Capital Structure Determinants within the Automotive Industry

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Abstract

This thesis aims to extend the capital structure literature and identify the firm specific determinants of leverage within the automotive industry, filling a gap in the academic literature, and providing a base for future research. Panel data comprised of 29 global automotive companies over a 10-year period, 2008-2017, is used to run OLS regressions on three classifications of capital structure: total debt, long-term debt, and short-term debt. Both the Pecking Order Theory and the Trade-off Theory are employed to offer predictions and justifications for the results detailed in this study. The empirical results identified in this thesis indicate that growth opportunities, the non-debt tax shield, and profitability produce a negative effect to total leverage while firm size and asset tangibility have a positive correlation. These results were predominantly supported by Trade-off Theory and its implications regarding capital structure choice.

Keywords: Capital Structure, Trade-off Theory, Pecking Order Theory, Firm Specific Determinants, Panel Data Regression.

Contents

1. Introduction

It has been over 70 years since the Modigliani & Miller published their pivotal 1958 study on capital structure. In the aftermath, the topic of capital structure, or the mix between debt and equity within a firm, has become one of the centerpiece topics within the realm of finance. Miller & Modigliani (1958) kick started the capital structure debate by introducing their irrelevance theory which argues that capital structure has no impact on a firm's value within a perfect market. While this theory has been the base for all capital structure research, there is still no consensus on the determinants of capital structure (Bajramović, 2017).

Multiple theories have been developed to attempt to explain funding decisions made by firms, however, the two most studied and developed theories are the Pecking Order Theory and the Trade-off Theory (Bajramović, 2017). The Pecking Order Theory was first coined by Myers (1984) and states that there is a pecking order to types of funding employed by a firm. Starting with internally generated funds, then moving to debt, and finally to equity. On the other hand, Trade-off Theory suggests that firms make financing decisions by weighing the costs of financial distress and the tax benefits of debt (Frank & Goyal, 2007).

This thesis looks to extend the capital structure research to the automotive industry with the hopes of identifying which firm specific characteristics determine capital structure in this sector. Within the current literature, no published or public comprehensive analysis of capital structure determinants in the automotive industry could be found. The aim of this study is to fill this void by identifying these potential determinants and to attempt to explain their significance through the primary capital structure theories of the Trade-off Theory and the Pecking Order Theory.

While the automotive industry is currently boasting record high global vehicle sales, 88 million units in 2016, and profit margins are at a 10 year high, analysts anticipate the automotive industry will soon run into a downturn (Parkin et al., 2017). With technological advances and innovations, and more stringent environmental and safety regulations, costs for automobile manufacturing have increased as much as 20% (Parkin et al., 2017).

Considering these market developments, understanding the firm specific characteristics that influence capital structure, and their theoretical underpinnings, could offer valuable insights into strategies and approaches for funding future projects.

This study is based on 29 global automotive companies over a 10 year period, 2008-2017. Structured panel data with fixed cross-section effects is used to regress 6 firm specific variables on the dependent variable; leverage. The independent variables include the dividend payout ratio, growth opportunities, non-debt tax shields, profitability, firm size, and asset tangibility. The empirical results identify five significant capital structure determinants in the automotive industry whose outcomes can be explained through the interpretation of either the Pecking Order Theory or Trade-off Theory. Specifically, this study finds that growth opportunities, non-debt tax shields, and profitability produce a negative effect to total leverage, while firm size and asset tangibility have a positive relationship.

The rest of this paper is structured as follows. Section 2 will outline the theoretical frameworks of the capital structure literature and introduce the founding principles behind the Pecking Order Theory and the Trade-off Theory. Section 3 will contain an introduction to the methodology employed in this study which includes an in-depth discussion of the expected relations between both the dependent and independent variables, an overview of panel data, and a quick discussion of the regressions used. The results of my methodology will be discussed in section 4, along with their theoretical justifications. Finally, section 5 will include a reflection on this study's limitations, discuss implications of the empirical results, and provide a direction for further research.

2. Theoretical Framework

In this section, I will introduce the theoretical background which shaped the capital structure debate. Additionally, I will introduce the Pecking Order Theory and Trade-off Theory and conduct a literature review of several of the most predominant capital structure studies and discoveries.

2.1 Capital Structure Irrelevance Theorem

The topic of capital structure has peaked the curiosity of economists for decades and is still a topic which is the center of much discussion. With the subject first being touched in the seminal paper *"The Cost of Capital, Corporation Finance and the Theory of Investment"* (Modigliani & Miller, 1958), an entire field of study has developed and a vast sea of knowledge has been gathered. Modigliani & Miller (1958) was the first paper to introduce and discuss the relationship between capital structure decisions made by a firm and their effects on the value of a firm. It is here in which they presented their Capital Structure Irrelevance Theorem. This theorem states that, while working under the assumptions of perfect markets and no transaction costs, capital structure is irrelevant (Modigliani & Miller, 1958).

Modigliani & Miller (1958) made two important propositions which hold true under perfect market assumptions:

> Proposition I: A firm's total market value is independent of its capital structure.
>
> Proposition II: A firm's cost of equity increases linearly with its debt-equity ratio.

For these propositions to be true, the following assumptions must be taken into consideration: capital markets are frictionless (i.e. no transaction costs), all investors have homogeneous expectations (i.e. no information asymmetries), market participants are atomistic (i.e. no single market participant can affect the market price), a firm's investment program is fixed and known, and a firm's financing is fixed (Ogden, Jen, & O'Connor, 2003).

Proposition I, which is often referred to as the irrelevance theorem, makes the case that capital structure has no impact on firm value in a perfect market. Instead, a firm can only increase their value through income generated by their assets (Ogden, Jen, & O'Connor, 2003). Miller & Modigliani (1961) also argue for the irrelevance of dividend policy with regard to the firm's equity value. As investors are able to sell their shares in the case that dividends are too low, or can reinvest dividend distributions into more shares if the dividend is too high, dividend policy is inconsequential to the investor (Ogden, Jen, & O'Connor, 2003). Furthermore, Proposition II extends from Proposition I and infers that a company's debt to equity ratio increases as the costs of equity increases. This illustrates that a firm's weighted average cost of capital is a linear function of its levels of debt (Ogden, Jen, & O'Connor, 2003).

Extending from their previous works, (Miller & Modiglaini, 1963) propose individual firms to finance their operations through 100% debt if there is both a positive corporate tax rate and the interest payments are tax deductible. This scenario would allow the company in question to take full advantage of their tax shield while not incurring any distress costs associated with bankruptcy.

While the contributions to the academic literature by Miller and Modigliani have been unfathomably large, their work has also attracted well-grounded criticism, especially regarding the perfect market assumptions (Stiglitz, 1969; Hirshleifer, 1966; Myers & Majluf, 1984). The general consensus within the academic community is that the theoretical framework of capital structure laid out by Modigliani & Miller (1958) does not give a realistic approach for how to determine a firm's capital structure (Frank & Goyal, 2003). However, the absence of a realistic approach provided the necessary academic environment in which future theories, like the Pecking Order Theory and Trade-off Theory, could be explored through easing the assumptions presented by Modigliani & Miller (1958).

