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Determinants of Capital Structure and the Cost of Capital

A Time and Industry differentiated Study on Swedish Listed Firms

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Abstract: This paper analyzes the impact of variables suggested by the trade-off theory and the pecking order theory, on publicly listed Swedish firms in a sample period of 8 years, ranging from 2003-2010. Also the relationship between leverage and weighted average cost of capital (WACC) is studied for the same set of firms and time periods. The model used is based on panel regression with fixed and random effects and the approach differentiates between time periods and industry sectors. Support is found for both theoretical frameworks, but the models display higher accuracy and consistency for the manufacturing / producing industry than for the service industry. The study also finds that impact and relevance of the theoretically implied variables differ across time samples and are likely impacted by the state of the economic environment.

Keywords: Capital structure determinants, weighted average cost of capital (WACC), panel regression, publicly listed firms, Sweden

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Chapter 1

1 Introduction

Firms operate in a dynamic environment and capital structure decisions may be based on internal strategy or in response to external factors. In either case, the capital structure may directly or indirectly impact firm value. Direct channels can be e.g. through the use of tax-shields, or via the impact of leverage on the firm's risk profile. Via indirect channels, capital structure impacts value through financial flexibility and ability to exploit emerging strategic opportunities, or respond to competitive threats and shocks.

There exists extensive literature on the topic of finding an optimal capital structure and its determinants. Much of this literature dates back several decades and many of the core theories were formulated as far back as half a century ago. More recent literature goes into the same area of research primarily in developing markets or former Eastern European economies. Less attention is directed to the companies in the western world, in regard to this field.

1.1 Background, related studies

In preparation of the topic, a number of studies using modern approaches from especially Asian and Middle Eastern economies where found. We have chosen to structure our paper much in the same way as Sheikh & Wang (2011)[1]. In their study *Determinants of capital structure: An empirical study of firms in manufacturing industry of Pakistan (2011)*[2], Sheikh & Wang take existing capital structure theories as a starting point to establish a set of possible determinants of a firm's gearing. Their research focuses on manufacturing companies that are publicly listed on the Karachi stock exchange in Pakistan and captures the period 2003-2007. The study is based on accounting data. The empirical results of the research are congruent with the three dominating capital structure theories, which are the trade-off theory, the pecking order theory and the agency theory.

Two fairly recent studies of capital structure determinants in the Swedish market, by Song (2005)[3]

[1] Sheikh, Wang (2011)
[2] Ibid
[3] Song (2005)

and Lööf (2003)[4] are used for comparison in the discussion of empirical results found in this thesis.

1.2 Discussion of the problem

Although the thesis generally follows the approach of Sheikh & Wang (2011)[5], there are additional considerations:

1. We have added possible capital structure determinants (explanatory variables) during the course of study of previously existing literature. A significant difference compared to Sheikh & Wang, is that whereas they rely solely on book values, we have used a combination of book and market values that we believe better reflect true values.

2. We introduce capital price components to the model, in order to study also the relationship between leverage and cost of capital, which is implied by the extended theoretical framework. These components are omitted in the first specification and addressed in the second set-up.

3. We use a starting point where we have collected and structured panel data for all our samples. Since the exact specification (i.e. strict panel structure, fixed/random effects, pooled regression) will depend on the tests of the data, our resulting model specification may or may not differ significantly from the Sheikh & Wang approach.

4. Since most recent studies come from developing economies with banking systems and credit markets that are very different from those in Sweden, our tests are likely to yield different results than e.g. those of Sheikh & Wang (2011) and will be measured against the expectations based on the theoretical foundations as well as slightly older studies of the relevant geographic region.

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[4] Lööf (2003)

[5] Sheikh & Wang (2011)

1.3 Purpose of the paper

We aim to test an essentially well-established theory of capital structure determinants on the relatively untested Swedish market, while adding two additional components: The cost of capital and the service sector, as in contrast to the commonly studied manufacturing/producing sector, which is also included in the study.

This study:

- Examines capital structure drivers suggested by the trade-off theory and pecking order theory to determine the relevance of these theories for Swedish firms.
- Differentiates between industry type and between time periods, to determine whether the theories can be justifiably extended to different types of firms and how the importance of drivers changes in different time periods.
- Analyzes the explanatory power of capital structure, studied in the first section of the paper, over the cost of capital.

1.4 Limitations

The empirical research covers accounting and market data only from companies listed on the Stockholm Stock Exchange and is limited to the period 2003-2010. Companies included are restricted to a wider definition of manufacturing/producing industry and service industry. Financial companies are excluded from the sample, since they are characterized by very high leverage ratios and a dual role as both lenders and borrowers. Further, companies that rely on bond-loan financing were removed from the sample, since the structure of those loans and the payment flows are unknown, or at least extremely difficult to gather in a complete and reliable manner. The thesis is also constrained to companies that remain active throughout the entire study period, implying that companies that went bankrupt or were latent during this period were not included.

1.5 Outline of the thesis

The thesis is structured as follows.

Chapter 1 – Introduction

The first chapter provides a short motivation of the relevance of the topic. Previous empirical studies on capital structure decisions are mentioned. Further, the purpose of the underlying thesis is presented and it is outlined to what extent it deviates from previous research. The chapter ends with an enumeration of the study's limitations and outline of the paper.

Chapter 2 – Theoretical foundation

The second chapter reviews the theoretical foundation on which the thesis is based. It starts from the Modigliani & Miller proposition of the irrelevance of capital structure under the assumptions defining a perfect capital market. By gradually relaxing those assumptions, the trade-off theory, the pecking order theory and the agency theory evolves.

Chapter 3 – Data and Methodology

The third chapter starts by describing the data employed and the process of collecting it. Next, the explanatory variables, assumed to have an impact on capital structure decisions, are introduced. The inclusion of each variable is justified by the findings of at least one existing capital structure theory. The chapter ends with the methodology section, where the econometric approach to the problem, including a description of performed regressions and associated tests, are discussed.

Chapter 4 – Empirical Results

The fourth chapter presents and discusses the results of the empirical tests, illustrating and explaining the determinants that were found critical for the capital structure decision and the relationship between leverage and cost of capital for each sample.

Chapter 5 – Conclusion

The fifth chapter summarizes the key findings of the thesis. Additionally, it provides recommendations for future studies.

Chapter 2

2 Theoretical Framework

The question of the existence of an optimal capital structure occupies one chapter in any finance textbook. In accordance with the shareholder value maximization theorem firms should target a capital structure that allows for minimization of the weighted average cost of capital, thereby maximizing firm value[6]. As shareholders bear higher risk than creditors, because of their deeply subordinated ranking in the seniority ladder of a firm's capital structure, they require an incremental risk premium on their returns, making cost of equity more expensive than cost of debt. The tax-deductibility of interest expenses further reduces the pre-tax cost of debt by the tax-shield, as is expressed in equation 1.1.

$$kd_{after-tax} = kd_{pre-tax} \times (1 - \tau_c) \qquad 1.1$$

$$kd = cost\ of\ debt;\ \tau_c = corporate\ tax - rate$$

Consequently, a firm should be able to reduce its weighted average cost of capital by substituting high-cost equity capital through low-cost debt capital. However, a considerable increase in financial leverage will trigger an upward adjustment of the company's risk profile, in the wake of an augmented financial distress probability. Capital markets will mark up the risk premium for cost of equity and cost of debt. A decrease in the weighted average cost of capital can still occur, given that the firm generates sufficient earnings to entirely exploit the larger tax-shield benefits brought about by the increased leverage.[7]

2.1 Modigliani & Miller theorem

Modigliani & Miller (1958)[8] laid the foundation of the evolution of capital structure theories. They assumed an ideal capital market as a starting point to establish their first proposition, the irrelevance of capital structure. This proposition postulates that under the below outlined assumptions the value of a firm will be independent of its capital structure, so that in an extreme example levering up an

[6] Koller et. al (2010)
[7] Gaughan (2011), pp. 293-334
[8] Modigliani, Miller (1958)

unlevered firm will not yield a change in firm value.

2.1.1 Assumptions of ideal capital market

1. Inexistence of capital market frictions, such as taxes, bankruptcy costs etc.
2. Homogenous information available to all market participants
3. Rational investors
4. Access to capital markets under equal conditions for firms and investors

The first proposition supposes that there exist no arbitrage opportunities in capital markets, so that the market value of a cash flow can be replicated by the market values of several cash flows, which compounded equal the original cash flow. If this does not hold and the original cash flow is cheaper than the compound cash flows, then an arbitrage profit can be realized by purchasing the original cash flow, dividing it into several single cash flows and selling each cash flow separately.

By providing capital for the funding of a firm’s operational business, shareholders and creditors are entitled to the cash flows resulting from these operations. Thus, a company generates the following cash flows through its operations, which are distributed among its shareholders and creditors:

$$Z_{E+D} = Z_E + Z_D \qquad 1.2$$

In an arbitrage free capital market, the firm value corresponds to the market value of the compound cash flows.

$$V_{levered} = MV(Z_{E+D}) = MV(Z_E) + MV(Z_D) \qquad 1.3$$

Equation 1.3 stipulates that the ratio of cash flow distribution among shareholders and creditors does not have an impact on the market value of the firm, gradating the gearing to an irrelevant determinant.

Assuming the existence of two companies with equal risk and gross profit into eternity, firm A is unlevered and firm B is levered. The firm value of A is:

$$MV(A) = V_{unlevered} = \frac{E(X)}{k_E^U} \qquad 1.4$$

$$E(X) = expected\ gross\ profit;\ k_E^U = unlevered\ cost\ of\ capital$$

For the levered firm, the gross profit is divided between shareholders and creditors, with the government coming away empty-handed as taxes were ruled out.

$$X_{E+D}^L = X_E^L + X_D^L \qquad 1.5$$

The firm value of B is equal to:

$$MV(B) = V_{levered} = \frac{E(X_E^L)}{k_E^L} + \frac{E(X_D^L)}{k_D^L} \qquad 1.6$$

$$k_E^L = levered\ cost\ of\ equity;\ k_D^L = levered\ cost\ of\ debt$$

Next, the assumption is made that *MV(B)* > *MV(A)*, implying the existence of arbitrage opportunities. An arbitrager sells his stake δ in B and obtains revenues R in the amount of:

$$R = \delta * \frac{E(X_E^L)}{k_E^L} \qquad 1.7$$

In addition, the arbitrager replicates the gearing of the levered firm by taking on debt D, which he will roll over at constant conditions into eternity.

$$D = \delta * \frac{E(X_D^L)}{k_D^L} \qquad 1.8$$

Thus, his total cash position C amounts to:

$$C = \delta * \frac{E(X_E^L)}{k_E^L} + \frac{E(X_D^L)}{k_D^L} = \delta * MV(B) \qquad 1.9$$

To return to the starting situation, the arbitrager uses part of C to purchase an equity stake of δ in the unlevered firm.

$$E_A^U = \delta * \frac{E(X)}{k_E^U} = \delta * MV(A) \qquad 1.10$$

$$E_A^U = Arbitrager's\ equity\ stake\ in\ unlevered\ firm$$

Since *MV(B)* > *MV(A)* the capital restructuring generates an arbitrage profit AP of:

$$AP = \delta * \{M(B) - MV(A)\} \qquad 1.11$$

The arbitrager, having exchanged his equity stake in the levered firm for an equivalent equity stake in the unlevered firm, will receive the same cash flows as before the transactions, after considering the cash flow impact of the interest payments on the loan D. Following assumption 4, symmetric access to capital markets for firms and investors, the arbitrager will pay an interest rate equivalent to the levered cost of debt. The interest payment I is depicted in equation 1.12.

$$I = \delta * k_D^L * \frac{E(X_D^L)}{k_D^L} = \delta * E(X_D^L) \qquad 1.12$$

For cash flow equality to exist the stated below equation must have validity.

$$\delta * E(X_E^L) = \delta * E(X) - \delta * E(X_D^L) \qquad 1.13$$

The left side depicts the cash flow to the arbitrager before the capital restructuring and the right side depicts the cash flow to the arbitrager after the capital restructuring, taking into account interest payments on D. Dividing both sides of the equation by δ and adding the expected gross profits of the levered firm to both sides of the equation will yield:

$$E(X) = E(X_E^L) + E(X_D^L) \qquad 1.14$$

As the conversion of equation 1.13 holds, equation 1.13 is valid, quod erat demonstrandum.

The assumption of debt did not put the investor in a worse position and he was able to exploit an arbitrage opportunity. This arbitrage opportunity persists only temporary, because the market will carry out a price adjustment. As many arbitragers recognize the opportunity, a bearish investor attitude towards stock of firm B emerges, while firm A’s stock will display a bullish tendency, bringing the market back into equilibrium, where *MV(B)* = *MV(A)*.

The framework of the Modigliani & Miller model implies that the weighted average cost of capital (WACC) is independent of the firm's leverage and solely determined by the risk category of the firm. As firms A and B in the above example were assumed to carry the same risk, they will feature the same WACC.

The firm value of the levered firm can be rewritten as:

$$MV(B) = V_{levered} = \frac{E(X_E^L) + E(X_D^L)}{WACC} = \frac{E(X)}{WACC} \qquad 1.15$$

Thus, solving for WACC gives:

$$WACC = \frac{E(X)}{V_{levered}} \qquad 1.16$$

Falling back on the result of the first proposition, were $V_L = V_U$, equation 1.16 can be expressed as follows:

$$WACC = \frac{E(X)}{V_{unlevered}} \qquad 1.17$$

The equation 1.17 allows for the conclusion that the unlevered firm's cost of equity is identical to WACC, as is outlined hereafter.

$$MV(A) = V_{unlevered} = \frac{E(X)}{k_E^U} \qquad 1.18$$

Substituting the result of equation 1.18 into equation 1.17 gives:

$$WACC = \frac{E(X)}{\frac{E(X)}{k_E^U}} = k_E^U \qquad 1.19$$

Since the levered firm carries a cost of equity and a cost of debt, the levered cost of equity cannot be identical to WACC, as its overall cost of capital matches WACC.

$$WACC = \frac{E(X)}{V_{levered}} = \frac{k_E^L * E + k_D^L * D}{V_{levered}} \quad 1.20$$

$$E = Equity\ proportion\ in\ levered\ firm;\ D = Debt\ proportion\ in\ levered\ firm$$

Multiplying and subsequently dividing both sides of equation 1.20 by the value of the levered firm results in:

$$WACC = k_E^L * \frac{E}{V_{levered}} + k_D^L * \frac{D}{V_{levered}} \quad 1.21$$

Since it was established in equation 1.19 that WACC is equal to the unlevered cost of equity, substituting for WACC in equation 1.21 provides the levered cost of equity.

