The Effects of Leverage on Stock Returns

Author: Matilda Andersson

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Supervisor: Erik Norrman
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Lund University
School of Economics and Management
Department of Economics

Abstract

This paper investigates the relationship between capital structure and stock returns for Swedish firms listed on the Nasdaq OMX Stockholm Stock Exchange. Actual stock returns and leverage figures in form of total, long-term and short-term debt are used in the calculations. The results suggest, in contrast with a majority of fundamental theories, that there is a negative relationship between leverage and stock returns. The results indicate that investors are not being compensated for the extra risk they are taking on when investing with high-leveraged firms. Several previous empirical studies has come to the same conclusion. This study in conjunction with other earlier empirical studies question a very common understanding of capital structure.

Contents

1 Introduction

This introductory chapter aims to present the background of why capital structure has been a researched subject and why it is still interesting today, to study the relationship between a firm's performance and its capital structure. It will include the purpose of the study, the main research questions and the limitations of the study. At the end an outline will be presented for the study.

1.1 Background

What defines a successful company? A company could be successful in many ways, in economical terms a company's success however is often linked with the company's value creation, i.e. the ability of the company to generate future returns in terms of invested capital. The value of a firm is driven by earnings and growth (Koller & Goedhart 2010), which in turn are rooted in the firms business strategy, unique assets, management, strategic market position, among other things (Sparrow 2013). Economists, managers and investors have always been seeking identifiers of success and many firms specific variables has as a result been considered crucial indicators of a firms performance.

A feature that applies to all companies is that they need financing to operate their activities. Even the smallest most simple business needs capital. To maximise profits it is in every company's interest to raise capital as cheaply as possible. This task is however not always easy since there are many different ways of raising capital. One way is to raise capital is by borrowing money from banks or bondholders, another is to sell ownership stakes by issuing equities. Still, many more options are available. Firms could for example issue hybrid securities in form of convertible debt or preferred stocks (Financial Times). A firm's composition of different types of capital is denoted as the firm's capital structure (Brealey, Myers & Allen 2011).

Since capital is a central component for conducting business and could be raised in so many different ways, capital structure has become a topic of discussion. Does the choice of capital structure matter for a firm's profitability or returns? What combination of capital lends itself to the greatest measure of success? In the attempt to generalise ideas of capital structure several theories of capital structure has been developed. The first was the Modigliani & Miller theorem published in 1958 which proposed that future stocks return should increase with the amount of debt. Their reasoning behind the proposition was that the higher the proportion of debt in a firm, the higher the risk of owning the firm's stock and the more should investors be compensated in terms of returns (Modigliani & Miller 1958). After Modigliani & Miller other theories such as the trade-off theory and the pecking order hypothesis was developed.

Capital structure has since the late 1950's been subject for many empirical studies. Interestingly enough the proposed relationship between firm performance and capital structure has not been conclusively proven (Baker & Martin 2001). Several studies come to the conclusion that firm performance correlate positively with the proportion of debt, others find a negative relationship. It is in other words still unclear whether capital structure affects a firm's performance and success and if so in which way.

1.2 Purpose and Contribution

The purpose of this study is to investigate if a firm's stock return can be explained by its capital structure and if fundamental theories as well as previous empirical findings can be applied to firms listed on the Nasdaq OMX Stockholm Stock Exchange. As mentioned above previous empirical studies have presented somewhat contradictory results, some agreeing som disagreeing with the fundamental theories of capital structure. The conflicting results justifies further research and investigation. The purpose of this paper is to contribute to the body of research on the subject. By focusing on Swedish data, on which few previous papers have been written, the ambitions of the study is to stand out and be able to contribute.

Within the spectra of existing studies, few researchers have been focusing on market based measurements of firm performance such as stock returns. Instead many studies have chosen to focus on book values such as return on equity or return on assets as dependent variable. By basing the study on stock returns instead of book values, this paper will investigate the relationship between firms performance and capital structure from an investor's perspective. The study will try to explore if investors should take capital structure into account in their investment decisions. Stock returns hasn't (to my knowledge) been used before as a proxy for firm performance in studies based on Swedish data. The papers ambition is to fill this research gap.

Most studies that investigate the relationship between shareholders return and capital structure use the *Capital Asset Pricing Model* (CAPM) to determine shareholder return and are using expected stock returns as dependent variable. By measuring actual stock returns this study will capture the actual effect of leverage on stock returns, not the impact leverage has on future returns.

This study will be employing regression on panel data. Panel data consist of both cross-sectional and time-series observations and is currently preferred to using cross-sectional or time-series data separately (Dougherty 2011). Since using panel data is quite a new method, older studies are rarely if ever based on panel data. Older studies may therefore be less accurate than newer ones.

1.2.1 Research Questions

The study will be built upon two research questions. The main research question is proposed as follows:

- How are stock returns affected by capital structure in Swedish listed firms during 2006-2015?

The secondary research question is:

- Does the observed relationship between capital structure and stock returns vary between the industrial and the technology industry?

1.3 Limitations of the Study

The study is limited by focusing on Swedish firms listed on the Nasdaq OMX Stockholm stock exchange. It is also limited to a ten-years time period (2006-2015). Using stock returns limits the sample size since no observations for stock returns are available before the point in time when the company in question is listed. To collect sufficiently large samples the lower limit is set to year 2006.

Only two industries will be investigated in this study: The industrial as well as the technology industry. The financial industry is excluded due to different regulations regarding capital structure (Alves & Francisco 2014). Other industries are excluded because of a lack of data due to missing data.

1.4 Disposition

Chapter 1 Introduction
The introducing chapter aims to present the background to and purpose of the study. It will further present the main research questions that are going to be investigated and the limitations of the study.

Chapter 2 Theoretical framework
The theoretical framework will present main theories on capital structure as well as previous empirical evidence of the relationship between stock return and leverage. The theories and empirical findings arrive as four hypotheses presented at the end of this chapter.

Chapter 3 Methodology
This chapter aims to explain the steps taken and choices made along the process of this study. The chapter will for example explain choices made regarding data selection, regression model and control variables.

Chapter 4 Empirical results
In this chapter descriptive statistics, correlation matrixes and the empirical results of the regressions will be presented.

Chapter 5 Analysis & Discussion
The chapter Analysis & Discussion will contain analysis of the empirical result in the context of fundamental theories and previous empirical findings presented in chapter 2. The purpose of the chapter is to resolve if the stated hypothesis shall be rejected or not.

Chapter 6 Conclusion

The final chapter will summarise the results of the study. It will also reflect on limitation of the study and purpose suggestions for further research on the subject.

2 Theoretical framework

This chapter will initially be introducing the concept of capital structure. After that the most fundamental theories on capital structure will be presented, followed by previous empirical findings of the relationship between leverage and stock returns. The theories and the empirical evidence will be the basis for the hypotheses developed which are presented at the end of this chapter.

2.1 Measurements of Capital Structure

2.1.1 Capital Structure

Capital structure is at its simplest defined as the composition of debt and equity financing (Brealey, Myers & Allen 2011) and determines who has the claim of a firm's assets and in what order. Investors provide equity financing while banks or bondholders provide financing trough debt. A firm's capital structure may be more or less complicated since there are options to issue also other types of securities for financing, e.g. hybrid securities such as convertible debt and preferred stocks (Financial Times). The capital structure could be measured as the ratio of debt through equity or debt through total assets (Örtqvist 2006). A high debt to total assets ratio implies that a firm raises more debt proportionally to issuing of equity, i.e. the firm is highly leveraged. It is important to note that the debt to total assets ratio could change both due to increased borrowing and to changes in the market valuation of equity (Brealey, Myers & Allen 2011).

2.1.2 Leverage

Leverage is a commonly used word for borrowed money that allows for increased returns, theoretically. Leverage is also used as a substitute for the proportion of debt that is uitilised by the company in question for financing its assets, i.e. the debt ratio. The general idea of using the word leverage instead of debt ratio regarding a firm's capital structure is to illustrate that more debt implies more risk. Equity is more sensitive to changes in firm value in a high-leveraged firm than in a low-leveraged one. A potential loss or gain will in other words be larger for a high-leveraged firm than a low-leveraged firm. This is called the leverage effect. Leverage is often defined as the proportion of all of a firm's liabilities, which among other things include long-term and short-term debt as well as pensions obligations (Brealey, Myers & Allen 2011).

