxies and check whether the results are robust to change in the proxies of leverage, profitability, and volatility. Our results show that profitability, non-debt tax shield, size, tangibility, and liquidity are significant determinants of the capital structure while growth and volatility are not significantly related with the leverage. We find a higher coefficient on non-debt tax shield in comparison with the previous empirical studies on Turkey. Besides, we find that NDTS is negatively associated with long-term debt and positively associated with short-term debt. Moreover, unlike the previous empirical studies on Turkey, we find a positive relationship between tangibility and leverage.

Overall, capital structure decisions of firms in Turkey are consistent with the hypothesis of pecking order theory rather than trade-off theory except for size. Size is found to be positively related with the leverage, which supports the trade-off theory rather than the pecking order theory. Given that models in which leverage is measured by total debt or long-term debt have higher adjusted R squares, determinants offered by the previous literature are able to explain total debt and long term debt rather than short-term debt.

This study has two main limitations. First, we exclude firms having missing data on any variable in years between 2009 and 2016. This causes the econometrical and methodological concerns (such as small sample size or survivorship bias) as well as prevents us from presenting an overall capital structure portrayal for firms in Turkey. Second, our analysis includes only the firms in Turkey. Therefore, we may not make a proper comparison with other emerging and developed markets. Of course, we compare our results with the previous studies on the different markets; however; the comparison may be ineffective since the studies differ in time frame. Therefore, further research may include several emerging and developed markets in order to examine any differences among the capital structure of the countries. Besides, given that there are various proxies for measuring the possible determinants of capital structure, a structural equation model (SEM) may be applied to test the theoretical framework.

References

Altman, E. I. (1984). A further empirical investigation of the bankruptcy cost question. *The Journal of Finance, 39*(4), 1067-1089. https://doi.org/10.1111/j.1540-6261.1984.tb03893.x

Ata, H. A., & Ağ, A. G. Y. (2010). Firma karakteristiğinin sermaye yapısı üzerindeki etkisinin analizi. *Ekonometri ve İstatistik e-Dergisi, (11)*, 45-60. Retrieved from http://dergipark.gov.tr/iuekois/issue/8984/112081

Bauer, P. (2004). Determinants of capital structure: empirical evidence from the Czech Republic. *Czech Journal of Economics and Finance (Finance a uver), 54*(1-2), 2-21. Retrieved from http://journal.fsv.cuni.cz/storage/958_s_2-21.pdf

Bayrakdaroglu, A., Ege, I., &Yazici, N. (2013). A panel data analysis of capital structure determinants: Empirical results from Turkish capital market. *International Journal of Economics and Finance, 5*(4), 131. http://dx.doi.org/10.5539/ijef.v5n4p131

Berger, P. G., Ofek, E., &Yermack, D. L. (1997). Managerial entrenchment and capital structure decisions. *The Journal of Finance, 52*(4), 1411-1438. https://doi.org/10.1111/j.1540-6261.1997.tb01115.x

Bhattacharya, S. (1979). Imperfect information, dividend policy, and "the bird in the hand" fallacy. *Bell Journal of Economics, 10*(1), 259-270. https://doi.org/10.2307/3003330

Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance, 56*(1), 87-130. https://doi.org/10.1111/0022-1082.00320

Bradley, M., Jarrell, G. A., & Kim, E. (1984). On the existence of an optimal capital structure: Theory and evidence. *The Journal of Finance, 39*(3), 857-878. https://doi.org/10.1111/j.1540-6261.1984.tb03680.x

Brennan, M. J., & Hughes, P. J. (1991). Stock prices and the supply of information. *The Journal of Finance, 46*(5), 1665-1691. https://doi.org/10.1111/j.1540-6261.1991.tb04639.x

Brooks, C. (2002). *Introductory Econometrics for Finance.* Cambridge: Cambridge University Press.