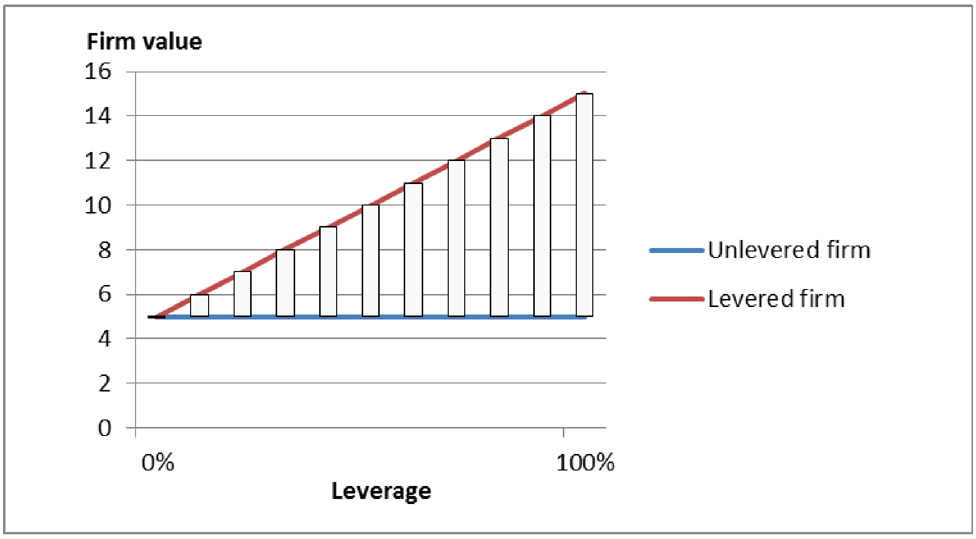
$$k_E^L = k_E^U + \frac{D}{E} * (k_E^U - k_D^L) \quad 1.22$$

Equation 1.22 expresses the quintessence of Modigliani & Miller's second proposition, which is that the cost of equity is positively correlated with the firm's gearing.

In a later study, Modigliani & Miller (1963)[9] relaxed the assumption of the inexistence of taxes by considering the effect of corporate income taxation on firm value. They assume a positive and linear relationship between corporate income taxation and gearing. This positive relationship is illustrated by the bars in figure 1, which symbolize the interest tax-shields.

[9] Modigliani, Miller (1963)

Figure 1: Firm value for unlevered and levered company under Modigliani & Miller[10]



However, this approach implies that firm value can be maximized by taking on a gearing of 100% and thereby ignores the negative consequences of increased leverage on firm value, such as a step-up of future financial distress costs.[11] The interplay between tax-shields and expected future financial distress costs and its impact on firm value is captured by the trade-off theory, which is described in the following.

2.2 Trade-off Theory

The trade-off theory was introduced in 1973 by Kraus and Litzenberger. It takes into account the benefits and costs brought along through an increase in debt levels, considering the influence of corporate taxes and expected future financial distress costs on the decision of a firm's gearing. In this manner, it relaxes the assumptions of the absence of corporate income taxation and the inexistence of bankruptcy costs stipulated by Modigliani & Miller (1958)[12].

$$V = D + E = VF + PV(Interest\ tax\ shields) - PV(Costs\ of\ financial\ distress) \quad 1.23$$

$$VF = Firm\ value\ assuming\ all - equity\ financing$$

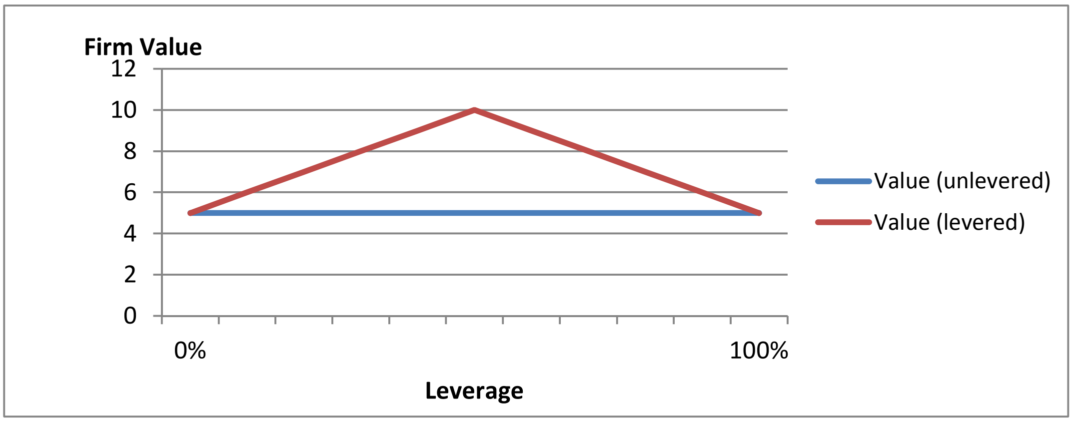
$$PV\ (Interest\ tax\ shields) = PV\ of\ future\ tax\ savings$$

$$PV\ (costs\ of\ financial\ distress) = PV\ of\ future\ costs\ driven\ by\ default\ risk$$

[10] Ibid
[11] Goyal, Murray (2007)
[12] Modigliani, Miller (1958)

Equation 1.23 constitutes the relationship between interest tax-shields and expected future financial distress, as defined by the trade-off theory. Since interest expenses are tax-deductible, leverage creates interest tax-shields that reduce the governmental claim on a firm's cash flows and scale up the after-tax cash flows to shareholders, thereby increasing firm value. At the same time, leverage brings about a default risk, which is positively correlated with debt levels.[13] Increased default risk raises direct and indirect financial distress costs. Direct financial distress costs include e.g. legal and accounting fees and asset sales at a discount of fair market value[14]. Indirect financial distress costs are triggered by the reactions of stakeholders on the distress state of the firm and encompass e.g. reduced sales due to customer churn[15], elimination of trade credits for cash on delivery by vendors and brain drain[16]. With mounting gearing, the marginal benefits of additional leverage decrease while the marginal costs increase. The optimum debt level is reached when marginal benefits and marginal costs equate each other.[17]

Figure 2: Firm value of unlevered and levered company under the trade-off theory[18]



In figure 2, this optimum debt level is symbolized by the peak of the levered firm, where benefits and costs are equal. After this point, additional leverage triggers a reduction in firm value, since expected future financial distress costs surpass tax-shield benefits. It must be noted that tax-shields carry a high degree of uncertainty, as their effective employment is restricted to times when the firm generates positive pre-tax profits, which can be sheltered from taxation.[19] Besides, a high amount of

[13] Ibid
[14] Lööf (2003)
[15] Pindado, Rodrigues (2005)
[16] Gaughan (2011), pp. 435-472
[17] Myers, S. C. (2003)
[18] Howe, Jain (2010)
[19] Lööf (2003)

non-debt tax-shields, such as depreciations, is expected to reduce the firm's incentive to take on additional debt with the purpose of tax reduction.[20]

2.3 Pecking Order Theory

The theory was introduced in 1961, by Gordon Donaldson and has later been developed by, among others Myers & Majluf[21]. The pecking order theory (POT) is one of the main theories commonly used in the literature that aims to explain corporate capital structure. The pecking order theory explicitly assumes market inefficiencies in terms of asymmetric information, where firm insiders (managers) have more information than outsiders (investors) and a premium, or information cost, arises as a result of imperfect information. In the framework of Myers & Majluf[22], this asymmetry may lead to underinvestment due to strong reluctance to issue equity.

Myers & Majluf start from a situation where there are no taxes, transaction costs or other capital market imperfections. Further, any investment requires that at least part of the funds is raised in the market by issuing equity and any investment opportunity will be lost if not pursued in a timely manner. In the perfect market, any positive net present value (NPV) project will be undertaken and the firm will be indifferent to the choice of internal and external finance as any asset sold to raise funds would be sold at fair value. In a second step the imperfection of asymmetric information is introduced, awarding the managers better information of true value of assets and investment opportunities. Then a conflict of interest between new and old shareholders may arise, but as long as all positive NPV projects are still undertaken, the issued shares are assumed to be on average fairly priced. Myers & Majluf discuss several alternative settings and starting points with different manager and owner incentive structures, but at the core of the argument and to clearly distinguish the pecking order theory, there is an assumption that managers maximize existing shareholder wealth given current ownership. Shareholders are assumed to be passive (they do not alter their ownership positions) and do not respond to the issue-investment decision.[23]

If management knows that a certain investment opportunity is especially advantageous, it may not be of interest to existing shareholders to finance the investment with a new equity issue, as this particular issue faces a high risk of undervaluation by an uninformed market. The decision not to

[20] Lööf (2003)
[21] Myers, (1984); Myers, Majluf (1984)
[22] Myers, Majluf (1984)
[23] Myers, Majluf(1984)

issue equity is thus perceived by the market, being aware of its own information disadvantage, as an indication of “good news”. The critical point of non-issuance will be when the cost to old shareholders outweighs their benefit from the project. Reversing the argument, the market will perceive an equity issue as an indication of “bad news” or at least “less good”. The signal has an impact on investor’s willingness to pay and the market price of the share will decrease, which will in turn affect the original decision of whether to issue equity to enable investment in the project. Should the firm decide not to invest in the project as an effect of this problem, the result is a market failure to efficiently allocate funds and the firm value will be lower as a consequence. The link to capital structure is explained as the firm's attempt to avoid ending up in the same financing trap, and again forgo profitable investments. In this context, the source of financing will be of importance to the firm's investment decision and especially to future investment opportunities. A firm with large holdings of cash, cash-equivalents and other marketable assets (i.e. internal sources) would be able to undertake all positive NPV projects, as would firms that can issue default free debt. Only as a last resort would equity be issued on short notice to satisfy investment needs.[24]

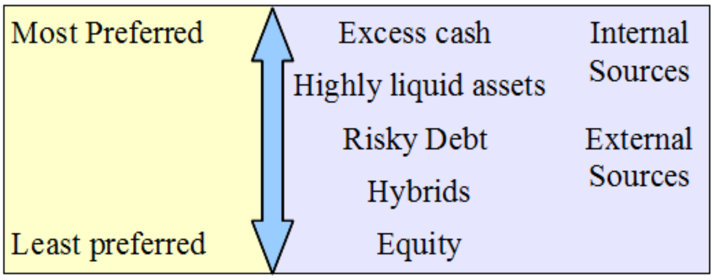


Figure 3: Summary and order of preferred financing sources

Naturally, the asymmetric information assumption is critical to the POT. It follows from the basic theory that if true values can be communicated in a reliable and costless manner, the firm will again be indifferent to the choice of internal and external sources of funds. In a real-world application, the cost of information asymmetry can be thought of as grades on a scale of the level of uncertainty and the lowest deviation of price/cost from its true value will be for the most liquid assets, usually cash[25]. The sources of funds can then be traced down through the balance sheet, ending up with unsecured debt, hybrids and finally equity, as the information cost is lower for debt. This follows from the nature of debt and equity (e.g. covenants and time horizons), but also from the monitoring

[24] Myers, Majluf (1984)
[25] Ganguin, Bilardello (2005), pp. 80-107

role of financial institutions[26]. The difference in cost of these various sources will be affected by the firm's transparency[27].

There are more recent empirical applications of the theory. Shyam-Sunder and Myers[28] find strong support for the POT in a study of US-based firms from 1971-1998. Murray and Vidhal[29] study US firms from 1971 – 1998 and find some, but limited support, for the POT. They also find a trend effect where pecking order is more relevant in the earlier part of the sample. A study of Spanish firms during 1995-2003, finds general support for the POT, but with stronger evidence among smaller firms[30]. Finally, in a study of German, French and British firms during the period of 1980-2007, support is found for the POT, but the theory is indicated to be a less appropriate explanation for capital structure decisions than the trade-off theory[31].

2.4 Agency Theory

A relatively recent approach to capital structure decisions is the focus on agency theory. Early agency theory has been developed by among others Jensen and Meckling[32] and describes conflicts in the relationship between different economic actors, such as owner/manager and equity holder/debt holder. As in the pecking order theory, the agency theory assumes asymmetric information, but unlike the pecking order theory, it suggests that actors are driven by private benefits and capital structure can be used to counter negative and unobservable behavior[33]. Agency theory is commonly referred to as one of the explanations of capital structure. As such, it is briefly mentioned here, but it has been knowingly excluded from the parameter and model specification, as an econometric approach to the theory would require detailed information regarding firm ownership as well as a deeper discussion of debt-related covenants. Obtaining the relevant data is both difficult and highly time-consuming and is therefore not feasible within the scope of this study. The theory may however still be relevant. Broadly speaking, the pecking order theory falls into the category of agency theory, but as it is supported by a more narrow and strict set of incentive assumptions, it allows for use of other parameters (see more under “POT” p.13 & in variables section pp.17-27).

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[26] Ogden et. al (2003)
[27] Myers, Majluf (1984)
[28] Shyam-Sunder, Myers (1999)
[29] Murray, Vidhal (2003)
[30] Gonzáles, Gonzáles (2012)
[31] Dang (2011/2013)
[32] Jensen, Meckling (1976)
[33] Tirole (2006)

Chapter 3

3 Data & Methodology

3.1 Data

The underlying empirical study focuses on the Swedish market, analyzing drivers of the capital structure for firms that are publicly listed on the Stockholm Stock Exchange. The study covers the time period 2003-2010. For practical reasons, yearly data is used, as several of the observations rely on accounting data gathered from yearly reports. Selected firms are separated into two groups.

The first is the *"industry"* group, which contains manufacturing industry, construction, wholesale and large retail, all of which require substantial investments in tangible assets.

The second group is the *"service"* group, which encompasses companies from the service industry.

The division into the groups "industry" and "service" is done, since the "industry" firms are expected to generally rely on a much larger share of physical assets, than the "service" firms. This difference will likely impact the capital structure as well as some of the explaining parameters used in the regression, motivating the separation of the two samples. The data is structured in balanced panel form, with one full sample and two sub-samples for each group of firms.

The sub-samples span the two 4-year periods 2003-2006 and 2007-2010. It allows for comparing capital structure determinants in times of a stable economic environment (2003-2006) to drivers in more turbulent times (2007-2010).

After identifying the potential determinants of capital structure, firms with incomplete data were removed from the samples, resulting in 39 yearly observations for the manufacturing industry and 23 yearly observations for the service industry, corresponding to a total of 312 and 184 observation points respectively for each parameter. Firms relying on bond financing were excluded from the sample, because the diverse conditions of these financial instruments exacerbates the identification of the yearly cost of debt.

As financial and accounting data (which may be subject to definition) is used, as few sources of data as possible are employed for the extraction. Information on stock prices is derived from *Yahoo! Finance*[34], while the accounting data is gathered from *Retriever*[35]. Additionally, the *annual reports* of the firms serve the purpose of cross-checking extracted data and to obtain data on shares outstanding. Government bond data, used to derive risk-free rates, is obtained from *ECB Statistics*[36].

3.2 Variables

The following section presents the variables that are derived from or implied by the theoretical framework. Also, expectations of linear or non-linear relationships between the explaining and dependent variables are based on the theoretical framework. In some cases, the expectations may differ between the two theories and thus the model specification itself will serve to indicate the dominant framework.

3.2.1 First set of variables

Below the variables used as determinants of capital structure are outlined and discussed.