2.2 Capital Structure in Theory

2.2.1 Modigliani-Miller Theorem

The Modigliani-Miller theorem, developed in 1958 by Franco Modigliani and Merton H. Miller, has laid the foundation for many of todays capital structure theories and has also been the subject of great many an empirical study (Baker & Martin 2011). The theory consists of two main propositions and is based on five perfect capital market assumptions (Modigliani & Miller 1958):

- There is neither transaction costs nor taxes in capital markets and investors are able to borrow at the same cost as companies
- There are no bankruptcy costs
- There is no asymmetric information in the capital markets, e.g the market participants share similar expectations about earnings and volatility
- Market participants are not able to affect market prices
- A firm's capital structure is constant and well known

Proposition I suggests that the market value of a firm is independent of its capital structure (Baker & Martin 2011):

$$V_j = (S_j + D_j) = \bar{X}_j \tag{1}$$

Where:

V_j = Market value of a firm
S_j = Market value of the firm's common shares
D_j = Market value of the firm's debt
$\bar{X}_j$ = The present value of future expected returns on the firms assets

Proposition II which holds when proposition I holds, suggests that common stock returns increase with the amount of debt. Proposition II is formulated as (Baker & Martin 2011):

$$i_j = \rho_k + (\rho_k - r)\frac{D_j}{E_j} \tag{2}$$

Where:

i_j = Expected return of a common stock
ρ_k = The capitalisation rate for the equity stream
r = The cost of debt
D_j/E_j = The ratio between debt and equity

Modigliani and Miller argue in their 1958 paper that the higher the proportion of debt in a firm, the higher the risk of owning said firms stock. In order to compensate investors for the higher risk, stocks for highly leveraged firms should generate a higher return (Modigliani & Miller 1958).

Empirical studies have come to contradictory conclusions. Even though the first proposition widely has been accepted theoretically it hasn't been conclusively proven to hold empirically (Miller 1988).

2.2.2 Agency Theory

In 1976 Jensen & Meckling published a study in which they tried to detail optimising a firms capital structure. Their reasoning is built upon the principal agents theory, i.e that agents are utility maximizing and therefore generally act in their own interests instead of the principals. Principals can in this case take control by incentivising agents, however this generates costs, so called agency costs. The principal-agent relationship fit the relationship of a stakeholder and a manager of a firm. Jensen & Meckling (1976) suggests that increasing the level of debt up to a certain level would decrease the agency costs since debt holders would get more power and control and thereby out-competing the agents potential egotistical actions. Thereby higher levels of debt, up to a certain level, may improve a firm's performance (Jensen & Meckling 1976).

2.2.3 Trade-off Theory

Myers (1984) further developed the optimal capital structure choice, which later became the trade-off theory. The trade-off theory suggests that managers view the capital structure decision of their firms as a trade-off between interest tax shield on the one side and costs of financial distress on the other. It also suggests that companies with a large amount of safe assets, such as tangible assets, in combination with a high income will finance their activities with a great proportion of debt. Since the tax-shield, assets structure and income are firm specific there is an optimal debt-ratio for each company. The marginal utility of issuing additional debt decreases when the debt proportion of total capital increases (Brealey, Myers & Allen 2011). As long as more debt is optimal, shareholders benefit from more debt (Baker & Martin 2011). The value of a firm is according to the trade-off theory formulated as (Brealey, Myers & Allen 2011):

$$V = V_e + PV(\text{Tax Shield}) - PV(\text{Costs of Financial Distress}) \tag{3}$$

$$
\begin{aligned}
V &= \text{Firm Value} \\
V_e &= \text{Firm Value, if all Equity Financed} \\
PV &= \text{Present Value}
\end{aligned}
$$

The trade-off theory explains why capital structure setups may differ between industries. Since technological high-growth companies normally have a lot of risky assets and a large amount of intangible assets, they often lack the opportunity to raise cheap debt. According to Brealey, Myers & Allen (2011) these firms often finance their activities by a high proportion of equity in relation to debt.

2.2.4 Pecking Order Hypothesis

The pecking order hypothesis is based on the assumption that there is a degree of information asymmetry between managers and investors. That is, the managers know more about their companies value, risks and future than the investors. A proof of this is that stock prices often rise after announcement of increased coming dividend payments. Asymmetric information has an impact also on a company's choice of financing. Financing could be done internally or externally and by issuing either debt or equity. The pecking order is that a firm at all times prefers internal financing to external and in cases when external financing is the only available option debt is preferred over equity. With the pecking order assumptions in mind, issuance of equity is a last resort. Issuing equity would according to this theory send bad signals and investors may in such a scenario fear that the firm is in financial distress. That in turn would cause the stock price to dip (Brealey, Myers & Allen 2011).

Issuing equity will not necessarily affect the stock price negatively for all firms. High-tech, high-growth firms possessing large amounts of intangible assets rarely have the opportunity to raise debt. Due to high costs of debt and difficulties with generating cash flows large enough for covering debt and interest rate payments, equity will be the only financing option to achieve growth. Since this characterise all high-tech high-growth firms the impact of the pecking order will not be as distinct as for mature profitable firms. Profitable firms in general are expected to pay down debt as soon as they are able to (Brealey, Myers & Allen 2011).

According to the pecking order hypothesis there is no optimal proportion of debt. The theory just concludes that the optimal proportion of debt differ between different types of firms. Profitable firms issue less equity and use less external financing than high-growth firms (Brealey, Myers & Allen 2011). Hovakimian, Opler & Titman (2001) agree with the pecking-order hypothesis and similarly suggest that profitable firms in general take advantage of high income and pay down debt.

2.2.5 Market Timing Theory

The market timing theory assumes that managers are sometimes irrational in their behaviour. In cases where a manager's outlook regarding their own company is more stable than the general investor's, they may decide to (and likely will) issue equity when the stock price is high and raise debt in times when the stock price is low. Managers are in other words, due to asymmetric information, able to time the market at least somewhat efficiently. The market timing theory as such suggests that debt could correlate negatively with stock returns (Brealey, Myers & Allen 2011).

According to Masulis & Korwar's (1986) and Asquith and Mullin's (1986) studies, firms generally issue more equity when the stock price goes up. Graham & Harvey's (2001) survey additionally shows that the majority of asked CFOs say they have timed the market when issuing equity. Similar evidence comes from Hovakimian, Hovakimian & Tehranian (2004) whom find the probability of issuing equity higher when the spot stock price is high.

2.3 Review of Empirical Studies

2.3.1 Positive Relationship between Leverage & Stock Returns

Hamada (1969) takes a theoretical approach to researching if Modigliani & Miller's second proposition holds by investigating the effect of capital structure on systemic risk of common stocks. His conclusion is that the rate of return increases with the debt ratio. In a later study made in 1972 using data of U.S firms, he proves that his thesis holds and establishes that there is a positive correlation between leverage and stock returns (Baker & Martin 2011).

Masulis's findings are in line with Hamada's. In his 1983 study he investigates the impact leverage changes have on stock returns. His results suggest that both firm value and changes in stock prices correlate positively with changes in the debt ratio (Masulis 1983).

Bhandari (1988) shows that expected common stock returns on a monthly basis correlate positively with annual debt-to-equity ratios. The relationship is observed both regarding firms of all sectors as well as manufacturing firms (specifically).

2.3.2 Negative Relationship between Leverage & Stock Returns

Ardatti (1967) examines the relationship between leverage and the geometrical average of returns for industrial, railroad and utilities firms. He finds a negative relationship between the variables, however it is statistically insignificant. Arditti concludes that the insignificancy may be a result of omitting risk variables that relates positively to return and negatively to leverage.

Hall & Weiss (1967) come across a negative relationship between leverage and returns when investigating the relationship between firm size and profitability. They probe the 500 largest industrial firms and define stock returns as returns on equity after taxes.

Adami et al. (2015) explore if there is any relationship between capital structure and stock performance during 1980 and 2008 for stocks listed on the London Stock Exchange. Their empirical results show that debt financing negatively affect stock returns. The results are explained by investors preferring to invest in financially flexible firms and therefore generate higher returns when investing in low-leveraged firms than high-leveraged firms (Adami et al 2015).

Penman, Richardson & Tuna's (2007) conclusions are in line with Adami et al.'s; market leverage correlates negatively with stock returns. They suggest that the unexpected relationship appears due to some of the following reasons: 1) there are measurement errors in the leverage figures, 2) omitting risk factors negatively effect leverage and 3) the market misprices leverage (Penman, Richardson & Tuna 2007).