Chang, C., Lee, A. C., & Lee, C. F. (2009). Determinants of capital structure choice: A structural equation modeling approach. *The Quarterly Review of Economics and Finance, 49*(2), 197-213. https://doi.org/10.1016/j.qref.2008.03.004

Chen, J. J. (2004). Determinants of capital structure of Chinese-listed companies. *Journal of Business Research, 57*(12), 1341-1351. https://doi.org/10.1016/S0148-2963(03)00070-5

DeAngelo, H., & Masulis, R. W. (1980). Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics, 8*(1), 3-29. https://doi.org/10.1016/0304-405X(80)90019-7

Deesomsak, R., Paudyal, K., & Pescetto, G. (2004). The determinants of capital structure: evidence from the Asia Pacific region. *Journal of Multinational Financial Management, 14*(4), 387-405. https://doi.org/10.1016/j.mulfin.2004.03.001

Durukan, M. B. (1997). Hisse Senetleri İMKB'de İşlem Gören Firmaların Sermaye Yapısı Üzerine Bir Araştırma: 1990-1995". *İMKB Dergisi, 1*(3), 75-91. Retrieved from http://www.borsaistanbul.com/datum/imkbdergi/IMKB_Dergisi_Turkce03.pdf

Eriotis, N., Vasiliou, D., & Ventoura-Neokosmidi, Z. (2007). How firm characteristics affect capital structure: an empirical study. *Managerial Finance, 33*(5), 321-331. https://doi.org/10.1108/03074350710739605

Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *Review of Financial Studies, 15*(1), 1-33. https://doi.org/10.1093/rfs/15.1.1

Ferri, M. G., & Jones, W. H. (1979). Determinants of financial structure: A new methodological approach. *The Journal of Finance, 34*(3), 631-644. https://doi.org/10.1111/j.1540-6261.1979.tb02130.x

Friend, I., & Lang, L. H. (1988). An empirical test of the impact of managerial self‐interest on corporate capital structure. *The Journal of Finance, 43*(2), 271-281. https://doi.org/10.1111/j.1540-6261.1988.tb03938.x

Gonenc, H. (2003). Capital structure decisions under micro institutional settings: the case of Turkey. *Journal of Emerging Market Finance, 2*(1), 57-82. https://doi.org/10.1177/097265270300200103

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, New Jersey: Prentice-Hall, International, Inc.

Heinkel, R. (1982). A theory of capital structure relevance under imperfect information. *The Journal of Finance, 37*(5), 1141-1150. https://doi.org/10.1111/j.1540-6261.1982.tb03608.x

Huang, G., & Song, F. M. (2006). The determinants of capital structure: Evidence from China. *China Economic Review, 17*(1), 14-36. https://doi.org/10.1016/j.chieco.2005.02.007

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2), 323-329. https://doi.org/10.2139/ssrn.99580

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm-and country-specific determinants. *Journal of Banking & Finance, 32*(9), 1954-1969. https://doi.org/10.1016/j.jbankfin.2007.12.034

Karadeniz, E., Yilmaz Kandir, S., Balcilar, M., & Beyazit Onal, Y. (2009). Determinants of capital structure: evidence from Turkish lodging companies. *International Journal of Contemporary Hospitality Management, 21*(5), 594-609. https://doi.org/10.1108/09596110910967827

Kester, W. C. (1986). Capital and ownership structure: A comparison of United States and Japanese manufacturing corporations. *Financial Management, 15*(1), 5-16. https://doi.org/10.2307/3665273

MacKie-Mason, J. K. (1990). Do taxes affect corporate financing decisions?. *The Journal of Finance, 45*(5), 1471-1493. https://doi.org/10.1111/j.1540-6261.1990.tb03724.x

Marsh, P. (1982). The choice between equity and debt: An empirical study. *The Journal of Finance, 37*(1), 121-144. https://doi.org/10.1111/j.1540-6261.1982.tb01099.x

Mazur, K. (2007). The determinants of capital structure choice: evidence from Polish companies. *International Advances in Economic Research, 13(*4), 495-514. https://doi.org/10.1007/s11294-007-9114-y