3.2.1.1 Leverage

Leverage represents capital structure and is the dependent variable in the first approach and is defined as;

$$Leverage = \frac{D}{D+E}$$

where D is book value of debt and E is market value of equity.

3.2.1.2 Volatility

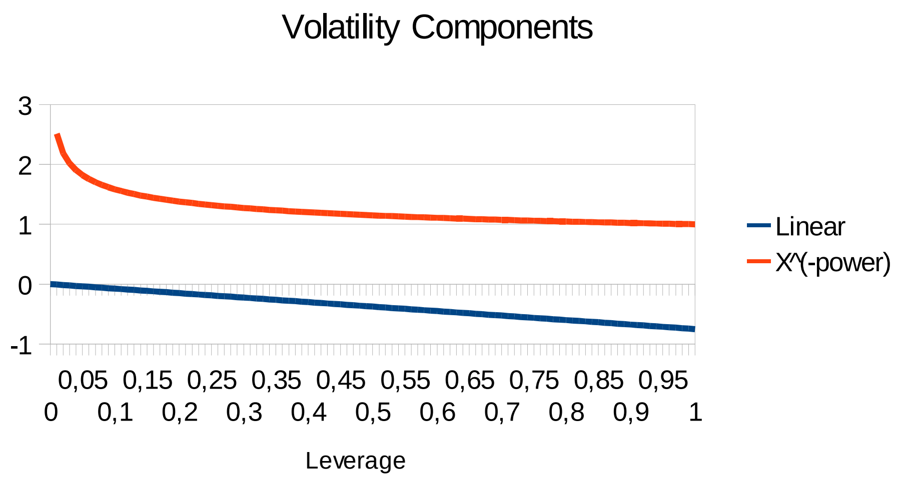
Volatility is calculated as yearly volatility, based on weekly observations of stock prices (adjusted closing prices). The use of stock market data allows for good availability of information and frequent measure points, but also implies that financial market reflect firm value to some extent of efficiency. The latter is assumed to be true. Volatility relates to the trade-off theory in particular as high volatility will mean that the trade-off cost, i.e. the expected cost of future default will be higher, the optimum leverage point will be passed earlier and cost will increase faster after

[34] http://finance.yahoo.com/
[35] http://ret-web05.int.retriever.no/services/businessinfo.html?redir=true
[36] http://www.ecb.int/stats/html/index.en.html

surpassing this point. The reason for this impact implicitly comes from an assumed probability distribution of default occurrence, which will increase exponentially when the company nears the default line[37]. High volatility should thus restrict the ability to increase leverage.

The expected non-linear relationship of the variable creates an issue as the study uses a linear model. One way to address this issue is to model the behavior of the parameter as non-linear, while maintaining a "linear" relationship between the dependent variable and the new non-linear parameter. If the true shape of the line is captured, this can be thought of as making the x-axis in a diagram increase non-linearly to allow a non-linear parameter, y, to depend linearly on the explaining variable x. The first approach is to add a non-linear explaining variable, which is the original variable raised to a negative power (shown as the top line in the schematic graph below, in figure 4) or to use the square root, expecting a negative coefficient. The original, linear, version of the initial variable (the straight line in the schematic graph) is also included. The composite variable is created as an un-weighted combination (Shown in figure 5) of the two components. The new volatility parameter turns out to fit the data well and improves the fit of the variable and the model.

Figure 4: Schematic Graph of Components



Although the adjustment of the parameter improves the model, a close study of the relationship between leverage and volatility shows a slight inconsistency for high levels of volatility.

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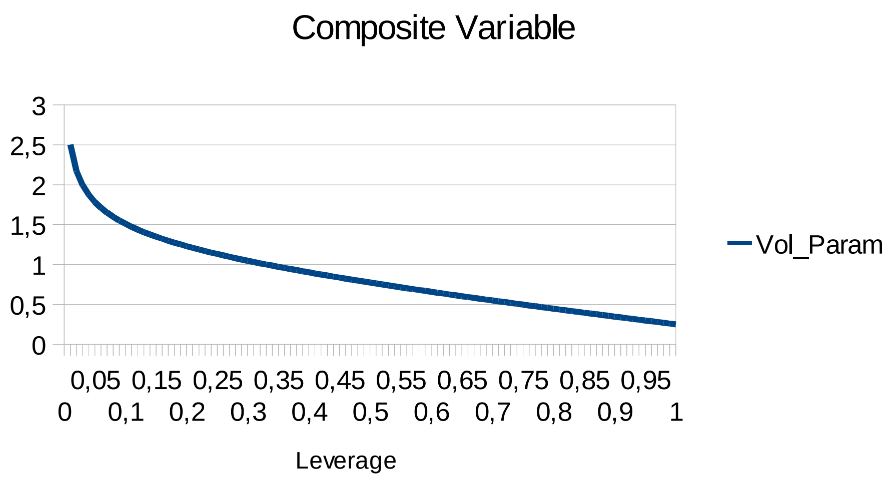
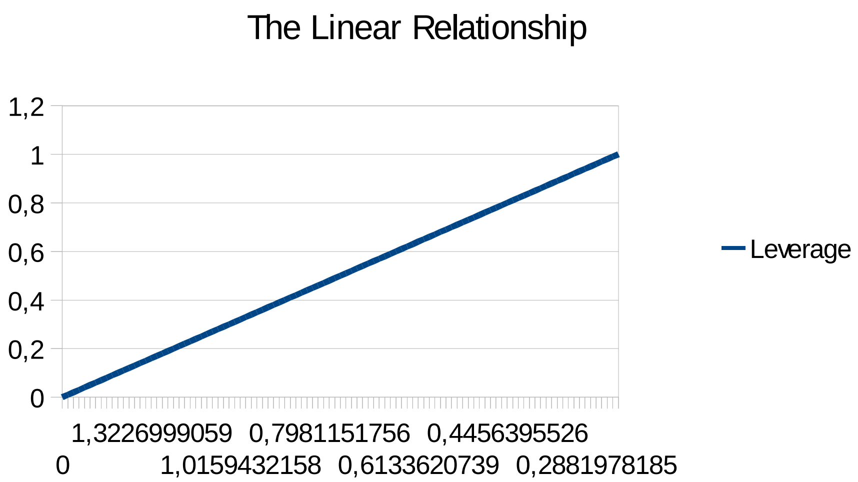
[37] Merton (1974)

Figure 5: Schematic Graph of the Composite Variable



The description of the volatility parameter may seem counter-intuitive, since the model uses leverage as the dependent parameter, but leverage cannot be made non-linear, because it is assumed to depend linearly on other explaining variables. The purpose of allowing volatility to behave in a non-linear manner may be clearer when expressing the adjusted variables in the same way as they are stated in the regression model, as shown below.

Figure 6: The Linear Relationship



It can now be seen[38] that the non-linear relationship between the two variables can be expressed in a linear fashion, by allowing the volatility parameter to be non-linear.

[38] Note that the diagrams in figures 4-6 are schematic and use the same experimental data. It does not depict the actual data in the study, but is used for illustration.

3.2.1.3 Profitability

Profitability is measured as net income margin and gives an indication of the debt capacity. Net income margin is used since the firm is likely to already have some debt and it thus captures not only the ability to cover existing debt, but also the additional debt capacity. The net income margin variable is strongly related to the trade-off theory. Since the measure already includes interest payments, there will be a positive debt tax shield as long as the margin is not negative. In addition, good profitability should result in cheaper debt, as the risk-related future cost of distress is lower.

In line with the pecking-order theory, high profitability should result in the use of less debt as internal financing is preferred. Thus, the two theories lead to different expectations regarding the impact on leverage.

3.2.1.4 Tangibility

Tangibility is employed as a measure of unused borrowing capacity. It is basically an indicator of the quality of assets held by the firm and the ability to secure debt obligations. A high ratio should support lower cost of debt and higher capacity to carry debt. Tangibility is defined as;

$$Tangibility = \frac{Current\ Assets - (ST\ Debt + 0.5 \times LT\ Debt)}{Total\ Assets},$$

where current assets represent assets with low cash-flow volatility and low valuation risk that can be levered up substantially, such as cash and cash equivalents[39]. To illustrate the depleted borrowing capacity in terms of percentage, short-term debt and 50% of long-term debt is subtracted from current assets, dividing the remainder by total assets[40]. As short-term debt is more exposed to volatility than long-term debt, because of its temporal structure, its granting is more dependent on a firm's amount of collateralizable assets[41]. Thus, higher tangibility should allow for increased leverage, in line with the trade-off theory, as is reduces expected distress costs.

[39] Ganguin, Bilardello (2005), p. 90
[40] Gray, Malone (2008)
[41] Ganguin, Bilardello (2005)

3.2.1.5 Growth Opportunities

The growth opportunities variable is defined as;

$$Growth\,opportunities = \frac{MV}{BV} \;,$$

where MV is market value of equity and BV is the book value. A high MV/BV ratio indicates a growth company and a low MV/BV ratio indicates a value company. A growth company is expected to strive for retained financial flexibility with low leverage in order to realize future opportunities when they occur, whereas a value company will normally be characterized by stable cash-flows, enabling it to heavily exploit tax-shields[42]. Increasing focus on growth opportunities should result in lower leverage. The argument is in line with the pecking order theory, through the preservation of debt capacity, which is intended for future investments in place of equity financing. The trade-off theory also suggests a negative relationship between growth opportunities and leverage through the low extent to which growth opportunities are expected to be collateralized.

3.2.1.6 Size

There are two variables used to represent size, total sales and market capitalization. Which of the two measures is used in the final regression is partially determined by the correlation matrix and partially by the statistical significance obtained for each indicator. Large firms tend to have better access to capital markets compared to small firms and can generally raise funds at more favorable terms. This is referred to by credit analysts as the size effect.[43] Since large firms are assumed to exhibit operational diversity (e.g. geographical-, product line diversity etc.), cash-flow volatility will be lower, thus reducing the probability of financial distress and allowing for a lower risk premium on debt. Additionally, stakeholders will be willing to sustain a temporary state of distress for large firms, because of their strong dependency on the firm's survival. As large firms are aware of this, they might be inclined to follow a more aggressive financial strategy being reflected in a debt-heavy balance sheet. These arguments fit within the trade-off theory, which proposes higher leverage for larger firms.

The pecking order theory suggests that large firms may use less leverage, because they are able to issue equity at lower premium than small firms, making it a cheaper source of funding. This is so,

[42] Pettit J. (2007)
[43] Ganguin, Bilardello (2005), p. 63

since large firms enjoy more extensive media attention and analyst coverage[44], diminishing information asymmetry and adverse selection. Additionally, due to its structure, equity has some advantages over debt, as it does neither require monthly interest payments nor repayment of principal. Thus, the reduced cost of equity combined with the structural benefits of the financing source can make it preferable to debt funding.

3.2.1.7 Real Tax Rate (Actual Taxes Paid)

The real tax rate captures the two tax-shields (debt and non-debt tax-shield) plus any other tax management done by the firm. Tax-shields relate mainly to the trade-off theory.

Non-debt tax shield is defined as;

$$\text{Non-Debt Tax-Shield} = \frac{Depreciation}{Total\ Assets}$$

As a firm's depreciation is recorded as a non-cash expense on the income statement, it contributes to the reduction of the taxable income. In doing so, it represents a non-debt tax-shield, increasing after-tax cash-flows to shareholders. De Angelo & Masulis (1980)[45] suggest a negative relationship between non-debt tax-shields and leverage, implying that the former has the same impact as debt tax-shields.

The debt tax-shield $(1-T)$ argument is central in the trade-off theory, as it reduces the net cost of debt and increases demand for leverage. However, any tax-shield is beneficial only as long as the company generates profits and thus a company with existing but under-utilized tax-shields has an incentive to increase leverage.

3.2.1.8 Transparency

To measure transparency, relative trading volumes is used as a proxy.

$$Transparency = \frac{Total\ volume}{Total\ no.\ of\ shares}$$

Trading volume is chosen as indicator due to the relationship with better coverage for highly traded stocks[46]. Trading volume is divided by shares outstanding. The ratio can be interpreted as relative

[44] Ogden et. al (2003)
[45] De Angelo & Masulis (1980)
[46] Pettit J. (2007)

trading volume and allows comparison of firms with large numbers of shares outstanding to firms with fewer shares outstanding. The transparency argument relates explicitly to the pecking-order theory and other signaling and agency theories, as higher transparency should reduce the risk premium of assumed but unknown risk[47].

3.2.1.9 Liquidity

The liquidity of a company is quantified by its current ratio outlined below.

$$Liquidity = Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilites}$$

Since high liquidity implies a reduced probability of defaulting on short-term debt, it results in lower future expected financial distress costs. Thus the inflection point where marginal benefits of debt and marginal cost of debt are on a par is shifted to a higher debt level. Based on trade-off theory a positive correlation can be expected between leverage and liquidity.

However, as current assets contain cash and marketable securities, high liquidity could be an indicator of a firm having ample internal funds available to satisfy its financing needs. According to the pecking order theory a negative relation would be expected between leverage and liquidity, since firms are assumed to prefer internal financing when possible.

[47] Ogden et. al (2003)

Table 1:Overview of theoretically predicted impact on leverage

Theory	Parameter	Parameter Symbol	Impact on leverage
Trade-off	*Volatility*	***Vol***	-
Pecking Order	*Volatility*	***Vol***	
Trade-off	*Profitability*	***Profitab***	+
Pecking Order	*Profitability*	***Profitab***	-
Trade-off	*Tangibility*	***Tang***	+
Pecking Order	*Tangibility*	***Tang***	
Trade-off	*Growth opportunities*	***GO***	-
Pecking Order	*Growth opportunities*	***GO***	-
Trade-off	*Market Capitalization*	***Mcap***	+
Pecking Order	*Market Capitalization*	***Mcap***	-
Trade-off	*Revenue*	***Rev***	+
Pecking Order	*Revenue*	***Rev***	-
Trade-off	*Real tax-rate*	***Rtrate***	+
Pecking Order	*Real tax-rate*	***Rtrate***	
Trade-off	*Transparency*	***Trans***	
Pecking Order	*Transparency*	***Trans***	-
Trade-off	*Liquidity*	***Liq***	+
Pecking Order	*Liquidity*	***Liq***	-

3.2.2 Second set of Variables

Below the variables used in the relationship between cost of capital and capital structure are outlined and discussed.

3.2.2.1 Debt Tax-Shield

The tax-shield is constructed using the mandated tax rate (which is the full tax shield) and a weight, w, which is based on coverage of interest payments. The weight w takes values 0 to 1 depending on the current ability to utilize the tax shield. A positive NI margin means that w=1, whereas a negative value below total cost of debt (i.e. < 0 - cost of debt) results in w=0. Values in the interval result in 0<w<1.

It is worth noting that the Swedish corporate tax rate has changed within the sample period.

However, the rate has been fairly stable, as this rate adjustment has been small in comparison to earlier changes. From the period 1994 – 2008, the corporate tax rate was 28 % and from 2009 onwards, it was reduced to 26,3 %[48].