Acheampong, Agalega & Shibu (2013) investigate the leverage effect on stock returns for manufacturing firms listed on the Ghanese stock exchange between 2006-2010. They demonstrate a statistically significant result in which leverage negatively correlates with stock return.

Muradoglu & Sivaprasad (2012) build portfolios using debt ratio as a basis for an investment strategy to evidence if there is a positive relationship between stock returns and leverage. They come to the conclusion that investing in low leverage portfolios yields higher returns in the long-run and therefore that the Modigliani and Miller theorem does not hold.

George & Hwang (2009) find a negative relationship between stock-return and leverage. They explain the negative relationship with that there is other types of risks in firms than leverage risk and that the higher return for low-leveraged firms thus may be compensation of such risks.

2.3.3 Pecking-order Hypothesis versus Trade-off Theory

Shyam-Sunder & Myers (1999) argue that the pecking-order hypothesis offers a better model for explaining reality than the trade-off theory. However, Hovakimian, Opler & Titman (2001) suggest that the theory which is most suitable depends (largely) on the time horizon considered. The trade-off theory works well in the long run as managers in the long term tend to make choices regarding capital structure that move their firms towards the optimal level of debt - if the is such a level. The pecking order hypothesis on the other hand makes sense in the short run. Their findings show that more profitable firms generally are less indebted. At the same time, profitable firms are more likely to issue debt than equity in comparison to less profitable ones (Hovakimian, Opler & Titman 2001).

2.3.4 Short- and Long-term Debt

Hall, Hutchinson & Michaelas (2000) propose that short-term and long-term debt should be regarded separately when investigating capital structure of firms. The determining factors of capital structure differ between short and long-term debt in their analysis. Long-term debt is for example positively correlated to asset structure and size while short-term debt is negatively correlated with the same.

Örtqvist (2006) has in his research on capital structure come to the same conclusion: That it is important to distinguish between short and long-term debt when analysing capital structure. His findings also show that the determining factors of capital structure differs between short-term and long-term debt and he conclude that it is problematic to measure the two debt ratios separately since it could potentially lead to misleading results.

Gill, Biger and Mathur (2011) distinguish between short- and long-term debt in their investigation of the relationship between return on equity and capital structure. Their findings show that there is a positive relationship between both debt ratios and return on equity. Nor were Yazdanfar & Öhman (2015)able to detect any difference between short-term and long-term debt. However they did find that there were a negative relationship between both short-term and long-term debt ratios and profitability.

2.3.5 Industry Specifics of Capital Structure

Arditti (1967) makes the proposition that risks are industry specific and therefore that the relationship between leverage and stock returns should be tested separately for different industries. According to Myers (1984) debt ratios are not determined by industry norms. Hall, Hutchinson & Michaelas (2000) on the other hand argue that the specific industry indirectly might affect capital structure since the nature of a firm's assets automatically effects a firm's debt ratio.

Zeitun & Tian (2007) suggest that industry will affect corporate performance. They test their hypothesis by including a dummy variable for industry. They come to the conclusion that the industry dummy variable is statistically significant. Adami ett al. (2015) investigate if the competetiveness of an industry has a significant effect on the relationship between stock returns and leverage and find in contrast with Zeitun & Tian that the industry effect doesn't seem to be significant.

2.4 Hypotheses

The broad theoretical framework and the many methods used in previous empirical studies enables one to investigate the relationship between capital structure and firm performance from many different angles. This study is however limited to investigate the research question stated in the introducing chapter:

- How are stock returns affected by capital structure in Swedish listed firms during 2006-2015?
- Does the observed relationship between capital structure and stock returns vary between the industrial and the technology industry?

The hypotheses that will be presented in this section are based on both the theories and previous empirical studies presented in this chapter. There will be four hypothesis investigated in total whereof the three main hypothesis will be rejected or not rejected due to the p-value that comes out from the regressions. The null hypothesis for each of the three first hypotheses is that there is no relationship between stock returns and capital structure. A fourth hypothesis will be investigated through observing and comparing separately performed regressions for industrial firms and technology firms.

Hypothesis regarding total debt:

- H_0: The total debt ratio will not affect stock returns significantly
- H_1: The total debt ratio will affect stock returns significantly

Hypothesis regarding long-term debt:

- H_0: The long-term debt ratio will not affect stock returns significantly
- H_1: The long-term debt ratio will affect stock returns significantly

Hypothesis regarding short-term debt:

- H_0: The short-term debt ratio will not affect stock returns significantly
- H_1: The short-term debt ratio will affect stock returns significantly

Hypothesis regarding industry:

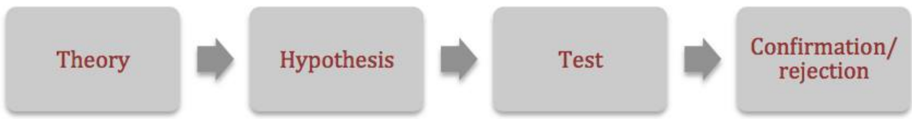
- H_0: The impact of leverage on stock returns vary between industries
- H_1: The impact of leverage on stock returns does not vary between industries

3 Methodology

This chapter aims to explain the steps taken and choices made along the process of conducting this study. By providing insight into the author's considerations and choices, the reader will hopefully gain a better understanding and a better ground to stand on whence taking a critical standpoint. The methodology is based on former empirical studies and evidence with the purpose of generating a trustworthy analysis as well as reliable results.

3.1 Research Approach

The purpose of this study is to seek a better understanding of the question regarding whether stock returns can be explained by capital structure or not. Since this relationship has not been tested on Swedish listed firms before, an exploratory approach is to be considered preferable. In addition, a deductive approach, i.e. a method of deriving a new conclusion from established theoretical assumptions and hypotheses will be used. The relationship between stock returns as the dependent variable and capital structure as the independent variable is tested this way in order to investigate if fundamental assumptions holds true in reality. The deductive approach is commonly used in combination with quantitative data (Saunders, Lewis & Thornhill 2009), upon which this study solely is based on. Generally the deductive approach implies four main steps: compiling a theoretical framework, defining a hypothesis according to the theoretical assumptions, testing the hypothesis and at last confirming or rejecting the hypothesis (Research methodology).



3.2 Data Collection

3.2.1 Data Selection

Panel Data

The data is collected from Thomas Reuters DataStream. The data sample is carefully selected to secure the validity of the study and to avoid common statistical defects. The set is characterised as panel data, which is a data set that have both a time and cross-section series dimension (Brooks 2008). There are several reasons as to why panel data is preferred over cross-section and time-series data and nowadays is commonly used by researchers (Dougherty 2011):

- The number of observations grow larger using panel data since the number of entities is multiplied with the number of points in time
- Panel data enables for solving the common fitting problem with cross-section samples called unobserved heterogeneity

Data Description

The data set consists of figures for listed firms at Nasdaq OMX Stockholm Stock Exchange. Nasdaq Stockholm consists of 332 companies as of 2016-07-02 and is divided into 10 different industries (Nasdaq OMX Nordic):

Table 1: Industry Classification

Classification	**Number of Companies**
Basic Materials	22
Consumer Goods	32
Consumer Services	30
Financials	79
Health Care	40
Industrials	80
Oil & Gas	6
Technology	34
Telecommunications	7
Utilities	2
Sum	332

To increase the sample size used in this study, and thereby increase the reliability of the results (Brooks 2008) the companies are reclassified into five larger groups. Consumer Goods and Consumer Services are consolidated into Consumers, Basic Materials, Industrials, Oil & Gas and Utilities to Industrial and Technology and Telecommunications into Technology.

Table 2: Industry Reclassification

Reclassification	**Number of Companies**
Consumer	62
Financials	79
Health Care	40
Industrial	110
Technology	41
Sum	332

The Financial Industry is commonly excluded in studies that treat capital structure because their balance sheets are generally more complicated to analyse and since regulations for these firms regarding leverage are different (Alves & Francisco 2014). Due to large amounts of missing data for the time period 2006-2015 the Health Care sector and Consumer sector will be excluded as well. The remaining industries to be investigated are the Industrial and Technology industries or sectors.

Time Period and Time Interval

The time period included in the data set is limited to 2006-2015. A greater time period would generally have been preferred in order to increase the sample. However a study of a longer period or in other words regarding more time-series observations had decreased the amount of cross-sectional observation (also called entities for panel data), due to the fact that fewer firms had not been listed at the starting point of the period and as such would have resulted in a smaller data set. Using a sample suffering from a large proportion of excluded entities would not be considered preferable since it would lower the quality of the study (Brooks 2008). When using an enormous amount of entities over many time periods there is also a greater risk for type two-error in the data (Park 2011).