2.2 Pecking Order Theory

The concept of a ranking order for the preferred methods of funding has long been deliberated, originating back to Donaldson (1961), however, it was firmly established as a theory by Myers (1984) and Myers & Majluf (1984). According to Myers (1984, pp. 576) a firm follows the Pecking Order Theory if "*it prefers internal to external financing, and debt to equity if it issues securities*." Firms are more inclined to utilize internal funding over external funding due to the costs associated with external sources through information asymmetries and adverse selection issues (Myers & Majluf, 1984). Additionally, the use of internal funds to finance projects does not offer any type of signal to the market regarding the true value of a firm (Shyam-Sunder & Myers, Testing Static Tradeoff Against Pecking Order Models of Capital Structure, 1999).

The use of external funding, debt and equity, occurs when the retained earnings do not cover the costs of an investment opportunity. Due to information asymmetries where managers of a firm have more knowledge regarding the true value of the firm as compared to external investors, the issuance of equity can be negatively influenced resulting in mispricing of the equity (Myers & Majluf, 1984; Harris & Raviv, 1991). From the investors' perspective, equity issuances are typically viewed as a signal of firm overvaluation (Ogden, Jen, & O'Connor, 2003). As the market is well aware of adverse selection among equity issuers, the firm's value is discounted and investors require a higher return on equity for undertaking increased risk (Ogden, Jen, & O'Connor, 2003).

This potential outcome is a common deterrent for managers to avoid equity issuances, thus the firm will not have the funds to take advantage of some positive net present value (NPV) projects resulting in an underinvestment problem (Harris & Raviv, 1991). As such, the costs of equity are twofold. First, internal information regarding the true value of the firm has been given to external investors through the negative signal in the market. Secondly, by not investing in the positive NPV project, the current shareholders and firm as a whole do not increase their value. Therefore, these potential costs render equity issuances risky in the eyes of managers and is considered a last resort for investment financing (Myers & Majluf, 1984).

Debt, on the other hand, is another external funding option for a firm which is argued to be safer than equity (Myers, 1984; Myers & Majluf, 1984). Debt also carries costs associated with information asymmetries and adverse selection; these costs, however, are considered minimal when compared to the costs of equity. The information asymmetry issue is partly mitigated through the issuance of debt due to its pricing method. Financial intermediaries, like banks, are given access to internal company information in order to determine the fair value of the debt. This valuation is then delivered to the market without exposing crucial information to the public or other competitors (Ogden, Jen, & O'Connor, 2003).

2.3 Trade-off Theory

While the Pecking Order Theory implies that capital structure decisions are influenced by the costs associated with different financing methods, the Trade-off Theory implies that firms move towards a target debt ratio which is obtained through balancing marginal costs and benefits (Frank & Goyal, 2007). The Trade-off Theory, first hypothesized by Myers (1984), states that a firm considers both the advantages and disadvantages of debt financing when making capital structure decisions. The benefit of debt, the debt tax shield, was identified when Modiglaini & Miller (1963) relaxed the Modigliani & Miller (1958) assumptions to take into consideration corporate taxes. This study implied companies should finance their operations exclusively with debt as there was no defined cost of debt (Frank & Goyal, 2007). However, several researchers including Kraus & Litzenberg (1973) and Scott (1976) argue that there are costs associated with debt, the costs of bankruptcy. This line of research was further expanded with the hopes of identifying a more plausible approach to capital structure.

Myers (1984) postulates that a firm follows the Trade-off Theory if a target debt ratio is established, and the firm gradually moves towards it. This target is then the balancing between the debt tax shields and the costs of financial distress. It is important to point out that this theory then also implies that there is an optimal capital structure for each individual firm (Ogden, Jen, & O'Connor, 2003). Figure 1 below is a graphical representation of the Static Trade-off Theory which was first introduced by Myers (1984). A firm is said to follow the

Static Trade-off Theory if the firm's leverage is determined by a single period trade-off between the tax benefits of debt and the deadweight costs of bankruptcy (Myers 1984). Furthermore, the value of a firm is maximized when the costs of debt exactly offset the benefits of additional leverage (Ogden, Jen, & O'Connor, 2003).

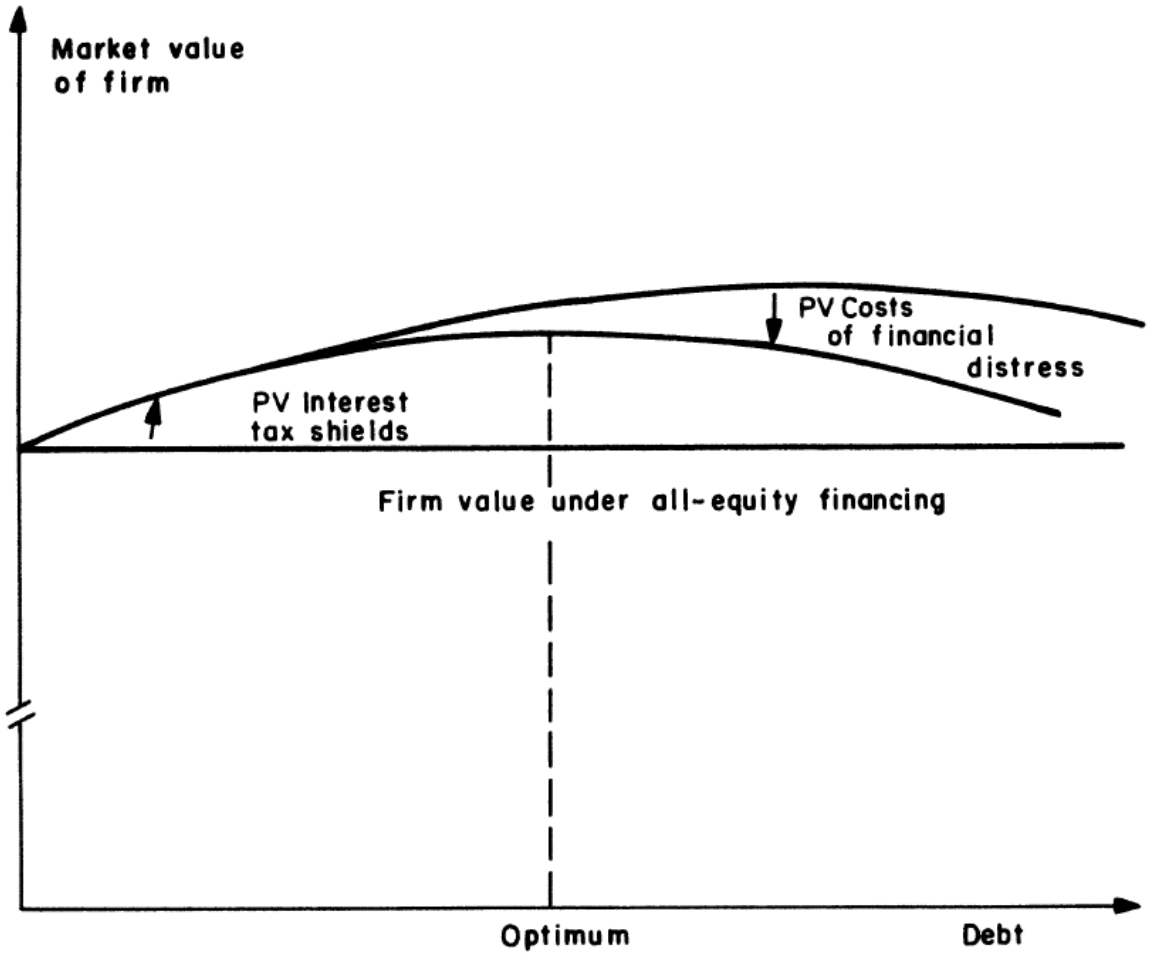

Figure 1: "The static-tradeoff theory of capital structure" from *"The Capital Structure Puzzle"* (Myers 1984, pp. 557).