3.2.2.2 Cost of Debt

Cost of debt is the total, gross, cost of all debt (companies with bond financing are excluded from the sample to avoid inclusion of such instruments).

3.2.2.3 Cost of Equity

Cost of equity is calculated using the CAPM. Risk free rate is derived from the interest on the 10-year Swedish government bond. The market premium for Sweden is assumed to be 5,5%, based on previous studies[49]. Systematic risk (β) is calculated from data on company stock prices (weekly observations, adjusted closing rates) and compared with the OMXS PI, which is the Stockholm stock exchange full index. Using the Swedish market index rather than the world market portfolio (which is originally implied by the CAPM framework) has its justification in findings of a strong home market preference among Swedish investors[50].

$$E[r_i] = r_f + \beta(E[r_m] - r_f)$$

3.2.2.4 WACC (Weighted Average Cost of Capital)

WACC is defined as;

$$WACC = \frac{E}{D+E} \times K_E + \frac{D}{D+E} \times K_D \times (1 - wT) \quad ,$$

where E is equity, D is debt, K_E and K_D are the costs of equity and debt respectively, T is the full tax shield and w is a weight that takes values 0 to 1.

The final section of this study tests the explanatory power of leverage, which has been described in the earlier sections of this paper, over the weighted cost of capital. In this case a non-linear relationship may be expected, depending on which theory is implemented. A non-linear expectation means that adjustments must be made to variables to maintain the linear relationship that can be captured by the linear model.

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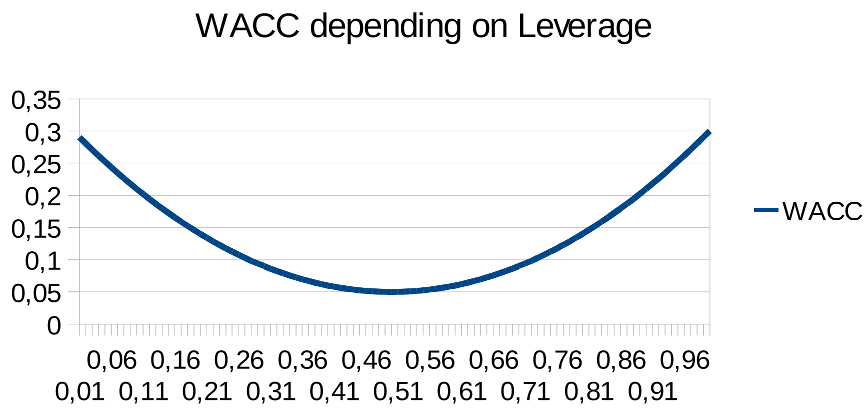
[48] KPMG (2011)
[49] Häcker, J. (2005)
[50] Karlsson, Norén (2004)

The trade-off theory leads to expectations of a relationship as that shown in figure 7 below, which is the commonly assumed pattern of the WACC-leverage relationship. For low levels of debt, equity is relatively expensive, whereas high levels of debt increase expected distress costs and thus debt becomes relatively expensive.

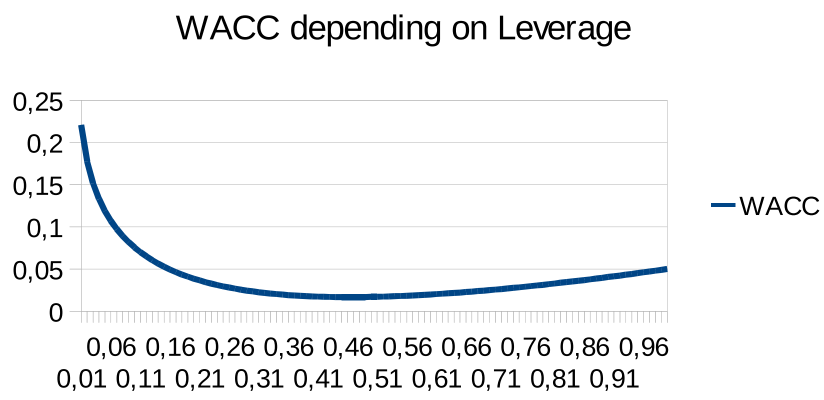
Figure 7: WACC depending on Leverage



The pecking order theory on the other hand, would suggest that, given information asymmetry, debt will be the preferred source of external finance. Since risk dynamics are not modeled, the POT should show a linear relationship between leverage and WACC, where WACC is low for high levels of leverage.

Since there are no additional variables in this test, it would be possible to transform the dependent variable, but for consistency, the explaining variable is adjusted to allow for non-linearity. The parameter in figure 7 (above) could be created using a combination of the negative linear parameter and a quadratic version of the parameter. However, the data is not well represented by such a curve, but rather suggests a curve like the one in figure 8 (below). This parameter is the composition of a positive linear parameter and the parameter raised to a negative power, or it can be more easily constructed from the positive linear parameter and the square root of the parameter, in which case a negative sign would be expected in the regression.

Figure 8: WACC depending on Leverage



3.3 Econometric Model and Methodology

This section explains the general model and methodology as well as the resulting specifications that are used in our study. The panel data approach uses the terminology of Brooks (2008)[51], which is the main source used for this section. Only paragraphs marked with another reference has been derived from other sources. The theoretical and econometric fundamentals of the model are discussed in detail, after which we present the logic for model decisions and the application in this paper.

3.3.1 Panel Data, terms and Concepts

A data sample with both time -and space elements is referred to as a ”panel of data”(which is the term that we use throughout the paper) or sometimes ”longitudinal data” and can be either balanced or unbalanced. In the balanced sample, the cross-sectional individual parameters are the same for all points in time, and there are no missing observations. In our sample, this would mean that the sample of firms included in the study maintains the same firms from year to year and that all firms can be observed in all years. If this is not the case, i.e. observations are missing or the sample changes, the panel is unbalanced and strictly speaking is not panel data, although the same techniques can be used in estimation after accounting for potentially missing observations.

[51] Brooks (2008)

The concept of panel data modeling captures spatial (cross-sectional), as well as temporal (time-series) elements in the same model. This approach may be advantageous compared to running multiple regressions for different observations in time or the cross-section sample, or compared to pooled data, as it encapsulates the effects of all parameters on other variables in a single model. Using multiple, separate regressions could omit detection of common variation in time or across the sample. When using the simpler pooled data approach, it is implicitly assumed that the relationship between variables and the mean of the variables are constant over time, which may not be the case.

$$Balanced\ panel = \begin{pmatrix} Firm & year & X_1 & X_2 & ,\ldots, & X_N \\ A & 1 & value & value & ,\ldots, & value \\ A & 2 & value & value & ,\ldots, & value \\ B & 1 & value & value & ,\ldots, & value \\ B & 2 & value & value & ,\ldots, & value \\ \ldots & year & X-1 & X_2 & ,\ldots, & X_N \end{pmatrix}$$

A number of advantages can be distinguished when using panel data rather than the other approaches discussed.

- As discussed above, there are certain patterns and variations that can be tested and detected using panel data, but not with the other methods mentioned. By using panel data, we can study how the variables and the relationship between the variables vary over time (or don't vary over time). Through the combination of both temporal and cross-sectional data (thereby increasing the number of observations and including information of the dynamic behavior of a large number or entities), the degrees of freedom and the power of tests can be increased for what might be considered a sample of limited size when using only a time-series or cross-section approach.
- Combining the data introduces additional variation, which can mitigate collinearity issues that may arise in individual time-series models.
- The structured panel can contribute to reduced omitted-variable bias.

3.3.2 The Econometric Model

The simple model can be represented by;

$$y_{it} = \alpha + \beta x_{it} + u_{it}$$

where y_{it} is the dependent variable, α is the intercept, β is a *k x 1* vector of parameters (coefficients) estimated on the independent variables x, x_{it} is a *1 x k* vector of observations on explanatory variables, u_{it} is an error term and t = 1...,T and i = 1...,N.

In practice there are two main methods in modeling; fixed effects (FE) or random effects (RE).

3.3.2.1 Fixed Effects Model

Fixed effects means that some of the parameters (intercept and or coefficients) in the model are fixed in either dimension or in both. For example, the intercept could be fixed cross-sectionally, but allowed to vary with time, whereas the slope estimates are fixed in both dimensions.

To let the basic econometric model represent the fixed effects, the term u_{it} is separated into two parts;

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it}$$

where m_i encapsulates the variables that impact the dependent variable cross-sectionally, but that don't vary over time.

This model could be constructed using the LSDV (Least Squares Dummy Variable) approach, where;

$$y_{it} = \beta x_{it} + \mu_1 + D1_i + \mu_2 D2_i \ldots \mu_N DN_i + v_{it}$$

and where the dummy variable D1 takes the value 1 for i=1 and otherwise 0. In our sample this means that the D1=1 for all observations for firm 1, D2=1 for all observations on firm 2 etc (the intercept is omitted in the LSDV to avoid the "dummy variable trap"[52]).

The LSDV setup allows us to test whether the strict panel structure actually adds value in the estimation process, compared to other approaches such as those previously discussed (i.e. pooled or separate regressions). The test resembles a Chow Test and the hypothesis that all dummies have the

[52] The dummy variable trap results in perfect multicollinearity between the intercept and the dummies.

same parameter, μ, is tested. If

$$H_0: (\mu_1 = \mu_2 = \ldots = \mu_N)$$

holds, then the panel data approach is not necessary and the data can simply be pooled and estimated with ordinary least squares (OLS). This means removing the temporal structure from the panel approach which leaves only one dimension (the cross-section). If H_O is rejected on the other hand, the restriction of all μ being equal cannot be applied and we must keep the panel structure.

As N+k parameters need to be estimated, this approach is cumbersome for large values of N, as is the case in our sample. The "within transformation" can be used as a simplification, where the time-mean is subtracted from the value of the parameter for each entitiy. This way, variables that are invariant over time will cancel out. We define $\bar{y}_i$;

$$\bar{y}_i = \frac{1}{T} \sum_{t=1}^{T} y_{it}$$

as the time mean of the dependent variable for cross-sectional unit *i*. The means of the explanatory variables are calculated in the same way and allow us to obtain demeaned variables by subtracting the time-mean from each variable and run a regression using only de-meaned variables. The general model can be written as;

$$y_{it} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i \text{ or in demeaned mode as } \ddot{y}_{it} = \beta \ddot{x}_{it} + \ddot{\mu}_i$$

Since the dependent variable is now constructed with zero-mean, we can omit α. The demeaned variable regression will produce the same parameters and standard errors as the full LSDV approach. An alternative to using the within transformation, would be to directly use the time-averages of values in a cross-section regression, called the "between estimator".

3.3.2.1.1 Time-Fixed Effects

Just as with the previous entity-fixed effects, the model can be specified with time-fixed effects, which follows precisely the same logic as described above, but with the difference that instead of m_i capturing the effects on y that change cross-sectionally, but not over time, we instead define λ_t that captures the effects on y that varies over time, but not cross-sectionally;

$$y_{it} = \alpha + \beta x_{it} + \lambda_t + v_{it}$$

3.3.2.2 Random Effects Model

The random effects, or *error component*, model is an alternative to the fixed effects approach for the panel model. The RE model suggests different intercept terms for each entity, but these intercepts are constant over time, just like in the first specification of the FE model previously described. The relationship between the dependent and independent variables is assumed to be constant over time and space. In the RE model, the intercepts for each cross-sectional entity are assumed to come from a global intercept, α, which is the same for all observations and a random variable, ε_i, which is constant over time, but varies cross-sectionally with *i*. The random variable captures the random deviation of the entities' intercept terms and the global α. The general model can be written;

$$y_{it}=\alpha+\beta x_{it}+\omega_{it}, \quad \omega=\epsilon_i+v_{it}$$

where x_{it} is a *1xk* vector of explanatory variables and ε_i captures the variation in the spatial dimension.

There are a number of conditions on the error term ε_i that must be met for the RE approach. ε_i is assumed to have zero mean, to be independent of the individual observation error terms, v_i, have constant variance s_e^2 and be independent of the explanatory variables x_{it}.

The RE approach uses generalized least squares (as OLS generation of a and b would yield consistent but inefficient estimates). Instead of the de-meaned approach used in FE, a weighted mean is subtracted from y_{it} over time, rather than the full mean. The transformation is done to remove cross-correlations in the error terms and yields the new, defined parameters;

$$y_{it}{*}=y_{it}-\theta\bar{y}_i \text{ and } x_{it}{*}=x_{it}-\theta\bar{y}_i \ ,$$

where $\bar{y}_i$ and $\bar{x}_i$ are the time means of y_{it} and x_{it}. The weight θ is a function of the error term of observations and of the entity-specific error term;

$$\theta=1-\frac{\sigma_v}{\sqrt{(T\sigma_\epsilon^2+\sigma_v^2)}}$$

where σ_ϵ^2 is the variance of the entity-specific error term and σ_v^2 is the variance of the observation error term.

As in the previous example of fixed effects, the RE model can be specified to allow for time variation rather than cross-sectional variation, by introducing an error term for each time period instead of cross-section entity. The model can also allow for variation in both dimensions.

3.2.3 Testing the Model Specifications

We work under the assumptions that the variables in our sample and their relationship with each other can change over time and/or space, and thus opt for the panel data structure, rather than e.g. a pooled structure. As discussed earlier, the panel data approach also holds a number of additional advantages. We then must evaluate the FE and RE approaches.

Generally speaking, the random effects model has some advantages over the fixed effects model. The GLS procedure's transformation (described above) uses a weighted mean and will not remove explanatory variables that don't vary with the specified dimension (in our example above, this means that the transformation does not remove the explanatory impact of variables that don't vary with time). Thus, more of the explanatory power is kept in the model, than with the fixed effect approach that would remove such variables (since we subtract the full mean). This is a drawback of the FE approach. Since the RE doesn't include dummies into the model, there are fewer parameters to estimate and thus degrees of freedom are preserved. This should yield a more efficient estimation. On the other hand, the conditions for the RE to be applicable are stricter than for FE (because both the error terms must be uncorrelated with all the explanatory variables) and if they are not met, the FE is a better approach.

When the sample consists of randomly selected entities, the RE is expected to be the better choice and when the sample corresponds to (or is, in fact) the entire population, then the fixed effects is expected to be more appropriate. Intuitively, our sample makes a better case for arguing fixed effects, but due to its qualities, we will start by testing if the random effects approach can be used.

3.2.3.1 Specification Tests, Fixed and Random Effects

After the previously described correlation-based adjustments of explaining variables, the model is subjected to specification tests for each sample. The procedure is described in the methodology section and full results are found in appendix A2 and B2. The random effects specification can be rejected for the full industry sample (at 1 % significance level), the first sub-sample (at 10 % significance level) and for the second sub-sample (at 20 % significance level). Strong support for fixed effects was found for all industry samples (at 1 % significance level). The test revealed fixed cross-section effects as the best fitting specification, but the specification with both cross-section and period fixed effects yield very similar results.

3.2.3.2 Specification Test - Hausman Test

The Hausman Test subjects the specification with random effects, to a test for alternative estimators to decide if random effects is the best approach. If the RE-approach is rejected, the fixed effects approach is selected instead.