The time-series data consist of quarterly observations due to fact that it's better than annual data and captures movements of higher frequency. Since several variables in this study are measured quarterly, observations of even higher frequency are discarded (Brooks 2008). However there are variables that are only measured on an annual basis. To be able to use these data points in an effective way with the study in question the decision is made to use a technique knows as interpolation. Interpolating data is a manipulative measure to make the data better fit the model. Interfering with the data is often a less than optimal method since it also may distort the results. However, interpolating variables such as in this study is considered as doing less harm than using the raw data as it is. The raw data is manipulated first hand since yearly observations have been divided by four to form quarterly observations. Linear interpolation is the most common method of interpolating and appropriate to use for a random process. The interpolated observations are based on two values, a start value and an end value, and are a linear fit between those values. The first interpolated value is in other words the start value plus one-quarter of the difference between the start and end value, while the second interpolated value is the first interpolated value plus one-quarter of the difference between the start and end value. For every new entity the start and end value changes. Linear interpolation is described by the function below:

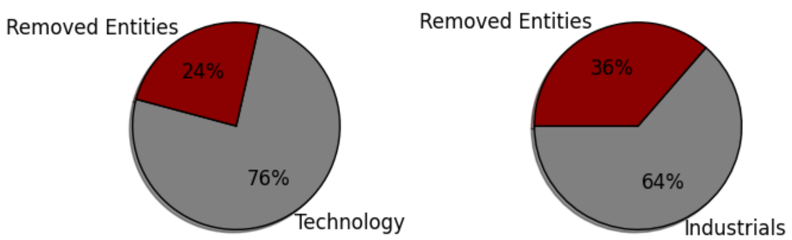
$$z(t_0 + i\Delta t) = z_{j'} + \frac{t_0 + i\Delta t - t_{j'}}{t_{j'+1} - t_{j'}}(z_{j'+1} - z_{j'}) \tag{4}$$

Where z is the interpolated value, $z_{j'}$ the start value and $z_{j'+1}$ the end value. t_0 to $t_0 + i\Delta t$ constitute the time period where every interpolated value is spaced by Δt. The interpolation is done between the times $t_{j'}$ and $t_{j'+1}$ (Dacorogna et al. 2001).

3.2.2 Data Loss

Data sets suffering from many missing observations may lead to distorted results. When the entities containing missing data observation are removed, also known as list wise deletion, the number of observations naturally diminishes. The data set will in this case be *balanced*, i.e all entities will be observed for equally amount of time-period observation. The alternative when sorting raw data is to keep entities containing of missing observations, but only keep observations that is complete and available. In this case the data is characterised as *unbalanced* panel data (Brooks 2008). A balanced panel data set may defect the study if the remaining entities badly represent the data set as a whole. There are some issues with using unbalanced panel data. When using unbalanced panel data, one needs to note that the cause of the missing observations and the model itself may be endogenous (Dougherty 2011). As with other studies concerning capital structure, entities suffering from missing data points are fully removed (Alves & Francisco 2014; Adami et al. 2015; Titman & Wessels 1988).

The amount of missing data for the industrials as well as technology sector is presented below:



3.3 Variables

3.3.1 Stock Returns

Return to investors are generated through capital gains, that is the change in stock price from one time to another, plus the dividend paid over the time period in question. Total (simple) stock returns R_t includes dividends and is calculated as follows:

$$R_t = \frac{(p_t - p_{t-1}) + D}{p_{t-1}} \tag{5}$$

Where p is the price at point t in time and $t-1$ one period behind (Finance Formulas [WEB]).

Since dividend yield significantly affects total stock return it is reasonable to include it. If dividend yields are not taken into account, returns in many cases will be underestimated, especially when returns are measured over longer holding periods. In case some companies in the data set employs regular dividend payments while others dont, excluding dividend yield may also have the effect of distorting the data set and therefore results, favouring so called growth stocks over income stocks generally paying a high dividend yield (Brooks 2008). An alternative way to calculate total stock return is to use the formula (Finance Formulas [WEB]):

$$R_t = \text{Capital Gains } [\%] + \text{Dividend } [\%] \tag{6}$$

In this study total stock return is used as a proxy for firm performance. Total stock returns is based on figures from DataStream, function no. 6 is used for calculating this in the panel data.

3.3.2 Capital Structure

Capital structure, commonly known as leverage, can be measured as debt in relation to total assets (Titman & Wessels 1988; Rajan & Zingales 1995). In this study, book leverage figures will be used instead of market leverage figures, according to Barclay, Morellec & Smith Jr (2003) the book-leverage measure is better to use in financial regressions since using market-based figures for the independent variable might cause it to correlate spuriously with exogenous variables. Bowman on the other hand shows that the correlation between book value and market value of debt are large and significant, indicating that using one over the other does not really matter (Bowman 1980). The Reuters DataStream codes are `WC02999`, `WC03051`, `WC03251` and `WC03255` for total assets, short-term debt, long-term debt and total debt respectively. Note that total debt doesn't necessarily equal total liabilities, total debt represents all debt that is interest bearing plus capitalised obligations. Total liabilities on the other hand also include other types of liabilities, such as pension obligations etcetera (Thomas Reuters DataStream). Normally the debt ratio is measured as total liabilities over total assets (Finance Formulas [WEB]).

$$\text{Debt Ratio (Normal)} = \frac{\text{Total Liabilities}}{\text{Total Assets}} \tag{7}$$

However in this study three debt ratios will be used in separate regressions, total debt ratio, long-term debt ratio as well as short-term debt ratio. Short-term debt represents the proportion of total debt that are expiring in one year meanwhile long term debt is defined as interest bearing obligations of payments, excluding interest bearing payments expiring up to one year (Thomas Reuters DataStream). In their study of small to medium sized companies, Cassar & Holmes suggest that it is important to distinguish between long and short-term debt in the analysis. In particular for small and medium sized firms. Since this study includes small, medium and large companies it may be relevant to distinguish between the different measurements (Cassar & Holmes 2003).

3.3.3 Control Variables

In a regression model of only one dependent and one independent variable it is impossible to say if a relationship is true, even though correlation between them is high. To avoid this regression trap more explanatory variables, so called control variables are introduced and included in the regression model. A so called multiple regression model enables the researcher to distinguish between effects of the specific independent variables. In this way the variables adjust for each other's effects and eliminate unappreciated variables apparent effects (Dougherty 2011).

The explanatory variables in this study were found and chosen in accordance with earlier studies on the subject and are suggested to affect both a firm's leverage ratio and stock returns. The variables used are size, growth and market-to-book ratio. OMX30 total return index is used as an explanatory variable and proxy for general market movements. The regressions will be done separately for the industrial industry and the technology industry.

Size

Several studies suggest that capital structure to a certain extent correlates with firm size. According to Titman and Wessels (1988) costs of debt are larger for smaller firms, both in terms of bankruptcy and borrowing costs. This implies that smaller companies should have a smaller proportion of debt than larger firms. In contrast to their theoretical reasoning, Titman & Wessel (1988) and Rajan & Zingales (1995) find a negative relationship between size and leverage. However Cassar & Holmes (2003) find the relationship to be positive, but their evidence of this is weak.

Size is also an important control variable for a firms result since it effects capabilities, benefits from diversification, economies of scale and credibility (Chadha & Sharma 2015).

As in previous studies size is represented by the natural logarithm of sales since it reduces the amount of variation (Titman and Wessels 1988; Rajan & Zingales 1995; Cassar & Holmes 2003; Barclay, Morellec & Smith Jr 2003).

Growth

According to the pecking-order hypothesis, firms experiencing a relatively high growth should be more open to financing their activities with equity than debt. Hence high-growth firms are often leveraged to a lesser extent (Brealey, Myers & Allen 2011). Growth is defined as the annual sales growth, i.e (Cassar & Holmes 2003):

$$\text{Growth}_i = \frac{\text{Net Sales}_i - \text{Net Sales}_{i-1}}{\text{Net Sales}_{i-1}} \tag{8}$$

Titman and Wessel (1988) & Barclay, Morellec & Smith Jr (2003) are using profitability as a substitute for net sales growth. Their reasoning for not using both are to avoid multicolliniarity issues (see section 3.4.4 for further explanation).

Sales growth has a direct impact on a firm's profitability, therefore the growth variable is a very significant control variable in the regression itself (Chadha & Sharma 2015).