2.4 Literature Review

Within the context of capital structure theory, the majority of literature is dedicated to identifying the correlation between different firm specific determinants and leverage ratios (Frank & Goyal, 2007). These results are then extrapolated to examine both the Pecking Order Theory and the Trade-off Theory, however, neither of these has been dubbed as being more explanatory than the other when it comes to determining capital structure decisions. Empirical results have indicated both support and contradiction for these theories and, seemingly, the only consensus is that neither theory can fully explain the financing decision of companies (Frank & Goyal, 2007).

Bradley et al. (1984) is one of the first studies to use cross-sectional, firm specific data to identify evidence of an optimal capital structure i.e. a trade-off between the costs of bankruptcy and non-debt tax shields. Their results support the Trade-off Theory, and other early studies such as Auerbach (1985) provide similar findings.

In the foundational paper *"The Determinants of Capital Structure Choice",* Titman & Wessels (1988) use linear structural modeling to measure latent variables. They go on to measure the impact of eight variables on debt levels with the variables being: the collateral value of assets, growth, industry, non-debt tax shields, profitability, size, uniqueness and volatility. The results from their study provide no definitive victor of the capital structure theory debate and they contain argumentations for both the Pecking Order Theory and the Trade-off Theory. Titman & Wessels (1988) find that short-term debt ratios are negatively correlated to firm size, indicating that transaction costs may have implications regarding the choice of capital structure. Furthermore, the negative relationship between debt and profitability is also directly in line with Pecking Order Theory as put forth by Myers (1984) and Myers & Majluf (1984) and is a direct contradiction to the prediction of Trade-off Theory (Shyam-Sunder & Myers, Testing Static Tradeoff Against Pecking Order Models of Capital Structure, 1999).

In their analysis, Frank & Goyal (2009) shine a spotlight on a crucial issue within the capital structure literature; different understandings of common facts is causing empirical issues.

The well referenced survey by Harris & Raviv (1991, pp. 334), which attempted to synthesize the available capital structure literature, states that "leverage increases with fixed assets, non-debt tax shields, growth opportunities, and firm size and decreases with volatility, advertising expenditures, research and development expenditures, bankruptcy probability, profitability and uniqueness of the product". Furthermore, according to Harris & Raviv (1991) the aforementioned statement is generally agreed upon by the available research. This is in direct confrontation with the findings from Titman & Wessels (1988) who do not find any significant effects on debt ratios from non-debt tax shields, volatility, collateral value, or growth. Frank & Goyal (2009) continue to identify six core factors to help explain some of the patterns found in their data, three of which directly apply to this study: tangible assets, firm size, and profitability. Both tangible assets and firm size are positively correlated with leverage which corresponds to Trade-off Theory, and profitability is negatively correlated with leverage which corresponds to Pecking Order Theory**.**

While the vast majority of literature is dedicated to identifying the correlation between different firm specific determinants and leverage ratios (Frank & Goyal, 2007), another approach is to compare the explanatory power of each capital structure theory. While Titman & Wessels (1988) test all hypothesis jointly, Shyam-Sunder and Myers (1999) look to isolate the explanatory powers of the Pecking Order Theory and the Trade-off Theory to identify which is more reliable. Their results suggest that the Pecking Order Theory is more reliable due to: (1) it is a robust first-order descriptor of corporate financing behavior, (2) the coefficients and significance levels remained almost constant when tested jointly the target adjustment model, (3) firms finance deficits with debt in their study, and (4) it is easily rejected when it is false as compared to the target adjustment model (Shyam-Sunder & Myers, Testing Static Tradeoff Against Pecking Order Models of Capital Structure, 1999).

After the Shyam-Sunders & Myers (1999) study was published, the academic community was quick to target several admitted issues with their methodology. In 2000, Chirinko & Singha highlight that the Shyam-Sunders & Myers (1999) model is too simple and leads to misleading inferences on the power of the Pecking Order Theory. Furthermore, they claim that the "empirical evidence can evaluate neither the Pecking Order nor Static Trade-off Models" (Chirinko & Singha, 2000, pp. 417). Frank & Goyal (2003) also criticize the Shyam-

Sunders & Myers (1999) approach by claiming the sample is too small to pull significant inferences. They go on to find that equity issues, not debt issues, tend to be the primary source of funding when external sources are needed which completely contradicts the notion of a pecking order hierarchy (Frank & Goyal, 2003). Interestingly, Frank & Goyal (2007) identify that, at an aggregate level, the relationship between financing deficits, equity issues, and debt issues, is in fact the opposite of their 2003 claim.

3. Methodology

In this section, I will provide a brief outline of the data used in my empirical analysis, followed by an in depth discussion regarding the dependent and independent variables and their expected relationships based on the current theoretical literature. Finally, I will introduce the model and regressions employed, their justifications, and conclude with a table summary of my expected results.

3.1 Data

The quantitative data used for this research study consists of financial data for 29 mature automotive companies with a primary focus on automotive manufacturers and not on suppliers within the industry. No single market is the focal point of this study, and the collected firms are global competitors. Annual financial data is gathered over the period 2008-2017 through the use of Thompson Reuters Eikon and various annual reports to supplement missing data. This resulted in a total of 290 observations.

3.2 Dependent Variable

This study aims to identify the determinants of capital structure within the automotive industry. In this study, the main dependent variable used as a proxy for capital structure is the total debt ratio which is equal to Total Liabilities / Total Assets. This is a commonly used representation of capital structure in other empirical papers (Pepur et al., 2016; Črnigoj & Mramor, 2009; Šarlija, 2016), and this measurement is considered to provide the broadest definition of leverage (Rajan and Zingales, 1995). However, one glaring issue arises when only looking at total liabilities. Pooling together all liabilities into one ratio does not allow for the analysis of long or short-term debt and how they are influenced by the regressors (Song, 2005; Chittenden et al., 1996). In order to analyze the nuances between total, long-term, and short-term debt, two additional regressions will be run. One regression with the long-term debt ratio (Long-term Liabilities / Total Assets) as the dependant variable, and one with

short-term debt ratio (Short-term Liabilities / Total Assets). The dependant variables used in this study are summarized in Table 1 below.