3.2.3.3 Specification Test - Redundant Fixed Effects Test

To test whether the fixed effects approach adds some value to the model, we use the redundant fixed effects test (which is similar to the Chow-Test) described in the previous section. Should the FE be found to be redundant, we can use a simpler model, based on pooled data. If the tests do not indicate that FE is redundant, there exists dependence between observations on variables and thus pooled regression cannot be used.

3.3.3 Diagnostic Tests

In addition to testing specifications of the panel data model, the data is subjected to a set of test to detect a number of potential issues. Here follows a description of the tests and a summary of the results and adjustments made to the model, as a result of the tests. More detailed results can be seen in the appendix.

3.3.3.1 Heteroscedasticity

Heteroscedasticity (i.e. violation of the assumption that the variance of errors is constant: $\sigma^2 > \infty$) does not cause inconsistent or biased estimators, but the presence of heteroscedasticity may lead to biased standard errors which in turn can result in biased inference[53]. A semi-manual test is conducted, following the method of Breusch, Pagan and Godfrey (BPG Test)[54]. A series of errors are estimated by regressing the main econometric model. The errors are squared and then regressed on the independent variables of the model for which the errors were estimated. The test is then conducted with a F-test under the hypothesis that coefficients are jointly zero. If the hypothesis is rejected, heteroscedasticity is present in the sample. If heteroscedasticity is indicated in the sample,

[53] Brooks (2008)
[54] Heij, de Boer (2004)

White Standard Errors[55] are used to address the issue of model inefficiency.

Table 2: BPG Test Results and Adjustments, Capital Structure

Sample	P-value, F-test	Indication of Heteroscedasticity	Adjustments
Industry Sample, Full	0,390	NO	None
Industry Sample, First	0,059	YES	White Standard Errors
Industry Sample, Second	0,751	NO	None
Service Sample Full	0,014	YES	White Standard Errors
Service Sample First	0,002	YES	White Standard Errors
Service Sample First	0,598	NO	None

[55] Brooks (2008)

Table 3: BPG Test Results, WACC

Sample	P-value, F-test	Indication of Heteroscedasticity	Adjustments
Industry, Full Sample	0,07	YES	White Standard Errors
Industry, First Sample	0,05	YES	White Standard Errors
Industry Second Sample	0,01	YES	White Standard Errors
Service, Full Sample	0,49	NO	None
Service, First Sample	0,42	NO	None
Service, Second Sample	0,03	YES	White Standard Errors

3.3.3.2 Multicollinearity

An initial regression, containing all variables, is run for each sample and correlation matrices containing all variables are generated. Variables with a correlation of more than 50% are excluded from the sample (see Appendix A2.1-A2.2 for detailed results).

For all industry samples a correlation surpassing 50% was found between revenue and market capitalization. Since both variables are employed as a proxy for firm size, revenues are removed from the regression. The justification for keeping market capitalization as a measure of firm size is that it exhibits higher statistical significance.

With respect to the service company sample, the only correlation surmounting the 50% threshold was detected in the second sub-sample between growth opportunities and market capitalization.[56] As market capitalization displays higher correlation with the remaining variables than growth opportunities, it was removed from the final regression.

The table below summarizes the excessive correlation and removed variables for each sample and each industry.

[56] See Table X in appendix for correlation matrices

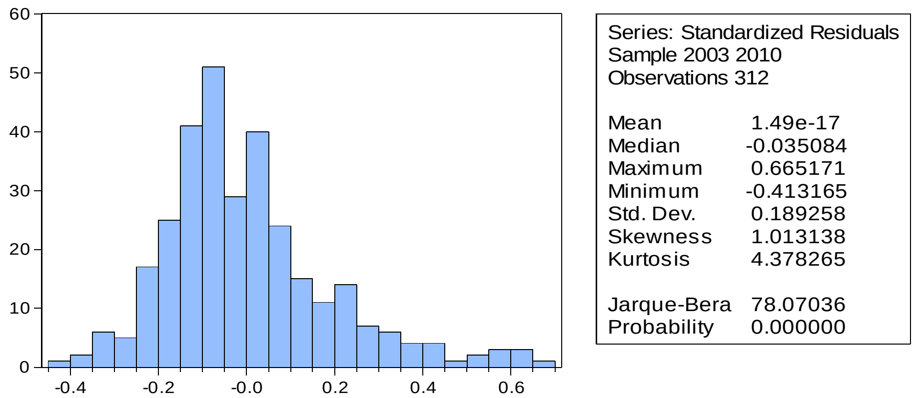
Table 4: Multicollinearity

Multicollinearity			
Industry sample	***Correlated variables***	***Correlation***	***Removed variable***
Full sample (2003-2010)	Revenue/Market Cap	61%	Revenue
Sub-sample 1 (2003-2006)	Revenue/Market Cap	58%	Revenue
Sub-sample 2 (2007-2010)	Revenue/Market Cap	65%	Revenue
Service sample	***Correlated variables***	***Correlation***	***Removed variable***
Sub-sample 2 (2007-2010)	Growth opp./Market Cap	68%	Market Cap

3.3.3.3 Non-Normality

Normality is sometimes omitted among the requirements criteria, especially for large samples. Non-normality can however cause problems when it comes to inferences from estimation results. A way to counter this effect is to include more observations in the sample to decrease the standard errors. This is one of the mentioned benefits of the panel data model as it adds a dimension to the data sample. Various methods of transformation, such as logarithmic transformation, may also be used to improve the result. The first test is done on errors from the initial model for the industry sample.

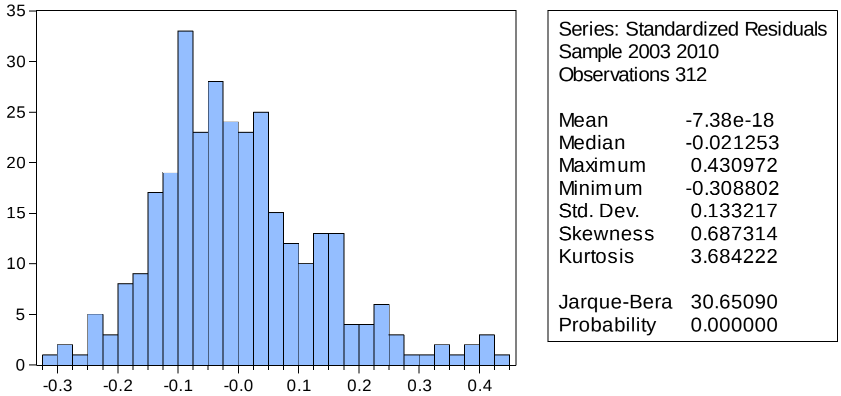
Figure 9: Industry normality test



Normality is rejected for the “industry” sample. There is skewness, shifting distribution mass to one side and there is excess kurtosis, meaning that more of the distribution is close to the mean than it would in a normal distribution.

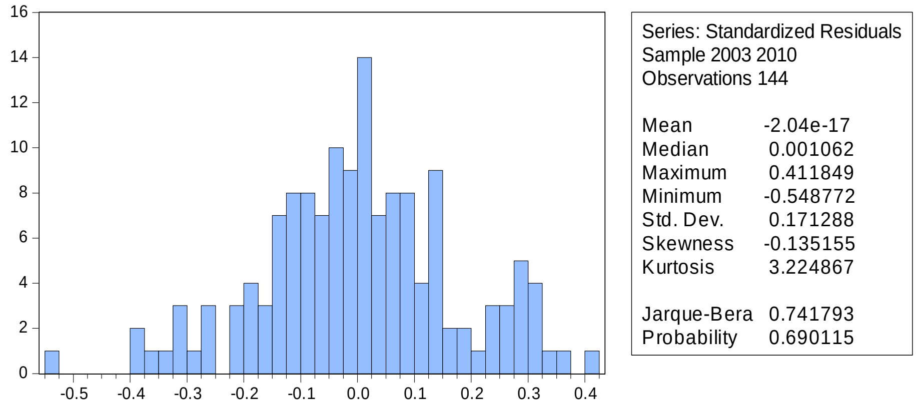
By using data transformation, it is possible to improve the likeness to a normal distribution. The dependent parameter is replaced by the natural logarithm of the same parameter. This greatly reduces the Jarque-Bera test statistic and shows a better fit with lower skewness and only slight excess kurtosis.

Figure 10: Industry normality test, using LN_Leverage



The service sample uses LN_Leverage and has a distribution which is not perfectly normally distributed, but very close.

Figure 11: Service normality test, using LN_Leverage



Deviation from normality changes the probability distribution used for significance tests, but seeing that the sample distributions, after adjustment, are fairly close to normally distributed and that few probability values in the tests fall close to the border value for rejection, this should not cause serious problems for inference within the study.

3.3.3.4 Non-Linearity

Because the model assumes a linear relationship between the dependent variable and the independent variables, adjustments must be made to handle any potentially non-linear relationship. In the first set-up (determinants of capital structure), a non-linear relationship between leverage and volatility is expected[57]. See details under "leverage" in the variables section 3.2.1.2.

In the second set-up (capital-structure as a determinant of cost of capital) a non-linear relationship is also expected between WACC and leverage. See details under "WACC" in the variables section 3.2.2.4.

3.3.3.5 Error-in-variables test

The third section in this paper, discussing the explanatory power of leverage over average weighted cost of capital, is based in part on *estimations* of cost of equity. These values are derived using the capital asset pricing model (CAPM) which is commonly used in theoretical approaches to find cost of equity[58], but the estimation method is not without controversy. A potential issue is the use of an unknown parameter (which has itself been estimated) in the regression[59] as this introduces an additional measure of uncertainty. The general purpose of an *error-in-variables* model, or *measurement-error model*, is to account for potential errors in the regression, unlike the normal model that assumes correct specification[60]. To perform the error-in-varibles test, parameters are grouped together in groups of 5 randomly selected companies in each group. This approach faces a trade-off between group size (including more companies in each group should result in an average with a smaller combined error) and observations in the regression, as larger groups will mean fewer observations in the sample. The regression with randomly selected groups, should display significantly lower measurement errors, as the errors should cancel out to some extent (due to a diversification effect within the group) if there are large errors in the standard regression.

The simple test with random bundles of observations does not yield lower errors than the regressions using individual observations. Thus there doesn't seem to be any significant diversification effect to reduce errors and the initial variable specification is assumed to be correct, without further adjustments.

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[57] Merton (1974)
[58] Koller et. al (2010)
[59] Note that this only affects the final test, where WACC is explained by Leverage.
[60] Petersen, M. A. (2005)

3.3.4 Model Application

Adjusted models after diagnostic testing (detailed specification of all models can be found in appendix A3.1-A3.2 for the first set-up and B3.1-B3.2 for the second set-up).

First Set-up: Determinants of capital structure

Full sample, industry;

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 MCap \beta_3 Profitab + \beta_4 RTrate + \beta_5 Tang + \beta_6 Trans + \beta_7 Vol + e$$

First sample, industry:

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 Profitab + \beta_3 RTrate + \beta_4 Tang + \beta_5 Trans + \beta_6 Vol + e$$

Second sample, industry:

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 MCap + \beta_3 Profitab + \beta_4 RTrate + \beta_5 Tang + \beta_6 Trans + \beta_7 Vol + e$$

Full sample, service:

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 MCap \beta_3 Profitab + \beta_4 RTrate + \beta_5 Tang + \beta_6 Trans + \beta_7 Vol + \beta_8 Rev + e$$

First sample, service:

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 MCap \beta_3 Profitab + \beta_4 RTrate + \beta_5 Tang + \beta_6 Trans + \beta_7 Vol + \beta_8 Rev + e$$

Second sample, service:

$$Ln\_lev = \alpha + \beta GO + \beta_1 Liq + \beta_2 Profitab + \beta_3 RTrate + \beta_4 Tang + \beta_5 Trans + \beta_6 Vol + \beta_7 Rev + e$$

where for all models:

$$e = \mu_i + v_{it} \wedge \vee e = \lambda_t + v_{it} \vee e = \omega = \epsilon_i + v_{it} \vee \omega = \epsilon_t + v_{it}$$

Second Set-up: Explaining power of capital structure over WACC

All samples;

$$WACC = \alpha + \beta Lev + e$$

where

$$e = \mu_i + v_{it} \wedge \vee e = \lambda_t + v_{it} \vee e = \omega = \epsilon_i + v_{it} \vee \omega = \epsilon_t + v_{it}$$

Chapter 4

4 Results & Discussion

4.1 Interpretation of Results – Industry Sample

Eight variables were statistically significant at a 10% level for the full industry sample regression. The predictors achieved to explain approximately 50% in the variations of the dependent variable leverage. The table below contrasts the expected relationship between each predictor and the dependent variable to the achieved relationship. The anticipated relationship is based on the expectations of the trade-off theory and the pecking order theory. For some variables e.g. profitability, the two theories predict an opposite impact on leverage. The last column states the theory that supports the impact of the significant variables on leverage.

Table 5: Results for industry full sample (2003-2010)

Industry full sample (2003-2010)				
Notation	**Variable**	**Exp.**	**Achieved**	**Dominant Theory**
GO	*Growth opportunities****	-	-	*Pecking Order; Trade-off*
Profitab	*Profitability***	±	+	*Trade-off*
Trans	*Transparency****	-	-	*Pecking Order*
Tang	*Tangibility****	+	-	*Unexplainable*
Liq	*Liquidity****	±	-	*Pecking Order*
Rtrate	*Real tax-rate***	+	+	*Trade-off*
Vol	*Volatility****	-	-	*Trade-off*
Mcap	*Market Capitalization****	±	-	*Pecking Order*

*** Statistically significant at 1% significance level, ** Statistically significant at 5% significance level, * Statistically significant at 10% significance level

Increasing growth opportunities cause leverage to decrease, being in line with the pecking order theory, which suggests that firms preserve financial flexibility. In this manner, companies will avoid having to forfeit value-creating investment opportunities, due to information-related costs. The result is also consistent with the trade-off theory. However, here the assumption is that growth opportunities are funded by equity, due to their intangible nature and the high degree of uncertainty associated with them, making them less suitable for collateralization. The increased amount of equity in the capital structure will cause a decline in debt levels.

Higher profitability allows for more leverage. This finding corroborates the trade-off theory. High profitability allows a firm to exploit tax-shields to a greater degree and moves the inflection point were marginal benefits of debt and marginal cost of debt equate each other upwardly.

Transparency has a very strong and negative impact on leverage. With respect to pecking order theory, companies with better transparency will rely more on equity, since the risk premium related to asymmetric information is reduced.

Tangibility, measuring a firm's unused borrowing capacity, is negatively correlated with leverage. This result is contradictory to what is predicted by the trade-off theory, which postulates that higher borrowing capacity reduces future expected distress costs and thereby makes room for levering up. However, it can be argued that tangibility does not have a strong impact on leverage for the underlying sample.

The relationship between leverage and liquidity is negative, being consistent with the pecking order theory and expecting that firms make use of liquid assets before resorting to debt.