Market-to-Book

Market-to-book value is in this study used as a proxy for growth opportunities. Barclay, Morellec & Smith Jr (2003) use market-to-book as a proxy for growth options. Muradoglu & Sivaprasad (2012) use market-to-book-value to investigate if there is any relationship between leverage and stock returns (cumulative average abnormal returns). They conclude that stock returns are higher for firms having low debt ratios and low market-to-book ratio. Rajan & Zingales (1995) also suggest that the relationship between market-to-book ratio and leverage is negative due to costs for financial distress.

OMX30 Total Return Index

Since stock returns follow the general market to a certain extent a proxy for the market can be included in the regression. The regression model will probably have a higher explanatory power with such a measurement included. Usually, a domestic stock market index is used as proxy for the entire market (Vishwanath 2007). Since

Swedish stocks are the ones focused upon in this paper it was natural to choose a Swedish stock index (OMX30) as the market proxy measurement.

This proxy will be the OMX30 total return index. OMX Stockholm 30 is the leading index on Nasdaq OMX Stockholm's stock exchange and is based on market weighted prices of Nasdaq Stockholm's 30 most traded stocks. The OMX30 total return index is collected from DataStream (Thomas Reuters DataStream).

3.3.4 Industry Separation

Arditti (1967) proposes that risks are industry specific and therefore that the relationship between stock return and leverage should be regarded separately for separate industries. This study will follow Arditti's position regarding this and be divided by industries to take the eventual differences into account.

According to Hou & Robinson (2006) industry concentration, i.e. the degree of competetiveness in an industry, is an important determinating factor for stock returns. Firms in more competitive industries generally have higher returns than firms in less competetive (low-concentrated) industries due to competitive pressure and a higher risk of bankruptcy (Hou & Robinson 2006). Adami et al.'s (2015) findings suggest that industry concentration not affect the relationship between stock returns and leverage. Zeitun & Tian (2007) find oppositedly that their included variable for industry is statistically significant, which implies that industry has an effect on the relationship between stock returns and leverage.

3.4 Regression Model

3.4.1 Multiple Regression Model

This thesis will utilise a multiple regression model, an important statistical tool for empirical studies. A multiple regression model describes and evaluates the relationship between one dependent and a number of independent variables. In comparison to a simple correlation analysis, the regression methodology assumes the dependent variable to be random, in other words having a probability distribution. The independent variables however are assumed to be fixed. An analysis utilising multiple regression is more effective than doing a simple correlation analysis. Due to the fact that many independent variables can be included it is also a more flexible model. The general multiple regression model for panel data is (Brooks 2008):

$$y_{it} = a_0 + \beta_1 x_{it} + \beta_2 x_{it} + \beta_3 x_{it} + ... + \beta_n x_{it} + u_{it} \tag{9}$$

Where:

y =Dependent Variable
i =Observed Entity
t =Time Period
a =Intercept Term
β =Coefficient to be estimated on the explanatory Variables
x =Independent Variable
u =Disturbance Term

3.4.2 Choice of Model for Panel Data

There are several types of models available for panel data. The simplest one is the *pooled regression model*. In this model entities are stacked together so that one column contains all observations, both entities and time-series observations. In this way the panel data will be defined as a single equation and an ordinary least square regression (OLS) can be used to find a satisfactory equation. The drawback with the pooled regression is that it assumes that the averages of the variables and the relation between the variables are fixed over both time and entities. This assumption is often violated (Brooks 2008).

Another regression technique is to use the *fixed effects model*. A common form of *fixed effects model* is known as the *least square dummy variable model* or *LSDV* for short. In this model the disturbance terms are assumed to contain an individual specific effect that could vary over both cross-section and time-series observations. The formula is specified as follows:

$$u_{it} = \mu_i + v_{it} \tag{10}$$

Where u_{it} is the disturbance term, μ_i represents the individual specific effect and v_{it} captures what is left from the disturbance term. Here μ_i varies across entities but not time. The LSDV regression model is defined as:

$$y_{it} = \beta x_{it} + \mu_1 \mathrm{D1}_i + \mu_2 \mathrm{D2}_i + \mu_3 \mathrm{D3}_i + ... + \mu_N \mathrm{DN}_i + v_{it} \tag{11}$$

In which D is a dummy variables substituting for the entities. The regression is fixed in terms of the cross-section observations. The fixed effects could also be adapted to the time-series observations as a *time-fixed effects model* or as a *two-way model* where both cross-sectional and time period observations are defined as fixed. To investigate if a fixed-effect model or pooled OLS preferred, a *redundant fixed effects test* could be performed with Eviews (Brooks 2008). Unfortunately, the fixed effects model does not deal with heterogeneity. If the disturbance terms themselves are very scattered in terms of variance and thus demonstrate heterogeneity, a third type of model, the *random effects model*, may be a better fit than the *fixed effects model*. The *random effects model* provides a solution to the heterogeneity problem, it does however require that it is possible to treat all of the unobserved variables as randomly drawn and that they are distributed independently of all explanatory variables. If those condition aren't fulfilled the *fixed effects model* is to be preferred over the *random effects model* (Dougherty 2011). To determine which model is most suitable for estimating the equation a *Hausman test* could be performed with Eviews (Brooks 2008).

In this analysis, the pooled and random effects models have been discarded due to their bad fit. The *redundant fixed effects test* is significant meaning that the *fixed effect model* is preferred to a *pooled OLS*. On the other hand the *Hausman test* is insignificant and the *random effects model* is therefore not considered to be very appropriate. An alternative to the *fixed effect model* could possibly have been the *generalised least square model*, also called the *weighted least square model*. In this model however it is of great importance that the dataset is not defected by many outliers. To justify using this model, the outliers must be investigated carefully and handled correctly. Since it is difficult to define all outliers in panel data and since any data set (of this considerable size) contains at least a few outliers, the *weighted least square model* is also discarded for this thesis (Brooks 2008).

3.4.3 Regression Specification

The research questions of this study is defined as follows:

- "How are stock returns affected by capital structure in Swedish listed firms during 2006-2015?"
- "Does the observed relationship between capital structure and stock return vary between the industrial and the technology industry?"

The first research question is broken down to three sub-questions:

- "How does the total debt ratio affects stock returns?"
- "How does the long-term debt ratio affects stock returns?"
- "How does the short-term debt ratio affects stock returns?"

Three different regression models are going to be used. Control variables stay constant through all regressions while the debt variable varies between total debt ratio, long-term debt ratio and short-term debt ratio. The regression models are presented below. To take the industry effect into account the three regression models are applied to both the industrial industry and the technology industry. The reason that industry is not included as a dummy is that it is problematic in combination with the *fixed effects mode* l since it creates perfect multicollinearity between the dummy variables.

$$R_{it} = a_0 + \beta_1 \frac{\mathrm{TD}}{\mathrm{TA}}_{it} + \beta_2 \mathrm{S}_{it} + \beta_3 \mathrm{G}_{it} + \beta_4 \mathrm{MTB}_{it} + \beta_5 \mathrm{OMX}_{it} + \mathrm{C} + \mu_{it} \tag{12}$$

$$R_{it} = a_0 + \beta_1 \frac{\mathrm{LTD}}{\mathrm{TA}}_{it} + \beta_2 \mathrm{S}_{it} + \beta_3 \mathrm{G}_{it} + \beta_4 \mathrm{MTB}_{it} + \beta_5 \mathrm{OMX}_{it} + \mathrm{C} + \mu_{it} \tag{13}$$

$$R_{it} = a_0 + \beta_1 \frac{\mathrm{STD}}{\mathrm{TA}}_{it} + \beta_2 \mathrm{S}_{it} + \beta_3 \mathrm{G}_{it} + \beta_4 \mathrm{MTB}_{it} + \beta_5 \mathrm{OMX}_{it} + \mathrm{C} + \mu_{it} \tag{14}$$

$$\begin{aligned}
R &= \text{Total return} \\
\mathrm{TD/TA} &= \text{Total debt / total assets} \\
\mathrm{LTD/TA} &= \text{Long-term debt / total assets} \\
\mathrm{STD/TA} &= \text{Short-term debt / total assets} \\
\mathrm{S} &= \text{Size, natural logarithm of sales} \\
\mathrm{G} &= \text{Growth, quarterly change in sales} \\
\mathrm{MTB} &= \text{Market-to-book value} \\
\mathrm{OMX} &= \text{OMX total return index} \\
\mathrm{C} &= \text{Crisis, dummy for the financial crisis}
\end{aligned}$$

3.4.4 Significance Level

The significance level is a term describing the risk of there being a type 1 error in the data when not rejecting the null hypothesis. For example a significance level of 1% means that all values that are extreme will appear with a probability of 1%. The common level of significance is 5% but when using a financial data set containing a large amount of observations, this can cause problems since standard errors tend to decrease when using large data sets. In case using large financial data sets the better way might be to set a 1% significance level (Brooks 2008). In this study both 10%, 5% and 1% significance levels will be presented in the results.