Table 1. Dependant Variable Summary

Dependant Variables	Definition
Total Debt Ratio (TDR)	$\frac{Total\ Liabilities}{Total\ Assets}$
Long-term Debt Ratio (LDR)	$\frac{Long-term\ Liabilities}{Total\ Assets}$
Short-term Debt Ratio (SDR)	$\frac{Short-term\ Liabilities}{Total\ Assets}$

3.3 Independent Variables

Dividend Payout Ratio

The dividend payout ratio provides useful insights as it may give information regarding a firm's financial stability. The payout of dividends is typically executed with a firm's retained earnings and excess cash which ultimately decreases the funds available for future projects. As a result, raising funds through external sources may be necessary to finance new projects. Based on the Pecking Order Theory, the payout of dividends (which reduces available internal funds) would result in an increase in debt as debt is a cheaper source when compared to equity (Myers, 1984). The positive relationship between leverage and dividend payout ratios is in line with the results of Fama & French (2002) as well as Frank & Goyal (2003). Furthermore, as Myers (1984) pointed out, dividends are sticky in the short-term, and fluctuations in cash flows are absorbed largely by debt. This could indicate a stronger correlation between short-term leverage and the dividend payout ratio which is also found by Frank & Goyal (2003).

According to the Trade-off Theory however, a negative relationship between dividend payout ratio and leverage is expected. As the debt of a firm increases, so do the costs associated with this debt. These costs include interest expenses, the principal amount, and a higher probability of default (Myers & Majluf, 1984). This results in a decrease in retained

earnings, excess cash, and other internal funds which could be used to distribute a dividend. This inverse relationship has been found in multiple studies (Al-Ajimi et al., 2009; Fama & French, 2002; Bokpin, 2009), however Frank & Goyal (2009), who also found that leverage has a negative correlation to dividend payments, postulate that the current literature on the relation between these two variables is too ambiguous to draw definitive conclusions.

Growth Opportunities

Growth opportunities are a firm specific characteristic which is used to identify which firms have a greater capability to grow and expand their operations. However, growth prospects require investments, and investments require firms to acquire the funding needed (Kumar et al., 2017). This paper uses the ratio of intangible assets to total assets to proxy for growth opportunities which is supported by Titman & Wessels (1988) and Michaels et al (1999). The Pecking Order Theory and the Trade-off Theory offer different expectations for its relation to capital structure. Generally, firms with high growth also have a higher risk of bankruptcy, which will decrease their levels of debt (Al-Ajimi et al., 2009). Furthermore, high growth firms typically have larger levels of intangible assets (Ngjeliu, 2018; Chen, 2004). Consequently, lenders charge a higher rate of return in order to accommodate for the increased probability of financial distress and information asymmetries (Chen, 2004). Therefore, under the tradeoff theory, a negative correlation between growth opportunities and debt is anticipated**.**

However, Bajramović (2017) argues that, under the Pecking Order Theory, the relation between growth and leverage will depend on the internal funding available to the firm. If these funds are not enough to fund the growth opportunities, then the firm will enter the market and issue more debt. A similar argument is put forth by Al-Ajimi et al. (2009), in order for a high growth firm to stay profitable, the firm needs to increase leverage when they encounter a financial deficit. Furthermore, it has been shown that short-term debt helps to mitigate agency problems (Michaelas et al., 1999). Thus, under the Pecking Order Theory, this study expects to find a positive relationship between short-term debt and growth opportunities.

Non-Debt Tax Shield

The continued use of tax shields to lower taxable income is an important and frequently used strategy when making capital structure decisions. However, it is not the only method that can reduce this financial burden. In their 1980 paper, DeAngelo and Masulis argue that tax benefits resulting from non-debt items such as depreciation and R&D expenses can be a substitute for tax benefits resulting from debt financing. As a firm's depreciation expenses, which are tax deductible, increase, that firm is less dependent on interest expenses from debt to lower their tax burden (Byoun, 2008). Furthermore, Cloyd (1997) propose that non-debt tax shields may in fact be a less costly substitute to reduce tax burdens. In this study, the ratio of depreciation to total assets is used to proxy for non-debt tax shields as utilized by Titman & Wessels (1988), Song (2005) and Fama & French (2002).

The results within the academic literature seems to be quite one sided and supports a negative correlation between non-debt tax shields and debt through the logic of the Trade-off Theory. The work of DeAngelo & Masulis (1980) points out that taxable income diminishes with the increase in non-debt tax shields which, in turn, lowers the tax rate imposed on the firm and ultimately reduces the expected payoff of debt tax shields. This inference was also found in the results of Titman & Wessels (1988), Frank & Goyal (2002), and Song (2005) among others. Following the literature trends, a negative correlation between non-debt tax shield and debt within the automotive industry is expected.

Profitability

The profitability of a firm is a commonly used variable to measure a firm's strength and gives some indication for future performance (Shyam-Sunder & Myers, 1994). Furthermore, profitability is one of the most studied firm specific variables within the capital structure literature (Kumar, Colombage, & Rao, 2017). I will employ the Titman & Wessels (1988) measurement for profitability which is operating income to total assets. Under the Trade-off Theory, the expected relation between profitability and leverage is positive. As the profits of a firm increase, their debt capacity also increases which in turn reduces the expected costs of financial distress (Pepur et al., 2016). Additionally, more profitable firms are incentivised

to issue more debt to take advantage of the tax savings provided through the deductibility of interest expenses (Pepur et al., 2016; Kaur & Rao, 2009; Bajramović, 2017).

The Pecking Order Theory offers a different rational. As Myers (1984) argues that the benefits of the interest tax shield and the costs of financial distress are a secondary consideration; external sources of funding will only be used if internal funding is not adequate to fund a project. As the profitability of a firm rises and the dividend policy remains the same (Myers, 1984), the retained earnings will also increase (Kaur & Rao, 2009). Thus, the firm's reliance on external financing diminishes with increases in profitability. This negative relationship has been consistently identified within the literature on capital structure including Myers & Majluf (1984), Titman & Wessels (1988), Rajan & Zingales (1995), Fama & French (2002), Frank & Goyal (2003), Chen (2004), and Chang et al. (2007) among others. In line with this overwhelming support, this thesis anticipates the identification of a negative relationship between leverage and profitability within the automotive industry.

Firm Size

The findings of previous studies have shown that the size of any given firm can greatly affect its capital structure (Kumar, Colombage, & Rao, 2017; Chen & Strange, 2005). The argumentation is that larger firms tend to be more diversified, which reduces their default risk (Eriotis et al., 2007). It is also shown that the assets of a large firm are not as volatile as that of a small firm, reducing its likelihood of financial distress (Rajan & Zingales, 1995). In this study, I use the natural logarithm of net sales as a proxy for firm size as utilized by other researchers such as Titman & Wessels (1988), Rajan & Zingales (1995), and Song (2005).