Leverage and real tax-rate expose a positive relationship, as expected. Given that a firm can effectively exploit tax-shields, an increase in these tax-shields will give rise to higher gearing. It should be noted that non-debt tax-shields are regarded as supplementary to the debt tax-shields, since firms are unlikely to engage in systematic tax planning through acquiring assets and generating tax-deductible depreciations.

Leverage and volatility are negatively related to each other. This is in accordance with the trade-off theory, which sets forth that higher volatility leads to a rise in the expected future distress costs by increasing the probability of the company's asset value falling below the default line.

For size, the model predicts a negative correlation with leverage, complying with the pecking order theory. Larger firms will benefit from increased transparency, making equity an eligible source of financing before debt, because of diminished information asymmetry faced by investors and the structural benefits of equity financing.

Table 6: Results for industry sub-sample 1 (2003-2006)

Industry sub-sample 1 (2003-2006)				
Notation	**Variable**	**Exp.**	**Achieved**	**Dominant Theory**
GO	*Growth opportunities****	-	-	*Pecking Order; Trade-off*
Profitab	*Profitability****	±	+	*Trade-off*
Tang	*Tangibility****	+	-	*Unexplainable*
Liq	*Liquidity****	±	-	*Pecking Order*
Vol	*Volatility****	-	-	*Trade-off*
Mcap	*Market Capitalization****	±	-	*Pecking Order*

*** Statistically significant at 1% significance level, ** Statistically significant at 5% significance level, * Statistically significant at 10% significance level

The table above displays the results for the first sub-sample, spanning the period 2003-2006. Besides revenues, also real tax-rate and transparency have been detected to be statistically insignificant. The relationship between the remaining variables and leverage does not differ from the findings for the entire sample.

A possible explanation for the removal of real tax-rate and transparency from the first sub-sample is that the overall market was in a state of economic growth. Companies may have taken advantage of over-valuation effects and relied more heavily on equity financing, so that tax-shields were not exploited anymore, reducing their explanatory power of gearing significantly. Also, transparency was negatively impacted by the economic growth phase, as stock markets were hot and most companies' shares showed high trading volume, reducing the power as an explanatory variable for leverage.

Table 7: Results for industry sub-sample 2 (2007-2010)

Industry sub-sample 2 (2007-2010)				
Notation	**Variable**	**Exp.**	**Achieved**	**Dominant Theory**
GO	*Growth opportunities****	-	-	*Pecking Order; Trade-off*
Trans	*Transparency****	-	-	*Pecking Order*
Tang	*Tangibility****	+	-	*Unexplainable*
Liq	*Liquidity****	±	-	*Pecking Order*
Rtrate	*Real tax-rate***	+	+	*Trade-off*
Mcap	*Market Capitalization****	±	-	*Pecking Order*

*** Statistically significant at 1% significance level, ** Statistically significant at 5% significance level, * Statistically significant at 10% significance level

Table 7 shows the results for the second sub-sample, which covered the period 2007-2010. In addition to revenues, volatility and profitability are determined to be statistically insignificant. The residual predictors have the same correlation with leverage than for the entire sample.

The loss of explanatory power in volatility can be motivated by the fact that the time period of the second sub-sample encompassed the financial crisis, where volatility was not only higher on average, but the volatility level also changed more frequently. As a consequence, debt levels could not adjust to the speed of volatility changes, making volatility an insignificant estimator of leverage in some instances. Regarding profitability, the entire western economy experienced an extreme state during the financial crisis, so that a large share of firms faced low profitability. This broad impact may have affected the significance of profitability as a predictor, since more or less global debt levels would have to be shifted to maintain consistency in the model and such major adjustments are likely to take time.

Our results can be contrasted to the findings of Song (2005), who performed an empirical study on the Swedish market, with the purpose of identifying capital structure determinants. The study encompassed the time period 1992-2000 and included accounting data for 6000 companies.[61]

[61] Song (2005)

In contrast to our empirical results, Song finds a positive and statistically significant relationship between tangibility and leverage.[62] The reason why our empirical finding on the relationship between tangibility and leverage differ from Song's findings might be explained by the different definition of the variable. While Song measures tangibility by the ratio fixed assets to total assets[63], we define it as unused borrowing capacity. The results of Song are congruent with those of Lööf[64]. As in our paper, Sheikh & Wang (2011) also obtain a negative correlation between tangibility and leverage and relate it to the agency theory[65].

With regard to profitability, Song's study postulates a negative relationship with leverage, being in line with the pecking order theory[66]. This finding is substantiated by Sheikh & Wang, who also find support for the pecking order theory[67]. As opposed to this, our empirical results display a positive correlation between profitability and leverage, as suggested by the trade-off theory. The difference in the results might be explained by distinct definition of the variable, or due to a mismatch of the time periods. During Song's study, the economy was in a recovery phase, so that firms had ample investment opportunities, causing them to engage in de-levering to ensure financial flexibility or as a result of asset value growth. Relating to Sheikh & Wang, a further factor might be the difference in the financial infrastructure of the analyzed markets, as Pakistani capital markets might not be as developed as Swedish capital markets, causing Pakistani firms to rely more on internal funds.

Concerning size, Song's results differ from ours, as they show a positive correlation with debt levels[68]. Thus, his findings corroborate the trade-off theory, while our findings are in favor of the pecking order theory. The study of Sheikh & Wang also finds support for the trade-off theory[69].

Another interesting finding is that for the full industry sample and the first sub-sample none of the two capital structure theories, pecking order and trade-off, dominate the capital structure decision of firms. This indicates that managers do not favor one theory over the other when deciding on leverage. However, in the second sub-sample covering the financial crisis, the decision on gearing is primarily grounded on the pecking order theory. The reason for that might be that in an economic

[62] Song (2005)
[63] Ibid
[64] Lööf (2003)
[65] Sheikh, Wang (2011)
[66] Song (2005)
[67] Sheikh, Wang (2011)
[68] Song (2005)
[69] Sheikh, Wang (2011)

crisis the information asymmetry related premium will rise, since the overall market uncertainty experiences an increase. Another explanation could be that during a crisis access to capital markets is impeded for all firms. With banks being more reluctant in providing debt capital and equity markets displaying a bearish tendency, firms might rely more on the pecking order theory when choosing gearing.

4.2 Interpretation of Results – Service Company Sample

The applied regression provides a lower fit for the service company sample in comparison with the industry company sample. Furthermore, fewer explanatory variables are found to be statistically significant. The model also shows lower consistency than when applied to the "industry" sample. The table below provides an overview of the statistically significant variables for the service company sample and also states their respective correlation with leverage.

Table 8: Overview of statistically significant variables for service company samples

Statistically significant variables service companies								
Variables	Service full sample FE (2003-2010)		Service 1st sample RE (2003-2006)		Service 1st sample FE (2003-2006)		Service 2nd sample FE (2007-2010)	
	Sig.	*Sign*	*Sig.*	*Sign*	*Sig.*	*Sign*	*Sig.*	*Sign*
Growth opportunities	***	-	***	-	***	-		
Profitability							***	-
Transparency				**	**	-		
Tangibility			***	+	***	+		
Liquidity	**	-	***	-	*	-		
Real tax-rate			***	+				
Volatility	***	-	*	-	***	-		
Market capitalization	***	-			***	-	**	-
Revenues	**	+			***	+		

*** Statistically significant at 1% significance level , ** Statistically significant at 5% significance level, * Statistically significant at 10% significance level

For the first service company sub-sample a regression with random effects and one with fixed effects were conducted, since random effects could not be rejected and the also significant fixed effects where used for consistency. Except profitability and tangibility all other statistically significant variables display the same correlation with leverage as in the industry sample. Regarding profitability, a negative impact on leverage is predicted, being in conformity with the pecking order theory. Firms with high profitability are expected to have ample internal funds available, relying to a smaller extent on debt financing. The industry sample estimates a positive relation between leverage and profitability, following the trade-off theory. For the service sample, one possible explanation for the reliance on the pecking order theory in regard to profitability is that service companies cannot lever up with the same ease as industrial companies, due to the lack of collateralizable assets, limiting their ability to exploit unused tax-shields. Tangibility, symbolizing unused borrowing capacity, positively impacts leverage as is anticipated by the trade-off theory. Higher tangibility reduces future expected distress costs, shifting the optimal amount of debt to a higher level. Interestingly, for the full sample and the first sub-sample based on fixed effects, both size measures, revenue and market capitalization are statistically significant, but with reverse impact on leverage. This might indicate that one of the two variables is not a suitable measure for size, but represents a separate impact on leverage.

In order to improve the explanatory power, the model must be further developed and adjusted to account for characteristics of service companies. It should be noted that most research on the validity of traditional capital structure theories is done on industrial companies rather than service companies. This may be an area where more research is needed.

4.3 Interpretation of results, WACC explained by leverage

Already in the specification section of the non-linear relationship between WACC and leverage can some insights be derived. The relationship is indeed non-linear as the trade-off theory suggests, but the curve is much flatter than the typical trade-off theory representation, making the negative linear relationship, implied by the pecking-order theory, fit fairly well. However, the nature of the explanatory power of leverage on WACC is better explained by a non-linear, than a linear, relationship in all samples. This supports the trade-off theory, but only to some extent, since the strong increase of WACC for high levels of debt does not show.

Table 9: Regression results, WACC depending on leverage

Sample	Leverage coefficient	Leverage p-value	R2
Industry, Full Sample	-0.034129	0.0002	0.401136
Industry, First Sample	-0.049214	0.0331	0.468786
Industry, Second Sample	-0.023037	0.0000	0.160910
Service, Full Sample	-0.006506	0.8450	0.256806
Service, First Sample	-0.004121	0.9262	0.049168
Service, Second Sample	-0.026025	0.0392	0.534926

The empirical results between the sectors show that the industry sample, which is assumed to rely more on collateralizable assets in debt-funding, has a very significant relationship between the degree of gearing and the weighted cost of capital. Findings indicate that firms on average benefit from higher leverage. This effect is small but significant. The effect is weakened in the later time-period, which contains the financial crisis, as the findings suggest that leverage ratio contributes less in explaining WACC, but the relationship is still highly significant. It seems likely that other factors come to play an important role and complementary role during the crisis period.

An interesting finding is that for the less physical asset reliant service sector, other factors than leverage seem to determine cost of capital. The exception is the later time period, where leverage becomes a strong determinant of WACC.

4.4 Discussion of potential errors

In order to obtain balanced panels with complete data, only firms that have remained active throughout the entire sample period were included. This may cause a survivor bias, since it is likely that firms facing bankruptcy have a different capital structure than the firms in the sample used. Since any firm included must have a history of at least eight years of data, young and recently listed firms are underrepresented in the sample, which may also affect capital structure characteristics in the sample.

Chapter 5

5 Conclusions

The empirical study finds support for both the pecking order theory and trade-off theory in the application on capital structure of Swedish firms. In terms of capital structure, there is no clear dominance of either theory, with the noted exception of the second industry sample, which shows a preference for the pecking order theory. In most samples, the two theories both contribute to the understanding of different variables.

The most significant and consistent support is found in the industry sample, whereas the theories are less applicable to firms in the service sector. Further study regarding modelling of capital structure in service companies may be useful.

Although some explanatory variables are persistently significant accross time periods, the significance and impact of several capital structure determinants differ with time and, very likely, with the state of the economic climate.

From the study of leverage as determinant of the weighted average cost of capital, a number of things can be concluded. First, the best model specification lends support to both the trade-off theory and the pecking-order theory, but is stronger in its support of the pecking-order theory due to the non-linear relationship found. The flatter than expected curve also indicates that the firms in the sample are not highly levered, or that Swedish listed companies generally have been allowed to carry high debts without strong impact on the cost of loans. Further, the study showed that other factors likely come into play in determining cost of capital during turbulent economic times. And finally, the results show that the theoretical framework used in the study is likely to be better suited for firms belonging to the industry sample, rather than to the service sample.

Most of our findings are in line with the theoretical expectations and results of previous studies. Deviations of results from previous studies may be ascribed to differences in the sample size, definition of employed explanatory variables and investigated market and time period.

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Appendix A: Tests and Regressions Relating to Leverage Determinants

A1 Heteroscedasticity tests

A1.1 Industry Heteroscedasticity Tests

Industry Full Sample

F-statistic	1.061884	Durbin-Watson stat	0.896353
Prob(F-statistic)	0.391950		

Industry First Sample

F-statistic	1.797815	Durbin-Watson stat	0.398591
Prob(F-statistic)	0.059331		

Industry Second Sample

F-statistic	0.684934	Durbin-Watson stat	0.561514
Prob(F-statistic)	0.751171		

A1.2 Service Heteroscedasticity Tests

Service Full Sample

F-statistic	2.092623	Durbin-Watson stat	0.556892
Prob(F-statistic)	0.014036		

Service First Sample

F-statistic	3.222061	Durbin-Watson stat	0.406311
Prob(F-statistic)	0.001689		

Service Second Sample

F-statistic	0.844158	Durbin-Watson stat	1.479561
Prob(F-statistic)	0.597672		

A2 Multicollinearity, Correlation Matrix

A2.1 Industry Multicollinearity, Correlation Matrix

Industry, Full Sample

Variable / Variable	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	0.057110	0.103024	-0.067045	-0.012965	-0.084452	0.061612	-0.024504	0.049234
LIQUIDITY	0.057110	1.000000	0.133764	-0.138245	0.045046	0.017831	0.321232	-0.020585	0.188196
MARKET CAP	0.103024	0.133764	1.000000	0.289156	0.011797	0.613705	-0.077928	-0.050649	-0.133509
PROFITABILITY	-0.067045	-0.138245	0.289156	1.000000	0.049595	0.249305	-0.269690	-0.227695	-0.243502
REAL_TAX_RATE	-0.012965	0.045046	0.011797	0.049595	1.000000	0.035316	-0.008597	-0.067394	-0.065360
REVENUE	-0.084452	0.017831	0.613705	0.249305	0.035316	1.000000	-0.014454	0.127270	-0.160865
TANGIBILITY	0.061612	0.321232	-0.077928	-0.269690	-0.008597	-0.014454	1.000000	-0.008498	0.293231
TRANSPARANCY	-0.024504	-0.020585	-0.050649	-0.227695	-0.067394	0.127270	-0.008498	1.000000	0.019488
VOLATILITY	0.049234	0.188196	-0.133509	-0.243502	-0.065360	-0.160865	0.293231	0.019488	1.000000

Industry, First Sample

Variable / Variable	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	0.137453	0.054618	-0.049668	-0.060806	-0.124137	-0.056043	-0.066669	0.088595
LIQUIDITY	0.137453	1.000000	0.161946	-0.249631	-0.114852	0.033031	0.344678	-0.009654	0.209490
MARKET CAP	0.054618	0.161946	1.000000	0.264038	0.006803	0.578392	-0.152930	-0.072869	-0.125439
PROFITABILITY	-0.049668	-0.249631	0.264038	1.000000	0.359883	0.250263	-0.401663	-0.175261	-0.311412
REAL_TAX_RATE	-0.060806	-0.114852	0.006803	0.359883	1.000000	0.061667	-0.245279	-0.012427	-0.264366
REVENUE	-0.124137	0.033031	0.578392	0.250263	0.061667	1.000000	-0.012024	0.194651	-0.152503
TANGIBILITY	-0.056043	0.344678	-0.152930	-0.401663	-0.245279	-0.012024	1.000000	0.025416	0.304441
TRANSPARANCY	-0.066669	-0.009654	-0.072869	-0.175261	-0.012427	0.194651	0.025416	1.000000	-0.025996
VOLATILITY	0.088595	0.209490	-0.125439	-0.311412	-0.264366	-0.152503	0.304441	-0.025996	1.000000