3.4.5 Validity Tests

Robustness

In order to investigate if the regression models used are robust, i.e. not changing significantly when they are modified (White & Lu 2010) several checks and modifications have been made during the process. Control variables have been added and removed one by one in order to investigate if the estimated coefficients change. Several variables have also been tested as different proxies. The variables for growth has for example been tested both through the growth in net sales in line with Cassar & Holmes (2003) and by capital expenditures over total assets in line with Titman & Wessels (1988). The variable net sales growth were chosen due to the fact that figures for capital expenditures are more frequently missing. The potential control variable of non-debt tax-shields that Titman & Wessels (1988) use to explain capital structure is excluded since it does not fit well with the regression model. Tangibility, also used by Titman & Wessels (1988), is a proxy for asset structure and is also excluded since it weakens several results in the regression model, especially the r-squared values. Since the remaining coefficients does not change considerably in direction of dependency or in magnitude during the modification tests the regression model is estimated as robust, even though there a several pitfalls with this type of robustness check (White & Lu 2010).

The regression model is also tested for three different data sets: quarterly data, quarterly data with interpolated observations as well as annual data. The coefficients are similar in regards to direction of influence and magnitude with a few exceptions, which also is good reason for justifying the regression model.

Normal distribution

An important assumption for ordinary least squares regressions is that the data set is normally distributed. If it is not or contains many so called outliers, values that doesn't fit the distribution, the estimated coefficients of the regression model may be seriously damaged. Excluding outliers may therefore improve the estimations of the regression model. There are different ways to dealing with outliers. One method is to use a robust regression technique while another is to correct or delete outlying values (Russeeuw 1987).

When using panel data it is hard to detect outliers. One method is to plot the residuals in a histogram with Eviews (or your statistics tool of choice). If the residuals have the form of normally distributed varialbe but shows sign of skewness, the non-normality problem could be approached by excluding outliers causing skewness. This method however is not ideal when using panel data since it is seldom enough for detecting all outliers. Since there is little research on the subject regarding panel data, this method will be used even in this thesis. To keep the data set balanced, whole entities will be excluded (Brooks 2008).

A third solution for dealing with non normal data may be to include a dummy-variable. For financial data dummy-variables are often used for adjusting for so called extreme events. A financial crisis is a good example of such an event and justifies the use of a dummy variable (Brooks 2008). In this study, a dummy variable for crisis will be included to adjust for outliers during the time period of the financial crisis.

Near Multicollinearity

Near multicollinearity is when some of the explanatory variables in a multiple regression strongly correlate with each other. In case the multicollinearity is ignored the estimated coefficients may be somewhat erratic. The standard errors and the r-squared value will then normally be high and give the illusion that the test as a whole went well while the coefficients in actuality are not even significant. If the correlation between variables is small this issue could be ignored (Brooks 2008). According to Kennedy (2011) variables that have a correlation below the *absolute value* of 0.8 are valid. One simple method to detect multicollinearity is to calculate the correlations for all explanatory variables. Correlation matrixes will be presented in section 4.2.

Autocorrelation

An underlying assumption with regressions such as this is that the correlation between the residuals are zero. If they aren't the data suffers from autocorrelation, also called serial correlation. One way to detect autocorrelation is to use the *Durbin-Watson test* that tests for first order autocorrelation. The *Durbin-Watson test* practically investigates the relationship between an errors current and previous value. If the value of the *Durbin-Watson test*, is near 2, there is no clear evidence of autocorrelation in the disturbance terms. The value of zero is a sign of perfect positive autocorrelation while the value of 4 on the other hand perfect negative autocorrelation (Brooks 2008).

Heteroscedasticity

Anonther assumption needing to be fulfilled justifying the estimations of a regression model is that the variance of the standard errors is constant. This assumption is known as homoscedasticity and the opposite, where the variance of standard errors changes is called heteroscedasticity. If heteroscedasticity is ignored the coefficients will be unbiased but inefficient. Normally a *White test* or an equivalent test is used to investigate if the data suffers from heteroscedasticity (Brooks 2008). This solution however is not available for panel data. Eviews instead offers the solution to adjust for a robust estimation of heteroscedasticity with the *White diagonal function.* The *White diagonal function* is used in this study to adjust for heteroskedasticity (Eviews User's guide).

Model fit

The r-squared value is a measure that indicates how well the regression model fits. A higher r-square generally equals a better fit. The r-squared value is at the same time not really a key indicator of the model's success. Even if the r-square is low, the regression model could be adequate, as long as the estimated coefficients are statistically significant (Dougherty 2011).

4 Empirical Findings

The following chapter will present descriptive statistics, multicollinearity matrixes and regression results. These findings will be the foundation upon which analysis and conclusions are built later on.

4.1 Descriptive Statistics

The table below presents the data set for industrial companies after excluding outliers. Mean total stock return for industrial firms is 3% and the average and median growth per quarter 2%. The median ratio of total debt is 22%. This figure may seem low. Note that usually the total debt ratio will be calculated as total liabilities over total assets (Finance formulas [WEB]). Since total liabilities also includes other types of debt than total debt does, this ratio is naturally going to be higher. The average long-term debt ratio is 12% and the average short-term debt is 6%.

Table 3: Descriptive Statistics - Industrial Firms

	Return	$Size$	$Growth$	MTB	OMX	$\frac{TD}{TA}$	$\frac{LTD}{TA}$	$\frac{STD}{TA}$
Mean	0.03	13.90	0.02	3.71	139.68	0.22	0.14	0.08
Median	0.02	13.64	0.02	2.16	133.64	0.22	0.12	0.06
Max	1.35	18.17	2.09	101.08	240.51	1.01	0.8	0.78
Min	-0.7	6.54	-0.25	-10.53	75.9	0	0	0
Stdv	0.2	2.12	0.07	8.77	40.13	0.15	0.12	0.08

Next table presents the data set for technology firms likewise. The mean return for technology firms is 4% while the median is 2%, slightly higher than for industrial firms. On average technological firms grow by 2% per quarter which is surprising since it's not in line with the theoretical assumption that technology firms generally have higher growth than industrial firms (Brealey, Myers & Allen 2011). A reasonable explanation for this could be that some of the technology firms included in the sample are better characterized as mature companies than high-tech, high-growth companies. If one uses another proxy for growth one might reach different conclusions than this.

As could be observed, technology firms have a generally lower level of debt than industrial firms. This is in line with the theories presented in chapter 2, suggesting that technology firms are less indebted than their industrial brethren (Brealey, Myers & Allen 2011). The median ratio of total debt over total assets is only 9%, approximately half of what the median total debt ratio is for industrial firms. The median for both long-term debt ratio and short-term debt ratio are 2% in contrast to around 12% respectively 6% for industrial firms.

Table 4: Descriptive statistics - Technology Firms

	Return	$Size$	$Growth$	MTB	OMX	$\frac{TD}{TA}$	$\frac{LTD}{TA}$	$\frac{STD}{TA}$
Mean	0.04	12.72	0.02	3.39	139.68	0.13	0.08	0.05
Median	0.02	12.45	0.02	1.9	133.64	0.09	0.02	0.02
Max	1.26	17.94	0.34	112.09	240.51	0.79	0.44	0.71
Min	-0.62	8.3	-0.44	-86.13	75.9	0	0	0
Stdv	0.21	2.35	0.06	9.41	40.14	0.14	0.1	0.08

4.2 Near Multicollinearity

Like mentioned in section 3.4.4, a check againt *near multicollinearity* is performed to justify the use of the explanatory variables. In case two variables correlates with an absolute value of more than 0.8 one of the variables should be excluded (Kennedy 2011).

The table below is a correlation matrix for industrial firms. As could be observed, no correlation is higher than 0.8 and most of the correlations are quite low. The highest correlation could be observed between the dummy variable crisis and the OMX30 total return index, -0.54. Since it is below the critical value both variables are included in the regression model. There is a positive correlation of 0.27 between the long-term debt ratio and size as well as 0.22 for total debt ratio and size.