According to the Trade-off Theory, the expectation is that large firms will have greater leverage ratios as bankruptcy costs decrease with size (Pepur, 2016). This decrease in bankruptcy costs is associated with the lower risk larger firms have due to diversification. This diversification also reduces the transaction costs associated with raising debt as banks find larger firms to be more favorable borrowers as compared to smaller firms (Eriotis et al., 2007). Furthermore, cash flows in large companies are more stable and the volatility of their

earnings are lower (Bajramovic, 2017). These factors may also incline large firms to prefer the use of long-term debt (Marsh, 1982).

Firm size has also been argued to be a proxy for information provided to outside parties, and that the larger the firm, the greater the amount of information provided (Fama & Jensen, 1983). Within this frame, the Pecking Order hypothesis would expect large firms to issue less debt and more equity as there is less information asymmetry (Titman & Wessels, 1988; Bajramović, 2017; Eriotis et al., 2007). Titman & Wessels (1988) also argue that, due to high transaction costs for smaller firms, short-term debt ratios will also have a negative relation to firm size.

Asset Tangibility

Asset tangibility is a measure used to proxy additional borrowing capacity as tangible assets can be used as collateral (Pepur et al., 2016). Also, these assets tend to suffer minimal value loss when a firm goes into distress, decreasing the expected costs of bankruptcy (Frank & Goyal, 2007; Frank & Goyal, 2009). Under these conditions, the Trade-off Theory assumes that a firm with greater tangible assets would also hold more debt (Bajramović, 2017). Furthermore, as tangibility indicates the liquidation value of a firm, a firm under financial distress with high values of tangible assets will be more likely to mitigate the distress costs (Bajramović, 2017). This positive relationship has been found in several studies including Harris & Raviv (1991) and Rajan & Zingales (1995).

The Pecking Order Theory, on the other hand, argues that firms with greater values of tangible assets are exposed to less information asymmetry and therefore raise less debt (Bajramović, 2017). The negative correlation between asset tangibility and leverage has been identified in academic literature (Titman & Wessels, 1988), however the overwhelming majority of research studies find that the Trade-off Theory holds with regards to tangibility of assets (Kumar, Colombage, & Rao, 2017). Thus, a positive correlation between leverage and asset tangibility is expected in this study.

The independent variables described in the section above, along with the expected results are summarized in Table 2. below.

Table 2. Independent Variable and Expectation Summary

Independent Variable	**Measured By**	**Theory**	**Expected Result**
Dividend Payout Ratio	$\frac{Cash\ Dividend}{Net\ Income}$	Trade-off Theory Pecking Order Theory:	- +
Growth Opportunities	$\frac{Intangible\ Assets}{Total\ Assets}$	Trade-off Theory Pecking Order Theory	- +
Non-Debt Tax Shield	$\frac{Depreciaiton}{Total\ Assets}$	Trade-off Theory	-
Profitability	$\frac{Operating\ Income}{Total\ Assets}$	Pecking Order Theory	-
Firm Size	$Ln(Total\ Assets)$	Trade-off Theory Pecking Order Theory	+ -
Asset Tangibility	$\frac{PP\&E}{Total\ Assets}$	Trade-off Theory	+

3.4 Model

Panel Data

The regression model presented in this paper is based on panel data which is the most frequently used methodology for capital structure determinant analysis (Kumar, Colombage, & Rao, 2017). Panel data is a commonly used data set when working with data that has both a time dimension and a cross sectional dimension (Brooks, 2008). With regards to this study, the cross-sectional units are the automotive companies over the time period 2008-2017. This type of data set allows for a more flexible and complex analysis of data than a stand-alone time series data or cross-sectional data as both elements are taken into consideration. This ultimately increases the degrees of freedom and, therefore, the validity of the test (Brooks, 2008).

With the increased complexity of panel data also comes increased complexity in its design. Depending on the research question, different structures can be placed on the data. The first available structure is to "pool" the data together. A pooled regression does not take into consideration the time factor of the data and regresses the variables as a cross sectional regression. This approach makes the assumption that there is no heterogeneity between cross-sectional units and no time period (Brooks, 2008). This will cause some issues as it is unlikely that there would be no dependence between an observation of a variable for a firm in time t=1 and the same firm in time t=2 (Brooks, 2008). Thus, the pooled regression results in a loss of valuable information and defeats the purpose of panel data (Brooks, 2008).

There are two general approaches when estimating panel data: fixed effects and random effects. A fixed effects model holds the coefficient estimates constant or fixed over both the time and cross-sectional dimensions, while allowing the intercept to vary cross-sectionally, but not over time (Brooks, 2008). This indicates that, for the focus of this paper, the intercept for any cross-sectional unit (e.g. BMW AG) will be fixed and will promote heterogeneous units. The random effects model also uses heterogeneous intercepts for each firm which are constant over time, and the correlation coefficients are constant over the time and cross-sectional dimensions (Brooks, 2009). However, the random effects model assumes that a

mutual intercept and a time-invariant error term make up the intercepts for each cross-sectional unit. It is within this error term that firm heterogeneity is captured (Brooks, 2009). In order to determine which of these two approaches best fits this study's data, the Hausman Test is used. The results of this test determined that the fixed effects model shall be implemented.

Regression Equations

The panel data described above was used to conduct ordinary least squares regressions in Eviews. Three regressions were conducted to measure the effects of the six independent variables on total debt, long-term debt, and short-term debt. The regression equations are presented below:

$$TDR_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 GO_{it} + \beta_3 NDTS_{it} + \beta_4 PROF_{it} + \beta_5 SIZE_{it} + \beta_6 TANG_{it} + \mu_{it} \quad (1)$$

$$LDR_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 GO_{it} + \beta_3 NDTS_{it} + \beta_4 PROF_{it} + \beta_5 SIZE_{it} + \beta_6 TANG_{it} + \mu_{it} \quad (2)$$

$$SDR_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 GO_{it} + \beta_3 NDTS_{it} + \beta_4 PROF_{it} + \beta_5 SIZE_{it} + \beta_6 TANG_{it} + \mu_{it} \quad (3)$$

where TDR, LDR, and SDT represent the total debt ratio, long-term debt ratio, and short-term debt ratio respectively. Furthermore, *DIV, GO, NDTS, PROF, SIZE*, and *TANG* represent the variables dividend payout ratio, growth opportunities, non-debt tax shield, profitability, size, and asset tangibility respectively. Descriptive stats for these variables are found in Appendix A6. In order to ensure the absence of multicollinearity (the correlation between the independent variables), a simple correlation matrix was completed in Eviews and the results can be found in Appendix A5**.** The general rule of thumb states that if two variables have greater than 0.8 correlation to one another, multicollinearity is an issue in the regression (Ogden, Jen, & O'Connor, 2003). As we can see in Appendix A5, the correlations between the independent variables in this study do not violate the rule of thumb mentioned above and we can therefore include the variables in the regression.