Miller, M. H. (1977). Debt and taxes. *The Journal of Finance, 32*(2), 261-275. https://doi.org/10.1111/j.1540-6261.1977.tb03267.x

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review, 48*(3), 261-297. Retrieved from http://www.jstor.org/stable/1809766

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *The*

American Economic Review, 53(3), 433-443. Retrieved from http://www.jstor.org/stable/1809167

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of financial economics, 5*(2), 147-175. https://doi.org/10.1016/0304-405X(77)90015-0

Myers, S. C. (2001). Capital structure. *The Journal of Economic Perspectives, 15*(2), 81-102. https://doi.org/10.1257/jep.15.2.81

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187-221. https://doi.org/10.1016/0304-405X(84)90023-0

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance, 50*(5), 1421-1460. https://doi.org/10.1111/j.1540-6261.1995.tb05184.x

Ross, S. A. (1977). The determination of financial structure: the incentive-signalling approach. *The Bell Journal of Economics, 8*(1), 23-40. https://doi.org/10.2307/3003485

Sayılgan, G., Karabacak, H., & Küçükkocaoğlu, G. (2006). The firm-specific determinants of corporate capital structure: Evidence from Turkish panel data. *Investment Management and Financial Innovations (open-access), 3*(3), 125-139. Retrieved from https://businessperspectives.org/author/hakan-karabacak

Silva Serrasqueiro, Z. M., & RêgoRogão, M. C. (2009). Capital structure of listed Portuguese companies: Determinants of debt adjustment. *Review of Accounting and Finance, 8*(1), 54-75. https://doi.org/10.1108/14757700910934238

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance, 43*(1), 1-19. https://doi.org/10.1111/j.1540-6261.1988.tb02585.x

Tong, G., & Green, C. J. (2005). Pecking order or trade-off hypothesis? Evidence on the capital structure of Chinese companies. *Applied Economics, 37*(19), 2179-2189. https://doi.org/10.1080/00036840500319873

Toy, N., Stonehill, A., Remmers, L., Wright, R., & Beekhuisen, T. (1974). A comparative international study of growth, profitability, and risk as determinants of corporate debt ratios in the manufacturing sector. *Journal of Financial and Quantitative Analysis, 9*(05), 875-886. https://doi.org/10.2307/2329684

Wald, J. K. (1999). How firm characteristics affect capital structure: an international comparison. *Journal of Financial Research, 22*(2), 161-187. https://doi.org/10.1111/j.1475-6803.1999.tb00721.x

Warner, J. B. (1977). Bankruptcy costs: Some evidence. *The Journal of Finance, 32*(2), 337-347. https://doi.org/10.1111/j.1540-6261.1977.tb03274.x

Wiwattanakantang, Y. (1999). An empirical study on the determinants of the capital structure of Thai firms. *Pacific-Basin Finance Journal, 7*(3), 371-403. https://doi.org/10.1016/S0927-538X(99)00007-4

Zou, H., & Xiao, J. Z. (2006). The financing behaviour of listed Chinese firms. *The British Accounting Review, 38*(3), 239-258. https://doi.org/10.1016/j.bar.2006.04.008

Notes

Note 1. Warner (1977) reports that direct cost of bankruptcy is approximately 1% of the market value of the firm before it went bankruptcy and it even decreases further as the size of firm increases.

Note 2. Altman (1984) finds that on average the total cost of bankruptcy is between 7% -11% of the firm value measured up to three years before the bankruptcy and it usually exceeds 20% of firm value measured immediately before the bankruptcy. Besides, the firms with smaller size are more affected by the bankruptcy cost.

Note 3. Of course, we also use observations in 2008 as well since some of our variables are defined as percentage change.

Note 4. As stated at section 3.8, we are not able to include “uniqueness” because research and development cost is not available.

Note 5. However, $\sigma(\Delta ROE)$ are not highly correlated with the other volatility proxies. Correlation between ROA and EBIT/TA is higher than the correlation between ROE and EBIT/TA as well as the correlation ROE and ROA.