Table 5: Correlation Matrix - Industrial Sector

	$Size$	$Growth$	MTB	OMX	Crisis	$\frac{TD}{TA}$	$\frac{LTD}{TA}$	$\frac{STD}{TA}$
Size	1							
Growth	-0.146	1						
MTB	-0.1999	0.0393	1					
OMX	0.0456	0.0514	-0.0122	1				
Crisis	-0.0074	-0.1614	-0.0475	-0.5446	1			
TD/TA	0.2176	-0.0855	-0.1139	0.0069	0.0543	1		
LTD/TA	0.2778	-0.0545	-0.1732	0.0185	0.0436	N.A	1	
STD/TA	-0.0286	-0.0706	0.0554	-0.0143	0.0308	N.A	N.A	1

Below is a similar table for technology firms. As for industrial firms, no correlation exeeds the criticual value of 0.8. The highest correlation is, as for industrial firms, observed between the dummy variable crisis and the OMX30 total return index, -0.55. The correlation between long-term debt and size is 0.4 and that between the short-term debt ratio and market-to-book 0.23.

Table 6: Correlation Matrix - Technology Sector

	Size	*Growth*	*MTB*	*OMX*	Crisis	$\frac{TD}{TA}$	$\frac{LTD}{TA}$	$\frac{STD}{TA}$
Size	1							
Growth	-0.1511	1						
MTB	-0.123	0.1464	1					
OMX30	0.0549	0.0034	-0.0344	1				
Crisis	-0.0134	0.0337	0.0649	-0.5461	1			
TD/TA	0.1787	0.0298	0.0751	-0.0099	0.0058	1		
LTD/TA	0.4023	0.0372	-0.0661	0.0247	-0.0335	N.A	1	
STD/TA	-0.1428	0.0187	0.2325	0.0004	0.0097	N.A	N.A	1

4.3 Regression Results

In the following tables, the statistical regression results are presented for both industrial firms and technology firms. The denotations of: *, ** or *** represents the 10%, 5% and 1% significance levels. The upper figure for every variable is the estimated coefficient. If the figure is negative for a variable, the variable and stock returns are negatively correlated. The figure below the estimated coefficient denotes the p-value for each variable and constitutes the basis for the significance level.

4.3.1 Industrial Firms

Debt Ratios

As can be observed in the table below, total debt and short-term debt correlate negatively with stock return at a 1% significance level. The estimated coefficient for total debt is -0.1446 and -0.3181 for short-term debt, indicating that short-term debt ratio has a greater negative impact on stock returns than the total debt ratio. Long-term debt ratio also correlates negatively with stock return, but the result is statistically insignificant.

Firm Specific Control Variables

Size has a negative impact on stock returns and is a reasonably good explanatory variable since the statistical significance is high in all of the three regressions. Growth estimates on the other hand are insignificant. The market-to-book estimates are significant at a lower level and suggest that there is a small yet positive correlation between market-to-book and stock returns.

Market Based Control Variables

As was observed above in the correlation matrix, the correlation between OMX30 total return index and the crisis dummy variable was quite high. This could have an impact on the estimated coefficients (Brooks 2008). The estimated coefficient for the OMX30 is significant but very small, suggesting that the there is only a very small positive correlation between stock returns and the total market return. The crisis dummy has as expected a negative effect on stock returns but the estimated coefficient is insignificant. It may be that the high correlation between the crisis dummy variable and OMX30 is a reasonable explanation for the low significance.

Other Comments

The r-squared value of 0.06 suggests that the regression model explains a mere 6% of stock returns. As stated in section 3.4.5 Validity tests, a low r-squared value does not automatically mean that the regression model is inadequate as long as the results are statistically significant (Dougherty 2011). The Durbin Watson-test figures lies is in the range 1.93-1.94 and suggest that the data suffers very slightly from autocorrelation (Brooks 2008).

Table 7: Regression Results - Industrial Sector

	TD		LTD		STD	
TD/LTD/STD	-0.1446	***	-0.0295		-0.3181	***
	0.0099		0.6319		0.001	
SIZE	-0.0474	***	-0.0524	***	-0.0528	***
	0.0056		0.0023		0.0018	
Growth	0.077		0.0833		0.0722	
	0.1709		0.1396		0.1962	
Market-To-Book	0.0033	*	0.0032	**	0.0034	**
	0.0258		0.0342		0.0168	
OMX30	0.0006	***	0.0001	***	0.0005	***
	0		0		0	
Crisis	-0.0184		-0.0214	*	-0.0199	
	0.1472		0.092		0.1176	
Number of observations	2623		2623		2623	
Cross section	66		66		66	
Time periods	40		40		40	
R-squared	0.06		0.06		0.06	
Durbin Watson	1.93		1.93		1.94	

4.3.2 Technology Firms

Debt Ratios

As for industrial firms the estimated coefficients of all debt ratios are negative. The p-values indicate that the coefficient for the short-term debt ratio and total debt ratio is significant. The coefficient for the short-term debt ratio of -0.5126 is significant at a 1% significance level while the coefficient for the total debt ratio -0.1968 is only significant at a 6% level. As for industrial firms the estimated coefficient for the long-term debt ratio is insignificant.

Firm Specific Control Variables

As for industrial firms the size variable has a negative impact on stock returns. In this case it is only significant regarding short-term debt ratio. In contrast to industrial firms the estimated coefficients for growth is highly significant and indicates that there is quite a high positive correlation between growth and stock returns for technology firms. The market-to-book estimates are insignificant for all three tests.

Market Based Control Variables

The estimated coefficients for the OMX30 Index is significant but very low as for industrial firms and suggests that the there is only a very small positive correlation between stock returns and the total market return. The estimated coefficients of crisis are negative and insignificant. Since the correlation between OMX30 total return index and the crisis dummy variable is quite high also for technology firms it is reasonable to believe that estimated coefficients for OMX30 and the crisis dummy may be distorted to a certain extent (Brooks 2008).

Other Comments

The r-squared values lie in the range 0.06-0.07 and suggest that the regression model of stock return is explained by between 6-7%. As suggested above, a low r-squared value does not automatically mean that the regression model is inadequate as long as the results are significant (Dougherty 2011). The Durbin Watson-test is in the range 2.12-2.14, suggesting that the data does not suffer from much autocorrelation (Brooks 2008).

Table 8: Regression Results - Technology Sector

	TD		LTD		STD	
TD/LTD/STD	-0.1968	*	-0.0508		-0.5126	**
	0.0594		0.7123		0.012	
SIZE	-0.0388	*	-0.0339		-0.0427	**
	0.0593		0.1228		0.033	
Growth	0.4833	***	0.4889	***	0.4717	***
	0		0		0	
Market-To-Book	0		0.0002		-0.0003	
	0.976		0.7955		0.7329	
OMX30	0.0007	***	0.0006	***	0.0007	***
	0.0007		0.0009		0.0004	
Crisis	-0.0116		-0.0131		-0.0090	
	0.5582		0.5109		0.6469	
Number of observations	1199		1199		1199	
Cross section	30		30		30	
Time periods	40		40		40	
R-squared	0.07		0.06		0.07	
Durbin Watson	2.12		2.12		2.14	

5 Analysis & Discussion

Here the empirical results will be analysed in the context of theories and previous empirical findings that were presented in chapter 2. The purpose of the chapter is to tie things up and give the reader a clear picture of how this study's results relates to previous results.

5.1 Stock Returns and Capital Structure

5.1.1 Total Debt Ratio

The regression results suggest that there is a negative relationship between total debt ratio and stock returns. H_0: "That total debt-to-total assets ratio will not affect stock returns significantly" is thus rejected. The results for industrial firms are significant at a 1% level but only at a 6% significance level for technology firms. These results are in line with a majority of previous empirical studies on the subject (Arditti 1967; Hall & Weiss 1967; Adami et al. 2015; Penman, Richardson & Tuna 2007; Acheampong, Agalega & Shibu 2013; Muradoglu & Sivaprasad 2012; George & Hwang 2009). Hamada (1969), Masulis (1983) and Bhandari (1988) however came to the conclusion that leverage and stock returns correlate positively.

The results are inconsistent with the majority of accepted theories such as the Modigliani & Miller theorem, the trade-off theory and the pecking order hypothesis. The Modigliani & Miller theorem suggests that firms that have a large amount of debt also should have high return due to the risk that comes with being leveraged. The trade-off theory suggests that this is the case at least up to a certain level of debt, the optimal debt level. A firm with a lower debt ratio should in accordancewith this generate a lower return (Brealey, Myers & Allen 2011).