Econometric Tests

The use of ordinary least squares regressions is only viable if certain assumptions hold true. The first of these is that the variance of the error terms exhibit homoscedasticity (the error terms are constant). In order to test for this, I employ the Breusch-Pagen-Godfrey test within Eviews with the null hypothesis of homoscedasticity which is rejected. To correct for this, I employ White Standard Errors in my regression. The next assumption is that there is no autocorrelation, or pattern, in the residuals. The Durban-Watson statistic in Eviews (0.728) was found to be below the minimum required critical value, indicating that first-order autocorrelation was present in the model. To mitigate this issue, I made the model dynamic by including the first order lag of the dependent variable as an independent variable. This seems to have solved the issue of autocorrelation as the DW statistic increased to 1.7, which is close to the optimal value of 2. Furthermore, the normality of the error terms was tested in Eviews and the output for the equation (1) can be found in Appendix A4. With a skewness and kurtosis of 0.17 and 5.99 respectively, the errors are not normally distributed. This issue may be a result of the sample size and could be mitigated by increasing the number of companies involved in the study.

4. Empirical Results and Analysis

This section will present the empirical results of the panel data ordinary least squares regression used in this study. These results will then be discussed and interpreted through the theoretical expectations described in previous sections.

4.1 Regression Results

Table 3. Consolidated Regression Results

Variable	TDR	LDR	SDR
Dividend Payout Ratio	0.0004(0.6080)	-7.18E-05(0.9729)	0.0024(0.0056)*
Growth Opportunities	-0.4419(0.0001)*	-0.4822(0.0781)	-0.0235(0.8787)
Non-Debt Tax Shield	-0.5986(0.0001)*	-0.8777(0.0002)*	-0.2492(0.0741)
Profitability	-0.7859(0.0000)*	-1.2257(0.0000)*	-0.3624(0.0003)*
Firm Size	0.0220(0.0000)*	-0.0119(0.7176)	0.0412(0.0001)*
Asset Tangibility	0.0798(0.0015)**	0.0829(0.0463)**	0.0480(0.3601)
R^2	0.9576	0.9788	0.8479
F-statistics	135.6214(0.000)	276.7809(0.000)	33.4437(0.000)

* Statistically Significant at 1% ** Statistically Significant at 5%
Dependent Variables: TDR: Total Debt Ratio LDR: Long-term Debt Ratio SDR: Short-term Debt Ratio

4.2 Results and Analysis

4.2.1 Dividend Payout Ratio

As shown in Table 3, the dividend payout ratio has a positive correlation with both total and short-term debt which is congruent with our expectations under the Pecking Order Theory, while a negative correlation is identified with long-term debt. However, the coefficients indicate that the dividend payout ratio has a minor impact on leverage. Furthermore, the p-values indicate insignificant results regarding total and long-term leverage. The positive correlation to short-term debt on the other hand is significant with a p-value of 0.0056.

This positive relationship between short-term debt and dividends can be explained by Pecking Order Theory. As internal funds are depleted through the distribution of a dividend,

a firm may find themselves in a financial deficit when it come to new project opportunities. As a result, external funding will be required in order to capitalize on the investment. Consequently, more debt will be raised as debt is a cheaper source of funding than equity. Additionally, these results are in line with the Frank & Goyal (2003) who find that dividend paying firms issue less long-term debt as compared to short-term debt. Myers (1984) discussed the stickiness of dividend policies within firms and how debt is commonly used to bridge funding requirements. With these inferences in mind, it is reasonable to identify this positive correlation between short-term leverage and the dividend payout ratio.

4.2.2 Growth Opportunities

The variable growth opportunities, measured by intangible assets to total assets, has an inverse relationship to each measure of debt: total, long-term, and short-term. While the variable is insignificant for both long and short-term debt, growth opportunities are statistically significant at the 1% level (p-value of 0.0001) for total debt with a correlation coefficient of -0.44.

This inverse relationship may be explained by several aspects of the Trade-off Theory. Chen (2004) argues that firms with higher growth opportunities tend to hold high amounts of intangible assets which increases the costs of debt to compensate investors for their increased risk. Moreover, Myers (1977) postulates that firms with a large number of growth opportunities may find it too costly to rely on debt due to asset substitution and underinvestment problems. Additionally, Frank & Goyal (2007) argue that high growth firms are more vulnerable to value losses when in a position of financial distress, in order words, the cost of debt for high growth firms is greater than the costs of debt for stable or mature firms. This inverse relationship has also been identified in Goyal et al. (2002), Kaur & Rao (2009), and Jensen (1986).

4.2.3 Non-Debt Tax Shield

The variable for non-debt tax shields indicates a strong negative correlation across all three classifications of debt with correlation coefficients of -0.6 for total debt, -0.88 for long-term debt, and -0.23 for short-term debt. Furthermore, the relationship is found to be significant at the 1% level for both total debt (p-value equal to 0.0001) and long-term debt (p-value

equal to 0.0002) while providing insignificant results for short-term debt. These results are aligned with the expectations described in section 3.3.

The results detailed above closely follow the results of previous studies and can be attributed to the Trade-off Theory. DeAngelo & Masulis (1980) detail the effects non-debt tax shields have on a company by first acknowledging that increasing non-debt tax shields reduces taxable income. This reduction in turn reduces the corporate tax rate imposed on the firm. This is critical as Frank & Goyal (2009, pp. 9) state that "high tax rates increase the interest tax benefits of debt". With the reduction of the tax rate, the expected payoff of the debt tax shield is also reduced. Furthermore, Song (2005) also identified the negative relationship between the long-term debt ratio and non-debt tax shields. It is argued that long-term debt is primarily used to shelter taxable income, and non-debt tax shields like depreciation act as a strong alternative (Song, 2005). These results may also give credence to Cloyd (1997) who proposed that non-debt tax shields may be a more efficient method for reducing tax burdens within a firm. Titman & Wessels (1988), Song (2005), and Fama & French (2002) also identify the same negative relationship in their studies.

4.2.4 Profitability

Firm profitability in this study is shown to have a strong inverse relationship with leverage. Across all three definitions of leverage: total, long-term, and short-term, the negative relationship is recognized with correlation coefficients of -0.79, -1.23, and -0.36 respectively. Moreover, all coefficients are found to be statistically significant with a 99% confidence interval across all debt classifications.

This outcome is directly in line with the vast majority of literature within the capital structure debate and is supported by the arguments under the Pecking Order Theory. The negative correlation between leverage and profitability shows strong support that the benefits of the tax shield and costs of distress are secondary considerations, as proposed by Myers (1989), in the minds of automotive companies. Furthermore, increased profitability implies an increase in the amount of retained earnings and other internal funding sources that can be used to fund new projects. As discussed in section 2.2, the Pecking Order Theory argues that managers will use these retained earnings as a source of funding before entering

the external market as it is the cheapest form of funding due to limited costs associated with agency-principal problems and information asymmetries (Myers, 1984; Myers & Majluf, 1984).

4.2.5 Firm Size

As summarized in Table 3, firm size is positively correlated with total and short-term debt with coefficients of 0.02 and 0.04 respectively. A negative relationship is found with long-term debt (-0.01), however the result is insignificant. Furthermore, the measures for total and short-term debt are both significant at the 1% level with p-values of 0.0000 and 0.0001 respectively.