Industry, Second Sample

Variable / Variable	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	-0.046187	0.166038	-0.091997	-0.012535	-0.047410	0.189794	0.017872	-0.013172
LIQUIDITY	-0.046187	1.000000	0.106389	0.035475	0.081834	0.008413	0.299466	-0.032505	0.164424
MARKET CAP	0.166038	0.106389	1.000000	0.342361	0.017485	0.648409	-0.007413	-0.028837	-0.150848
PROFITABILITY	-0.091997	0.035475	0.342361	1.000000	0.017477	0.273086	-0.094419	-0.313439	-0.113896
REAL_TAX_RATE	-0.012535	0.081834	0.017485	0.017477	1.000000	0.041509	0.017075	-0.092899	-0.055938
REVENUE	-0.047410	0.008413	0.648409	0.273086	0.041509	1.000000	-0.008886	0.086946	-0.188690
TANGIBILITY	0.189794	0.299466	-0.007413	-0.094419	0.017075	-0.008886	1.000000	-0.042160	0.300006
TRANSPARANCY	0.017872	-0.032505	-0.028837	-0.313439	-0.092899	0.086946	-0.042160	1.000000	0.079737
VOLATILITY	-0.013172	0.164424	-0.150848	-0.113896	-0.055938	-0.188690	0.300006	0.079737	1.000000

A2.2 Service Multicollinearity, Correlation Matrix

Service Full Sample

VARIABLE/VARIABLE	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	-0.007771	0.496601	-0.063805	0.011797	-0.152821	-0.093597	-0.061783	-0.032387
LIQUIDITY	-0.007771	1.000000	0.059342	0.004234	-0.051687	-0.229115	0.170352	0.011947	-0.004051
MARKET CAP	0.496601	0.059342	1.000000	0.068730	-0.005883	0.084008	-0.106222	-0.088832	-0.055876
PROFITABILITY	-0.063805	0.004234	0.068730	1.000000	0.067470	0.061237	0.016052	-0.055990	-0.004005
REAL TAX RATE	0.011797	-0.051687	-0.005883	0.067470	1.000000	0.064529	-0.066437	-0.072297	-0.009975
REVENUE	-0.152821	-0.229115	0.084008	0.061237	0.064529	1.000000	0.023193	-0.099002	-0.069372
TANGIBILITY	-0.093597	0.170352	-0.106222	0.016052	-0.066437	0.023193	1.000000	0.103397	0.038352
TRANSPARANCY	-0.061783	0.011947	-0.088832	-0.055990	-0.072297	-0.099002	0.103397	1.000000	-0.010747
VOLATILITY	-0.032387	-0.004051	-0.055876	-0.004005	-0.009975	-0.069372	0.038352	-0.010747	1.000000

Service First Sample

VARIABLE/VARIABLE	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	-0.028017	0.434872	-0.069182	-0.006732	-0.176501	-0.293290	-0.077000	-0.052581
LIQUIDITY	-0.028017	1.000000	0.030497	0.012577	-0.087713	-0.255746	0.216264	0.091870	-0.019813
MARKET CAP	0.434872	0.030497	1.000000	0.051383	-0.067462	0.106843	-0.313262	-0.121274	-0.069050
PROFITABILITY	-0.069182	0.012577	0.051383	1.000000	0.057201	0.063688	-0.071130	-0.082975	0.004804
REAL TAX RATE	-0.006732	-0.087713	-0.067462	0.057201	1.000000	-0.045484	-0.173376	-0.052941	-0.020981
REVENUE	-0.176501	-0.255746	0.106843	0.063688	-0.045484	1.000000	-0.008518	-0.087980	-0.086617
TANGIBILITY	-0.293290	0.216264	-0.313262	-0.071130	-0.173376	-0.008518	1.000000	-0.067468	0.038500
TRANSPARANCY	-0.077000	0.091870	-0.121274	-0.082975	-0.052941	-0.087980	-0.067468	1.000000	-0.045657
VOLATILITY	-0.052581	-0.019813	-0.069050	0.004804	-0.020981	-0.086617	0.038500	-0.045657	1.000000

Service Second Sample

VARIABLE/VARIABLE	GROWTH OPPORTUNITIES	LIQUIDITY	MARKET CAP	PROFITABILITY	REAL TAX RATE	REVENUE	TANGIBILITY	TRANSPARANCY	VOLATILITY
GROWTH OPPORTUNITIES	1.000000	-0.077790	0.679956	-0.015822	0.016512	-0.046118	-0.018747	-0.068946	-0.041748
LIQUIDITY	-0.077790	1.000000	0.093931	0.017092	-0.010881	-0.158718	0.154368	0.048088	0.008156
MARKET CAP	0.679956	0.093931	1.000000	0.120543	0.100923	0.116178	-0.004603	-0.127844	-0.114407
PROFITABILITY	-0.015822	0.017092	0.120543	1.000000	0.095582	0.037000	0.091624	-0.095393	-0.081784
REAL TAX RATE	0.016512	-0.010881	0.100923	0.095582	1.000000	0.212642	-0.028840	-0.097774	0.035980
REVENUE	-0.046118	-0.158718	0.116178	0.037000	0.212642	1.000000	0.083386	-0.163160	0.011266
TANGIBILITY	-0.018747	0.154368	-0.004603	0.091624	-0.028840	0.083386	1.000000	0.141026	0.188852
TRANSPARANCY	-0.068946	0.048088	-0.127844	-0.095393	-0.097774	-0.163160	0.141026	1.000000	0.063014
VOLATILITY	-0.041748	0.008156	-0.114407	-0.081784	0.035980	0.011266	0.188852	0.063014	1.000000

A3 Specification Tests

A3.1 Industry Specification Tests

Full Sample, RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	26.371132	8	0.0009

Full Sample, FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	25.964286	(38,258)	0.0000
Cross-section Chi-square	490.977031	38	0.0000
Period F	7.408472	(7,258)	0.0000
Period Chi-square	57.145527	7	0.0000
Cross-Section/Period F	22.711457	(45,258)	0.0000
Cross-Section/Period Chi-square	499.720397	45	0.0000

First Sample, RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	12.451651	7	0.0867

First Sample, FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	20.280766	(38,106)	0.0000
Cross-section Chi-square	329.579722	38	0.0000
Period F	13.032365	(3,106)	0.0000
Period Chi-square	48.978390	3	0.0000
Cross-Section/Period F	19.298296	(41,106)	0.0000
Cross-Section/Period Chi-square	333.196232	41	0.0000

Second Sample, RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.284346	8	0.1861

Second Sample, FE

Effects Test	Statistic	d.f.	Prob.
Cross-section F	21.010979	(38,106)	0.0000
Cross-section Chi-square	334.440862	38	0.0000
Period F	11.790703	(3,106)	0.0000
Period Chi-square	44.921198	3	0.0000
Cross-Section/Period F	20.298749	(41,106)	0.0000
Cross-Section/Period Chi-square	340.169852	41	0.0000

A3.2 Service Specification Tests

Service Full Sample RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	17.538706	8	0.0250

Service Full Sample FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	25.052713	(17,111)	0.0000
Cross-section Chi-square	226.983516	17	0.0000

Period F	1.613763	(7,111)	0.1388
Period Chi-square	13.956038	7	0.0520
Cross-Section/Period F	18.424477	(24,111)	0.0000
Cross-Section/Period Chi-square	231.288003	24	0.0000

Service First Sample RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.119222	8	0.9267

Service First Sample FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	53.207262	(17,43)	0.0000
Cross-section Chi-square	222.670913	17	0.0000
Period F	0.272435	(3,43)	0.8449
Period Chi-square	1.355665	3	0.7160
Cross-Section/Period F	45.336168	(20,43)	0.0000
Cross-Section/Period Chi-square	222.837885	20	0.0000

Service Second Sample RE

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.107382	8	0.0204

Service Second Sample FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	24.759024	(17,43)	0.0000
Cross-section Chi-square	171.250289	17	0.0000
Period F	0.288417	(3,43)	0.8335
Period Chi-square	1.434411	3	0.6975
Cross-Section/Period F	21.889927	(20,43)	0.0000
Cross-Section/Period Chi-square	173.825873	20	0.0000

A4 Regression Results

A4.1 Industry Regression Results

Industry, Full Sample, FE Specification

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/17/12 Time: 23:31
Sample: 2003 2010
Periods included: 8
Cross-sections included: 39
Total panel (balanced) observations: 312

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.545789	0.349382	4.424345	0.0000
GROWTH_OPPORTUNITIES	-0.003677	0.000422	-8.707133	0.0000
PROFITABILITY	0.075724	0.033071	2.289764	0.0227
TRANSPARENCY	-9.924848	3.594421	-2.761182	0.0061
TANG	-0.199915	0.030506	-6.553249	0.0000
LIQUIDITY	-0.048819	0.008784	-5.557649	0.0000
REAL_TAX_RATE	0.019159	0.008273	2.315843	0.0213
VOLATILITY_PARAM	-0.759551	0.244408	-3.107721	0.0021
M_CAP	-5.12E-10	8.84E-11	-5.791870	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.503708	Mean dependent var	0.220058
Adjusted R-squared	0.478558	S.D. dependent var	0.189121
S.E. of regression	0.136566	Akaike info criterion	-1.094096
Sum squared resid	5.520489	Schwarz criterion	-0.902147
Log likelihood	186.6789	Hannan-Quinn criter.	-1.017379
F-statistic	20.02820	Durbin-Watson stat	0.389068
Prob(F-statistic)	0.000000		

Industry First Sample, FE-Specification, Whites Cross-Section Standard Errors

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 12:27
Sample: 2003 2006
Periods included: 4
Cross-sections included: 39
Total panel (balanced) observations: 156
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.764453	0.313044	5.636446	0.0000
GROWTH_OPPORTUNITIES	-0.003644	0.000258	-14.14422	0.0000
PROFITABILITY	0.126853	0.020884	6.074149	0.0000
TRANSPARENCY	-2.212547	4.458293	-0.496277	0.6205
TANG	-0.259910	0.018261	-14.23294	0.0000
LIQUIDITY	-0.033294	0.008392	-3.967261	0.0001
REAL_TAX_RATE	-0.041443	0.063375	-0.653935	0.5142
VOLATILITY_PARAM	-0.908839	0.200808	-4.525901	0.0000
M_CAP	-6.03E-10	3.96E-11	-15.21769	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.535975	Mean dependent var	0.215848
Adjusted R-squared	0.500529	S.D. dependent var	0.190333
S.E. of regression	0.134515	Akaike info criterion	-1.100481
Sum squared resid	2.605571	Schwarz criterion	-0.865877
Log likelihood	97.83752	Hannan-Quinn criter.	-1.005195
F-statistic	15.12077	Durbin-Watson stat	0.365737
Prob(F-statistic)	0.000000		

First Sample, FE-Specification, Adjusted model, Whites Cross-Section Standard Errors

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 12:30
Sample: 2003 2006
Periods included: 4
Cross-sections included: 39
Total panel (balanced) observations: 156
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.758888	0.368904	4.767874	0.0000
GROWTH_OPPORTUNITIES	-0.003604	0.000216	-16.71970	0.0000
PROFITABILITY	0.121501	0.007069	17.18881	0.0000
TANG	-0.254942	0.022137	-11.51663	0.0000

LIQUIDITY	-0.033587	0.008980	-3.739983	0.0003
VOLATILITY_PARAM	-0.916856	0.244152	-3.755267	0.0002
M_CAP	-5.92E-10	3.97E-11	-14.92548	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.533739	Mean dependent var	0.215848
Adjusted R-squared	0.504997	S.D. dependent var	0.190333
S.E. of regression	0.133912	Akaike info criterion	-1.121314
Sum squared resid	2.618129	Schwarz criterion	-0.925810
Log likelihood	97.46247	Hannan-Quinn criter.	-1.041909
F-statistic	18.56992	Durbin-Watson stat	0.351163
Prob(F-statistic)	0.000000		

Industry Second Sample, FE-Specification

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 12:17
Sample: 2007 2010
Periods included: 4
Cross-sections included: 39
Total panel (balanced) observations: 156

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.270680	0.541274	2.347570	0.0203
GROWTH_OPPORTUNITIES	-0.004205	0.000697	-6.033202	0.0000
PROFITABILITY	-0.030438	0.061965	-0.491203	0.6240
TRANSPARENCY	-17.41910	4.954604	-3.515740	0.0006
TANG	-0.151640	0.040866	-3.710685	0.0003
LIQUIDITY	-0.061301	0.012488	-4.908827	0.0000
REAL_TAX_RATE	0.018545	0.008406	2.206260	0.0290
VOLATILITY_PARAM	-0.552831	0.383189	-1.442713	0.1513
M_CAP	-4.06E-10	1.28E-10	-3.164842	0.0019

Effects Specification

Period fixed (dummy variables)

R-squared	0.512161	Mean dependent var	0.224268
Adjusted R-squared	0.474896	S.D. dependent var	0.188419
S.E. of regression	0.136536	Akaike info criterion	-1.070649
Sum squared resid	2.684470	Schwarz criterion	-0.836045
Log likelihood	95.51065	Hannan-Quinn criter.	-0.975363
F-statistic	13.74358	Durbin-Watson stat	0.502026
Prob(F-statistic)	0.000000		

Industry Second Sample, FE Specification, Adjusted Model

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 12:34
Sample: 2007 2010
Periods included: 4
Cross-sections included: 39
Total panel (balanced) observations: 156

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.487147	0.029929	16.27654	0.0000
GROWTH_OPPORTUNITIES	-0.004079	0.000689	-5.920432	0.0000
TANG	-0.130280	0.038474	-3.386182	0.0009
LIQUIDITY	-0.062629	0.012474	-5.020911	0.0000
M_CAP	-4.66E-10	1.17E-10	-3.974640	0.0001
TRANSPARENCY	-15.86850	4.655147	-3.408807	0.0008
REAL_TAX_RATE	0.017538	0.008379	2.093088	0.0381

Effects Specification

Period fixed (dummy variables)

R-squared	0.504080	Mean dependent var	0.224268
Adjusted R-squared	0.473510	S.D. dependent var	0.188419
S.E. of regression	0.136716	Akaike info criterion	-1.079862
Sum squared resid	2.728936	Schwarz criterion	-0.884358
Log likelihood	94.22924	Hannan-Quinn criter.	-1.000457
F-statistic	16.48917	Durbin-Watson stat	0.457766
Prob(F-statistic)	0.000000		