The results on the other hand are consistent with the market timing theory. Which is if one recalls, that stock returns are supposed to correlate negatively with leverage since managers tend to act irrationally and lower the debt ratio in times when the stock price is high (Brealey, Myers & Allen 2011). Several studies have demonstrated that the market timing theory holds in reality. Masulis & Korwar (1986), Asquith and Mullins (1986) as well as Hovakimian, Hovakimian and Tehranian (2004) demonstrate that equity is issued more often in times when the stock price is high, suggesting that the stock price is high when the debt ratio is low and as such correlates negatively with leverage.

Adami et al. (2015) and Penman, Richardson & Tuna (2007) were expecting a positive relationship between stock returns and leverage due to the higher risk leverage generates but observed the opposite. Adami et al. suggested that the opposite results best are explained by investors preferring to invest with firms who are financially flexible and hence earn higher returns when doing so. Penman, Richardson & Tuna (2007) instead suggest that the unexpected relationship appears due to some of the following reasons: 1) there are measurements errors in the leverage figures, 2) omittance risk factors negatively affect leverage or 3) the market generally misprices leverage. George & Hwang (2009) suggest that the negative relationship is observed due to the fact that investors may be compensated for other types of risks than leverage risk.

Summary

The market timing theory and a few empirical studies satisfactorily explain the negative relationship observed between stock returns and leverage. According to the market timing theory leverage might negatively influence stock returns since firm managers time the market, lowering debt ratios via issuing more equity in times when their respective stock prices are high.

Investors oddly enough seems to not be compensated for the additional risk that higher leverage ratios supposedly entail. The reason may be that the market generally misprices leverage or that investors preferences for high-leverage-stocks are lower and that these therefore yield lower returns due to the lower demand. A third option for explaining the phenomena is that the higher observed stock returns for less leveraged firms could be compensation for investors for taking on other types of risks.

The relationship could further be explained by leverage figures suffering from measurement errors or that some control variables distort the results. Since different empirical studies define leverage differently and use different methodologies for investigating its potential effect on stock returns the results may differ somewhat.

5.1.2 Short-term and Long-term Debt Ratios

The estimated coefficients for both the long-term and short-term debt ratios are negative for both industries. They are however only statistically significant for the short-term debt ratios. These results contradict those of Gill, Biger & Mathur (2011) and Yazdanfar & Öhman (2015) that suggest short-term and long-term debt ratios yield the same results. It has however been argued that long-term and short-term debt should be investigated separately (Örtqvist 2006; Hall, Hutchinson & Michaelas 2000). The results of this study suggest that long-term and short-term debt ratios fare better by being separated since they yield different results.

The insignificant estimated coefficients for the long-term debt ratios suggest that there is no clear relationship between stock returns and long-term debt. H_0: "The long-term debt ratio will not affect stock returns significantly" could thereby not be rejected.

H_0: "The short-term debt ratio will not affect stock returns significantly" is on the other hand rejected since the estimated coefficients for short-term debt ratios are statistically significant at a 1% significance level.

5.2 Industry

The results suggests that the relationship between stock returns and leverage doesn't differ between industrial and technology firms. The relationship is as stated in section 4.3 negative both for total and short-term debt while insignificant regarding long-term debt. The estimated coefficient of the total debt ratio for technology firms is not as significant as for industrial firms and the short-term debt ratio is more negatively correlated to stock returns for technology firms. H_0: "The impact of leverage on stock return vary between industries" is therefore rejected. As pointed out in section 4.1, the theoretical assumption that technology firms should exhibit higher growth is not confirmed. This could possibly effect the regression results. If many firms in the technology industry are characterised as mature firms rather than high-tech, high-growth firms, there will practically be no industry effect in the data. It might also be possible that an industry effect had been observed if more industries had been included in the study.

These results contradicts Zeitun & Tian's (2007). They come to the conclusion that their industry dummy variable is significant. The are however similar to Adami et al.'s conclusions (2015) which suggest that industry concentration doesn't have any significant effect on the relationship between stock returns and leverage.

Control Variables

As could be observed in table 7 & 8 the significant explanatory variables are not the same for technology firms as for industrial firms. It seems that growth is a decent explanatory variable for technology firms, while not working well for industrial firms. On the ohter hand size seems to be a good explanatory variable for industrial firms but not as good for technology firms. These results suggest that the regression might have been better fitted if the growth variable was excluded for industrial firms and the size variable was excluded for technology firms. These regression tests however weren't performed since their results woulde been difficult to compare since they would've been based on different sets of variables.

6 Conclusion

The concluding chapter attempts to reconnect with the research questions and present conclusions drawn from the study. Ending with an explanation of the limitations involved and presenting suggestions for further research on the subject.

6.1 General Thoughts

The purpose of this study was to investigate if there is a relationship between stock returns and capital structure for Swedish firms listed on the Nasdaq OMX Stockholm stock exchange. The goal was to contribute with new research on a previously well discussed and researched subject on which former researchers results are inconclusive. The study also investigated if the relationship between stock returns and capital structure differs between the industrial and technology industries. Swedish panel data was used in three different multiple regression models for each industry to distinguish between different types of debt ratios.

The results indicate that there is a negative relationship between leverage and stock returns, suggesting that investors are not compensated for the leverage risk. These results contradict accepted theories such as the Modigliani & Miller theorem, the trade-off theory and the pecking- order hypothesis and question the common understanding of capital structure. The results however are in line with the market timing theory. Previous researchers such as Adami et al. (2015) and Penman, Richardson & Tuna (2007) have come to the same conclusion, suggesting that stock return correlates negatively with leverage. There are no significant observed differences in the results between the industrial and technology industry.

Though there are interesting significancies regarding the question of whether on deal with long or short term debt ratio. According to these results one should divide short term and long term debt separately. There might be - and there most certainly is - more to investigate and observe regarding short-term, total debt ratio difference since their results differ so significantly. Short term debt ratio has a greater negative effect on stock return than total debt ratio (and by that reasoning also long term debt ratios).

6.2 Limitations

Since results of previous empirical studies in some cases are contradictory it is difficult to say what is actually correct. The conflicting results may come about due to differences in methodologies and definitions regarding stock return and leverage. Additionally there are risks such as the relationship between stock returns and capital structure suffers from a reversed association problem. The reversed association problem is present if capital structure affects stock returns at the same time as stock returns affect capital structure.

Results may also be contradictory due to different samples. Since this study is limited to using Swedish data and not is taking any country or cultural effect into account, it is difficult to say if the results are applicable to other countries. It is however reasonable to believe that they could be applicable to countries that are similar to Sweden in term of business climate and culture. This argument is strengthened by the fact that financing decisions to a large extent are based on international norms.

The results show that there is no direct industry effect on the relationship between stock returns and capital structure. Since the study is limited to investigating only the industrial and technology industries this conclusion is rather weak. More industries would be preferable to investigate to be able to answer this question with a greater degree of certainty.

6.3 Future Research

Since capital structure is a factor concerning and influencing all firms, it will certainly always be an interesting topic to discuss and investigate. A way to dig deeper into the subject is to do similar regressions with other variables. In this study debt to total asset was used as a proxy for capital structure. Another ratio that also is commonly used is the debt to equity ratio. It could be interesting to perform regressions with other explanatory variables. Since there is a large amount of pervious studies on the subject there is also a large amount of control variables that have been tested and that could be tested again on other data or in other combinations.

Few studies that have investigated the relationship between firm performance and capital structure have used stock return as dependent variable. The majority have instead used book value measurements such as return on equity or return on assets. The majority of studies using stock return as dependent variable have also often used the expected stock return and CAPM as computation model of the variable. This study is conducted for actual stock returns and a suggestion for future studies would be to further investigate this variable in relation to capital structure.

In addition, many of the performed studies on the relationship are now old and not performed with panel data. A suggestion for further research is therefore to perform similar studies on more current data with more accurate methods. This may contribute to a better understanding of todays relationship between stock return and capital structure.

Furthermore, previous studies are limited regarding distinguishing between short-term and long-term debt ratios. In line with Örtqvist (2006) the results of this study suggests that is important to distinguish between different types of debt ratios. A suggestion for future studies would therefore be to look deeper into this problematic area regarding capital structure.

As mentioned above this thesis is limited to investigating the industrial and technology industries. To be able to better explain if industry has an effect on the relationship between stock returns and capital structure more industries could be included in the investigation, perhaps in another part of the world or when more data is readily avaliable?

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