The positive relationships found through this study follow the expectations of the Trade-off Theory. Larger firms have typically achieved a mature status which indicates a more diversified portfolio (Eriotis et al., 2007), a more stable flow of cash (Rajan & Zingales, 1995), and show lower volatility in their earnings (Bajramovic, 2017). All of these attributes decrease the firm's probability of default and the associated bankruptcy costs (Pepur et al., 2016). Ultimately, the reductions of risk associated with the health of the firm allows banks and other lenders to offer more favorable conditions on loan agreements. These favorable conditions include lower transaction costs and interest rates which smaller, more risky firms do not have access to (Eriotis et al., 2007). These results are also strengthened due to the fact that the sample in this study is comprised of large, mature firms from the automotive industry.

4.2.6 Asset Tangibility

The tangibility of assets has a positive correlation with total debt (0.08), long-term debt (0.08) and short-term debt (0.05). The coefficients of this positive relationship is significant for both total and long-term debt at the 5% level, while the short-term debt results reveal to be insignificant.

Consistent with the majority of the capital structure literature, the positive correlation between asset tangibility and leverage (both total and long-term) is supported by the Trade-off Theory. Tangible assets reduce the costs of bankruptcy as these assets can be used as collateral to obtain secured loans, which offer lower interest rates, from lenders (Frank &

Goyal, 2007). Additionally, tangible assets reduce agency costs and moral hazard issues through the reduction of information asymmetries between the firm and external parties (Jensen & Meckling, 1976). Table 4 below offers a summary of the results discussed in the section above.

Table 4: Results Summary

Independent Variable	Significant Results	Theoretical Explanation
Dividend Payout Ratio	SDR: +	Pecking Order Theory
Growth Opportunities	TDR: -	Trade-off Theory
Non-Debt Tax Shield	TDR: - LDR: -	Trade-off Theory
Profitability	TDR: - LDR: - SDR: -	Pecking Order Theory
Firm Size	TDR: + SDR: +	Trade-off Theory
Asset Tangibility	TDR: + LDR: +	Trade-off Theory

Dependent Variables: TDR: Total Debt Ratio LDR: Long-term Debt Ratio SDR: Short-term Debt Ratio

5. Conclusion

Through the use of panel data regressions, this paper set out to identify the firm specific variables which affect the components of capital structure within the automotive industry. The extension of the capital structure literature within the automotive sector attempts to begin the process of filling a gap in the available literature as, currently, no comprehensive analysis is available. Furthermore, as the automotive industry may be moving towards a downturn (Parkin et al., 2017), insights into capital structure determinants may be able to provide useful information for optimal financial practices. Based on 29 automotive firms, over a 10 year period, this study regresses 6 firm specific characteristics, the dividend payout ratio, growth opportunities, the non-debt tax shield, profitability, firm size, and asset tangibility, on 3 classifications of leverage; the total debt ratio, long-term debt ratio, and short-term debt ratio. The empirical results are then analyzed using the insights provided by the Pecking Order and Trade-off Theories, and the prominent capital structure literature.

As this study offered a first glance into these firm specific characteristics, it is not without its limitations. Most notably, the selected sample, the specifications within the model, and the reliance on purely theoretical explanations for the results**.** With regards to the sample, this study is based on 29 mature automotive manufactures. This excludes various other parties, such as automotive suppliers or start-ups, which could be included to offer a more holistic picture while increasing the size of the sample. The model employed in this study was not designed to take certain characteristics into account. Considerations such as country of operations, market effects, or tax rates are not tested and therefore offers exploration opportunities. Future research could implement a more inclusive model to further expand our understanding of the automotive sector. Finally, the justifications for the results in this paper rely heavily on the theoretical applications from the capital structure literature. As evidence has been found that the 6 variables included in this thesis do have an effect on the capital structure, and there is a strong indication of management behavior in line with Trade-off Theory concepts, a more thorough analysis considering common practices and

approaches implemented within the automotive industry is necessary to expand the interpretation of these findings.

Despite its limitations, this paper does shed light on some interesting implications for the automotive industry. The total debt ratio of automotive firms are found to be negatively correlated with growth opportunities, non-debt tax shields, and firm profitability while being positively influenced by the size of the firm and the tangibility of its assets. Furthermore, the theoretical explanations for these findings is almost exclusively derived from the Trade-off Theory. The only exception to this observation being profitability, which is overwhelmingly expected, based on previous literature, to be explained by the principals of the Pecking Order Theory. Moreover, this is the only result to be significant across all classifications of leverage. Interestingly, the deconstruction of debt into long-term and short-term classifications produced a similar trend. Pecking Order Theory could explain the positive relationship between short-term debt and the dividend payout ratio, however the remaining findings fall within the domain of the Trade-off Theory.

While it is argued that neither the Pecking Order Theory nor the Trade-off Theory can explain all of the financing decisions made by companies (Frank & Goyal, 2007), the overwhelming prevalence of Trade-off Theory behavior being observed in the automotive industry could indicate that managers are more inclined to establish, and move towards target leverage ratios. Furthermore, this implies that the maximization of firm value through the balancing of the tax benefits experienced through the raising of leverage, and the costs of financial distress, holds greater precedent than raising funds through the cheapest source available. If the downturn in the market predicted by Parkin et al. (2017) come to fruition, a managerial shift away from the target approach towards a more cost oriented mentality could potentially offer automotive firms a greater level of financial slack. This could allow these firms to stay relevant in the industry by having the resources necessary to undertake investment opportunities otherwise not feasible, and ultimately overcome the market downturn. Further research regarding capital structure determinants within the automotive industry, with an emphasis on Trade-off Theory and its implications, could uncover valuable insights for managers and assist their navigation through the increasingly dynamic market.

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Appendix

A1. Panel OLS Regression
Dependent Variable: Total Debt/Total Assets

Dependent Variable:
TDR_TA
Method: Panel Least Squares
Date: 05/06/18 Time: 19:55
Sample (adjusted): 2009 2017
Periods included: 9
Cross-sections included: 29
Total panel (unbalanced) observations: 246
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.041934	0.040547	1.034203	0.3022
DIV	0.000400	0.000779	0.513724	0.6080
GO	-0.441903	0.111277	-3.971213	0.0001
NDTS	-0.598565	0.148446	-4.032202	0.0001
PROF	-0.785946	0.065466	-12.00543	0.0000
LFS	0.022025	0.003743	5.884309	0.0000
TANG	0.079806	0.024752	3.224188	0.0015
LAGTD_TA	0.655908	0.016785	39.07771	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.957634	Mean dependent var	0.676325
Adjusted R-squared	0.950572	S.D. dependent var	0.140935
S.E. of regression	0.031333	Akaike info criterion	-3.953828
Sum squared resid	0.206170	Schwarz criterion	-3.440852
Log likelihood	522.3208	Hannan-Quinn criter.	-3.747276
F-statistic	135.6214	Durbin-Watson stat	1.733522
Prob(F-statistic)	0.000000		