A4.2 Service Regression Results

Service Full Sample, FE, Whites Standard Errors

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 14:28
Sample: 2003 2010
Periods included: 8
Cross-sections included: 18
Total panel (balanced) observations: 144
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.400031	0.033072	12.09586	0.0000
GROWTH_OPPORTUNITIES	-0.003863	0.001146	-3.370866	0.0010
LIQUIDITY	-0.028385	0.014292	-1.986043	0.0492

M_CAP	-5.10E-11	1.01E-11	-5.075142	0.0000
PROFITABILITY	-0.009446	0.006224	-1.517654	0.1316
REVENUE	3.17E-08	1.38E-08	2.296031	0.0233
TANG	0.009131	0.029288	0.311775	0.7557
TRANSPARENCY	0.003657	0.003260	1.121870	0.2640
REAL_TAX_RATE	0.007199	0.021215	0.339334	0.7349
VOLATILITY_PARAM	-0.020037	0.003100	-6.463490	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.367812	Mean dependent var	0.273303
Adjusted R-squared	0.293728	S.D. dependent var	0.215429
S.E. of regression	0.181047	Akaike info criterion	-0.475683
Sum squared resid	4.195577	Schwarz criterion	-0.145704
Log likelihood	50.24919	Hannan-Quinn criter.	-0.341598
F-statistic	4.964764	Durbin-Watson stat	0.376489
Prob(F-statistic)	0.000000		

Service First Sample, RE Whites Standard Errors

Dependent Variable: LN_LEV
Method: Panel EGLS (Cross-section random effects)
Date: 05/18/12 Time: 16:05
Sample: 2003 2006
Periods included: 4
Cross-sections included: 18
Total panel (balanced) observations: 72
Swamy and Arora estimator of component variances
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.296006	0.052520	5.636113	0.0000
GROWTH_OPPORTUNITIES	-0.001161	0.000127	-9.169462	0.0000
LIQUIDITY	-0.047686	0.001472	-32.38668	0.0000
M_CAP	-2.39E-12	4.31E-12	-0.556313	0.5800
REAL_TAX_RATE	0.010120	0.003371	3.002507	0.0039
TANG	0.267756	0.034400	7.783574	0.0000
VOLATILITY_PARAM	-0.005985	0.003296	-1.815812	0.0742
TRANSPARENCY	-0.021981	0.089843	-0.244663	0.8075
PROFITABILITY	0.001026	0.000803	1.277052	0.2063
REVENUE	-3.18E-08	4.32E-08	-0.734972	0.4651

Effects Specification

	S.D.	Rho
Cross-section random	0.208105	0.9601
Idiosyncratic random	0.042428	0.0399

Weighted Statistics

R-squared	0.716292	Mean dependent var	0.022889
Adjusted R-squared	0.675109	S.D. dependent var	0.072605

S.E. of regression	0.041385	Sum squared resid	0.106186
F-statistic	17.39274	Durbin-Watson stat	1.341784
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.225434	Mean dependent var	0.225697
Sum squared resid	2.388428	Durbin-Watson stat	0.059654

Service First Sample, FE Whites Standard Errors

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 15:02
Sample: 2003 2006
Periods included: 4
Cross-sections included: 18
Total panel (balanced) observations: 72
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.299313	0.040352	7.417510	0.0000
GROWTH_OPPORTUNITIES	-0.002483	0.000570	-4.355046	0.0001
LIQUIDITY	-0.030785	0.017986	-1.711614	0.0921
M_CAP	-3.40E-11	3.72E-12	-9.150877	0.0000
REAL_TAX_RATE	0.012693	0.007601	1.669807	0.1024
PROFITABILITY	-0.002878	0.007022	-0.409805	0.6834
REVENUE	6.86E-08	1.02E-08	6.754976	0.0000
TANG	0.154220	0.007542	20.44790	0.0000
TRANSPARENCY	-0.072390	0.032879	-2.201730	0.0315
VOLATILITY_PARAM	-0.022398	0.001514	-14.78989	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.406459	Mean dependent var	0.225697
Adjusted R-squared	0.297643	S.D. dependent var	0.208400
S.E. of regression	0.174653	Akaike info criterion	-0.501017
Sum squared resid	1.830225	Schwarz criterion	-0.121572
Log likelihood	30.03660	Hannan-Quinn criter.	-0.349959
F-statistic	3.735290	Durbin-Watson stat	0.182048
Prob(F-statistic)	0.000436		

Service Second Sample FE

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	25.054456	(17,42)	0.0000
Cross-section Chi-square	173.566080	17	0.0000
Period F	0.133785	(3,42)	0.9394
Period Chi-square	0.684770	3	0.8768
Cross-Section/Period F	22.225181	(20,42)	0.0000
Cross-Section/Period Chi-square	176.369379	20	0.0000

Cross-section fixed effects test equation:
Dependent Variable: LN_LEV
Method: Panel Least Squares
Date: 05/18/12 Time: 16:13
Sample: 2007 2010
Periods included: 4
Cross-sections included: 18
Total panel (balanced) observations: 72

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.401274	0.562467	-0.713419	0.4784
GROWTH_OPPORTUNITIES	-0.005536	0.003380	-1.637957	0.1068
LIQUIDITY	-0.036777	0.025219	-1.458304	0.1501
M_CAP	-6.65E-11	3.17E-11	-2.097771	0.0402
REAL_TAX_RATE	0.018507	0.032460	0.570142	0.5707
TANG	-0.009914	0.027703	-0.357873	0.7217
VOLATILITY_PARAM	0.619675	0.398194	1.556212	0.1250
TRANSPARENCY	0.004978	0.011404	0.436528	0.6640
PROFITABILITY	-0.019870	0.004210	-4.719215	0.0000
REVENUE	8.61E-09	2.43E-08	0.354462	0.7243

Effects Specification

Period fixed (dummy variables)

R-squared	0.493797	Mean dependent var	0.320910
Adjusted R-squared	0.390841	S.D. dependent var	0.213181
S.E. of regression	0.166385	Akaike info criterion	-0.587046
Sum squared resid	1.633348	Schwarz criterion	-0.175982
Log likelihood	34.13366	Hannan-Quinn criter.	-0.423400
F-statistic	4.796176	Durbin-Watson stat	0.804881
Prob(F-statistic)	0.000020		

Appendix B: Tests and Regressions, WACC as Dependent on Leverage

B1 Heteroscedasticity Tests

B1.1 Industry Heteroscedasticity Tests

Sample	P-value, F-test	Heteroscedasticity Detected	Adjustment
Full Sample	0,07	YES	White Standard Errors
First Sample	0,05	YES	White Standard Errors
Second Sample	0,01	YES	White Standard Errors

B1.2 Service Heteroscedasticity Tests

Sample	P-value, F-test	Heteroscedasticity Detected	Adjustment
Full Sample	0,49	NO	None
First Sample	0,42	NO	None
Second Sample	0,03	YES	White Standard Errors

B2 Specification Tests

B2.1 Industry Specification Tests

Industry Full Sample Specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.954680	1	0.3285

Industry First sample specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.638053	1	0.4244

Industry First Sample Specification, FE

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.577720	(38,113)	0.0346

Cross-section Chi-square	66.398921	38	0.0029
Period F	2.750340	(3,113)	0.0460
Period Chi-square	10.994119	3	0.0118
Cross-Section/Period F	1.610724	(41,113)	0.0259
Cross-Section/Period Chi-square	71.794255	41	0.0021

Industry Second Sample Specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section and period random	0.110450	1	0.7396

B2.2 Service Sample Specification Tests

Service Full, Specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.231574	1	0.6304

Service First Sample Specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.047096	1	0.8282

Service Second Sample Specification, RE

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.033129	1	0.8556

B3 Regression Results

B3.1 Industry Regression Results

Industry Full Sample Regression Results

Dependent Variable: WACC
Method: Panel EGLS (Period random effects)
Date: 05/19/12 Time: 19:36
Sample: 2003 2010
Periods included: 8
Cross-sections included: 39
Total panel (balanced) observations: 312
Swamy and Arora estimator of component variances
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.091092	0.006441	14.14164	0.0000
LEVERAGE+LEVERAGE^.5	-0.034129	0.008960	-3.808846	0.0002
	Effects Specification			
			S.D.	Rho
Cross-section fixed (dummy variables)				
Period random			0.003655	0.0233
Idiosyncratic random			0.023652	0.9767
	Weighted Statistics			
R-squared	0.401136	Mean dependent var		0.066558
Adjusted R-squared	0.315270	S.D. dependent var		0.028691
S.E. of regression	0.023742	Sum squared resid		0.153316
F-statistic	4.671624	Durbin-Watson stat		1.971308
Prob(F-statistic)	0.000000			
	Unweighted Statistics			
R-squared	0.390767	Mean dependent var		0.066558
Sum squared resid	0.157885	Durbin-Watson stat		1.980282

Industry First Sample Regression Results

Dependent Variable: WACC
Method: Panel EGLS (Period random effects)
Date: 05/19/12 Time: 19:40
Sample: 2003 2006
Periods included: 4
Cross-sections included: 39

Total panel (balanced) observations: 156
Swamy and Arora estimator of component variances
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.104017	0.016145	6.442745	0.0000
LEVERAGE+LEVERAGE^.5	-0.049214	0.022822	-2.156466	0.0331

Effects Specification		
	S.D.	Rho
Cross-section fixed (dummy variables)		
Period random	0.005080	0.0326
Idiosyncratic random	0.027682	0.9674

Weighted Statistics			
R-squared	0.468786	Mean dependent var	0.069201
Adjusted R-squared	0.290188	S.D. dependent var	0.032971
S.E. of regression	0.027778	Sum squared resid	0.089508
F-statistic	2.624811	Durbin-Watson stat	2.657787
Prob(F-statistic)	0.000037		

Unweighted Statistics			
R-squared	0.453892	Mean dependent var	0.069201
Sum squared resid	0.093127	Durbin-Watson stat	2.639881

Industry Second Sample Regression Results

Dependent Variable: WACC
Method: Panel EGLS (Two-way random effects)
Date: 05/19/12 Time: 19:44
Sample: 2007 2010
Periods included: 4
Cross-sections included: 39
Total panel (balanced) observations: 156
Swamy and Arora estimator of component variances
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.080738	0.004749	17.00035	0.0000
LEVERAGE+LEVERAGE^.5	-0.023037	0.004302	-5.355031	0.0000

Effects Specification		
	S.D.	Rho
Cross-section random	0.012416	0.3896
Period random	0.001339	0.0045
Idiosyncratic random	0.015482	0.6058

Weighted Statistics			
R-squared	0.160910	Mean dependent var	0.032513
Adjusted R-squared	0.155462	S.D. dependent var	0.016996
S.E. of regression	0.015619	Sum squared resid	0.037568
F-statistic	29.53225	Durbin-Watson stat	1.710326
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.292802	Mean dependent var	0.063914
Sum squared resid	0.061133	Durbin-Watson stat	1.079312

B3.2 Service Regression Results

Service Full Sample Regression Results

Cross-section random effects test equation:
Dependent Variable: WACC
Method: Panel EGLS (Period random effects)
Date: 05/19/12   Time: 19:28
Sample: 2003 2010
Periods included: 8
Cross-sections included: 23
Total panel (balanced) observations: 184
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.084989	0.028084	3.026187	0.0029
LEVERAGE+LEVERAGE^.5	-0.006506	0.033232	-0.195766	0.8450

Effects Specification		
	S.D.	Rho
Cross-section fixed (dummy variables)		
Period random	0.019689	0.0245
Idiosyncratic random	0.124199	0.9755

Weighted Statistics			
R-squared	0.256806	Mean dependent var	0.079791
Adjusted R-squared	0.149972	S.D. dependent var	0.134845
S.E. of regression	0.124323	Sum squared resid	2.473000
F-statistic	2.403779	Durbin-Watson stat	0.675265
Prob(F-statistic)	0.000795		

Unweighted Statistics			
R-squared	0.252250	Mean dependent var	0.079791

Sum squared resid	2.536948	Durbin-Watson stat	0.678684

Service First Sample Regression Results

Period random effects test equation:
Dependent Variable: WACC
Method: Panel EGLS (Cross-section random effects)
Date: 05/19/12 Time: 19:30
Sample: 2003 2006
Periods included: 4
Cross-sections included: 23
Total panel (balanced) observations: 92
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.100282	0.035099	2.857122	0.0053
LEVERAGE+LEVERAGE^.5	-0.004121	0.044377	-0.092867	0.9262
	Effects Specification			
			S.D.	Rho
Cross-section random			0.109739	0.3308
Period fixed (dummy variables)				
Idiosyncratic random			0.156091	0.6692
	Weighted Statistics			
R-squared	0.049168	Mean dependent var		0.097394
Adjusted R-squared	0.005451	S.D. dependent var		0.156239
S.E. of regression	0.155813	Sum squared resid		2.112155
F-statistic	1.124699	Durbin-Watson stat		0.761479
Prob(F-statistic)	0.350173			
	Unweighted Statistics			
R-squared	0.034710	Mean dependent var		0.097394
Sum squared resid	3.130729	Durbin-Watson stat		0.513734

Service Second Sample Regression Results

Dependent Variable: WACC
Method: Panel EGLS (Period random effects)
Date: 05/19/12 Time: 19:33
Sample: 2007 2010
Periods included: 4
Cross-sections included: 23
Total panel (balanced) observations: 92
Swamy and Arora estimator of component variances

White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.085535	0.011102	7.704183	0.0000
LEVERAGE+LEVERAGE^.5	-0.026025	0.012376	-2.102805	0.0392

Effects Specification		
	S.D.	Rho
Cross-section fixed (dummy variables)		
Period random	0.015337	0.2943
Idiosyncratic random	0.023751	0.7057

Weighted Statistics			
R-squared	0.534926	Mean dependent var	0.062189
Adjusted R-squared	0.377621	S.D. dependent var	0.029925
S.E. of regression	0.023608	Sum squared resid	0.037900
F-statistic	3.400576	Durbin-Watson stat	2.782187
Prob(F-statistic)	0.000047		

Unweighted Statistics			
R-squared	0.462374	Mean dependent var	0.062189
Sum squared resid	0.049707	Durbin-Watson stat	2.772333

B4 Error-In-Variables Test

B4.1 Industry Error-In-Variables Test

Dependent Variable: G_WACC
Method: Panel Least Squares
Total panel (unbalanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.367939	0.022196	16.57718	0.0000
G_LEV	-0.025990	0.015218	-1.707914	0.0928
S.E. of regression	0.064292			
Sum squared resid	0.248007			

B4.2 Service Error-In-Variables Test

Period fixed effects test equation:
Dependent Variable: G_WACC

Method: Panel Least Squares
Total panel (unbalanced) observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.506249	0.340032	1.488829	0.1604
G_LEV+G_LEV^.5	-0.038927	0.119268	-0.326385	0.7493

Effects Specification	
Cross-section fixed (dummy variables)	
S.E. of regression	0.342456
Sum squared resid	1.524593