A2. Panel OLS Regression
Dependent Variable: Long-term Debt / Total Assets

Dependent Variable: LDR_TA
Method: Panel Least Squares
Date: 05/07/18 Time: 01:10
Sample (adjusted): 2009 2017
Periods included: 9
Cross-sections included: 29
Total panel (unbalanced) observations: 246
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.966993	0.350988	-2.755064	0.0064
DIV	-7.18E-05	0.002114	-0.033956	0.9729
GO	-0.482248	0.272403	-1.770351	0.0781
NDTS	-0.877756	0.227802	-3.853150	0.0002
PROF	-1.225764	0.128104	-9.568519	0.0000
LFS	-0.011945	0.032981	-0.362172	0.7176
TANG	0.082996	0.041397	2.004880	0.0463
LAGTD_TA	1.055254	0.035209	29.97072	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.978782	Mean dependent var	-0.436357
Adjusted R-squared	0.975246	S.D. dependent var	0.419935
S.E. of regression	0.066070	Akaike info criterion	-2.461738
Sum squared resid	0.916708	Schwarz criterion	-1.948763
Log likelihood	338.7938	Hannan-Quinn criter.	-2.255187
F-statistic	276.7809	Durbin-Watson stat	1.393246
Prob(F-statistic)	0.000000		

A3. Panel OLS Regression
Dependent Variable: Short-term Debt / Total Assets

Dependent Variable:
SDR_TA
Method: Panel Least Squares
Date: 05/07/18 Time: 01:11
Sample (adjusted): 2009 2017
Periods included: 9
Cross-sections included: 29
Total panel (unbalanced) observations: 246
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.284430	0.127694	-2.227439	0.0270
DIV	0.002496	0.000892	2.799681	0.0056
GO	-0.023545	0.154107	-0.152785	0.8787
NDTS	-0.249283	0.138884	-1.794892	0.0741
PROF	-0.362417	0.099183	-3.654030	0.0003
LFS	0.041229	0.010626	3.880130	0.0001
TANG	0.048059	0.052404	0.917087	0.3601
LAGTD_TA	0.371504	0.029237	12.70647	0.0000

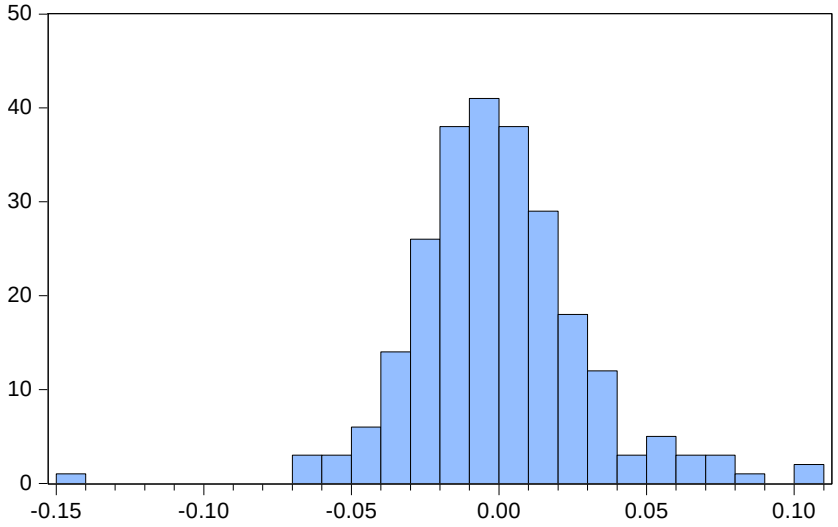
Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.847885	Mean dependent var	0.385816
Adjusted R-squared	0.822532	S.D. dependent var	0.104149
S.E. of regression	0.043875	Akaike info criterion	-3.280489
Sum squared resid	0.404252	Schwarz criterion	-2.767513
Log likelihood	439.5001	Hannan-Quinn criter.	-3.073937
F-statistic	33.44378	Durbin-Watson stat	1.234440
Prob(F-statistic)	0.000000		

A4. Normality Test

The Eviews output below is a graphical representation of the normality of the residuals from the regression on total debt. Similar results were found for the other regressions.



Series: Standardized Residuals
Sample 2009 2017
Observations 246

Mean	-1.41e-18
Median	-0.001055
Maximum	0.104624
Minimum	-0.141014
Std. Dev.	0.029009
Skewness	0.174679
Kurtosis	5.997979
Jarque-Bera	93.37675
Probability	0.000000

A5. Multicollinearity Check – Correlation Matrix

The results from the correlation matrix show that the correlation coefficients between the independent variables is less than the rule of thumb of 0.8.

	DIV	GO	NDTS	PROF	LFS	TANG	LAGTD_TA
DIV	1.000000	-0.067107	-0.064876	0.053306	0.057442	-0.049182	0.030552
GO	-0.067107	1.000000	0.125186	0.084054	0.077534	0.127869	0.214324
NDTS	-0.064876	0.125186	1.000000	-0.083914	0.285183	0.136276	0.260527
PROF_2	0.053306	0.084054	-0.083914	1.000000	-0.012878	0.016192	0.247034
LFS	0.057442	0.077534	0.285183	-0.012878	1.000000	0.243797	0.508626
TANG_2	-0.049182	0.127869	0.136276	0.016192	0.243797	1.000000	0.115760
LAGTD_TA	0.030552	0.214324	0.260527	0.247034	0.508626	0.115760	1.000000

A6. Descriptive Stats

	DIV	GO	LFS	NDTS	PROF_2	TANG_2	TD_TA	LTD_TA	STD_TA
Mean	-0.313350	0.038865	10.18746	0.039624	0.048169	0.458686	0.686220	-0.421289	0.392963
Median	-0.138365	0.021806	10.27045	0.037197	0.045527	0.417377	0.698498	-0.358823	0.375196
Maximum	2.141975	0.228026	12.35739	0.266331	0.800641	1.091964	1.939828	0.662599	0.830508
Minimum	-14.97000	-0.000813	0.000000	0.000000	-0.222325	0.000000	0.009023	-4.707954	0.004101
Std. Dev.	1.377694	0.044179	1.510830	0.023641	0.068777	0.217078	0.157611	0.407181	0.108028
Skewness	-8.678157	1.790880	-1.936581	4.485173	4.328551	0.819439	1.014551	-7.116702	0.340620
Kurtosis	88.44678	6.685330	11.11735	39.84322	55.61558	3.666486	18.98146	70.56362	4.235747
Jarque-Bera	86477.24	300.4212	920.1545	16356.00	32343.05	35.60519	2952.090	54229.54	22.64942
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000012
Sum	-85.54453	10.61008	2781.175	10.81737	13.15012	125.2213	187.3381	-115.0120	107.2788
Sum Sq. Dev.	516.2668	0.530875	620.8688	0.152023	1.286650	12.81747	6.756808	45.09655	3.174261
Observations	273	273	273	273	273	273	273	273	273