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Rethinking the Balance Sheet

How to compose the balance sheet to improve firm performance

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Abstract

Title	Rethinking the balance sheet
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Authors	Victor Estwall, Hugo Oftedal and Andreas Åström
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Keywords	Return on assets, firm performance, corporate finance, regression analysis, balance-sheet compositions
Purpose	The aim of this study is to investigate what firm specific variables affect return on assets during a time of economic recession. The study also aims to analyze potential differences in these variables between firms in the industrial and technology sector.
Methodology	The methodology chosen in this study is of a quantitative and deductive nature, adopted to answer the research questions. Two regression models have been formed to show the relationship between the return on assets and the variables, as well as sectorial differences.
Theoretical perspectives	The theoretical framework of this paper consists of previous research on the variables presented including the main theories on capital structure.
Empirical results	This paper's empirical findings are based on historical data from 42 companies in the industrial and technology sector. The data collected covers a period of six years, yielding 252 observations.
Conclusions	This study finds several significant variables that affect return on assets, both contradicting and building on previous research. The findings underline the importance for companies to locate and follow its value creating core operations during times of economic recession. Further on, firms of the two sectors did show differing effects of variables. The findings also contribute to the existent literature in that it introduces a non-linear effect on all variables, and strengthens the basis for analysis in the paper.

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Chapter 1 Introduction

In the first chapter the background to the study is presented in order to actuate the area of study. By affirming the relevance of the study the problem is presented and formalized into research questions and lastly the objectives and limitations to the research are presented.

1.1 Background

The opportunity for companies to efficiently manage their composition of assets, debt and equity is today greater than ever with new hybrid forms of funding being introduced and greater reach to global financial markets. The rationale behind trying to find the optimal balance sheet structure is the belief that it greatly affects the company's performance and firm value, which motivates the great amount of research that has been done in the area. This makes it highly justifiable to spend large resources and attention to obtain the, to the extent to which it is possible, most beneficial structure, both for company leaders and investors (Ogden, Jen, & O'Connor, 2003). Traditionally this has been a large issue for managers which can explain the extensive research that has been conducted on the subject. However, there has been a shift in interest during the last two-three decades where both firms and academics have been exploring new ways to add value to companies and its investors. To understand theories on capital structure is necessary in order to understand and capitalize on the implications that balance sheet compositions can have on firm performance.

Even though the scope of this study is not to specifically and solely examine the relationship between capital structure and firm performance, it is important to understand that earlier studies and the applied theories in this study are to some extent influenced by the same main theories; the irrelevance theorem by Modigliani and Miller, the pecking order theory and the trade-off theory. The former argues that with perfect market conditions (no taxes, no transaction costs, no financial distress costs and no information asymmetries) there is no preferable leverage ratio (Modigliani & Miller, 1958). The pecking order theory, published by Myers and Majluf, relaxed the assumption of information asymmetries whereas the trade-off theory explains the issue in a world with both financial distress costs and taxes (Myers & Majluf, 1984; Myers, 1984). Even though vast amounts of research has been based on these theories, and their proven relevance, there is yet no theory that fully depicts the complex relationship between a company's performance and its capital structure. However these three theories form a comprehensive background on which further theories can be based.

The motivation to find the optimal capital structure is to reach the highest possible return and value given a certain amount of resources, investment opportunities and similar conditions. During the most recent decenniums there has been a shift in the way that companies create value and achieve competitive advantages. Capital-intensive production processes are becoming relatively less important whereas intangible assets have increased in relevance, which could be indicated by considerably higher market to book ratios over the last two decades (Eustace, 2001). Investors and company leaders alike are aware of the many problems that occur when attempting to value intangibles seeing as they are hard to identify and cannot be easily measured. The publication IAS 38 from IFRS in 2004 attempted to solve some of these problems. It affected companies from the fiscal year of 2005 and onward within the EU, with the main implications surrounding accounting procedures regarding intangible assets. Following the publication, companies could follow more precise requirements regarding recognition and amortization of these assets (Deloitte, 2015). Even though comprehensive guidelines have been introduced, intangible assets remain a debated subject in the economy today. The increased occurrence and importance of intangibles in firms' balance sheets signals the value of estimating their contribution to performance relative other items in the balance sheet. It also underlines the necessity for companies to understand and evaluate the key value drivers of all their assets in order to reach a more efficient use of employed assets.

The tendencies on the Swedish market have since the 1990's been evident. In the end of this period Sweden was the country that displayed the biggest difference, compared to the previous decade, in business expenditures on R&D and was also among the top countries regarding productivity improvement (Eustace, 2001). This comparison to the other OECD countries raises the interest in whether this phenomenon still exists and if the Swedish companies have maintained these high levels. Eustace (2001) further recognizes that "... the capacity to combine external and internal sources of knowledge to exploit commercial opportunities has become a distinctive competency." He also argues that the changes seen are not only applicable to service- and internet enterprises but also that more traditional sectors such as non-service industries and new growth companies are probable to see large effects from this (Eustace, 2001). Therefore it is relevant for present studies to evaluate whether these sectors have enjoyed the above-mentioned effects and whether intangible assets might be of importance to firm performance.

1.2 Problem statement

The large extent to which research has touched on the capital structure issue would have you believe that rather distinct results have been reached. However there is still much contradiction among researchers and there has been few recent advancements made (Baker & Martin, 2011). As presented above the most central theories are all based on some sort of assumption, which of course limits their applicability but also leaves room for speculation. Speculations in form of how firms should compose their balance sheet has, to the knowledge of the authors, mostly concerned the ratio of equity and debt rather than involving the assets. With assets composing an equally large part of the firm, a deeper understanding of this part of the balance sheet and how different types of assets can enhance companies' efficiency and profitability.

The previous research on how firms can relate their performance to their asset structure has left much to ask for. Bertmar and Molin (1977) conducted a comprehensive investigation as to how different financial measures could be related to capital structure, asset structure, growth rates and similar firm specific proportions. They look at the period from 1966-1972 which they motivate in that it captures years of both normal conditions and conditions characterized by economic recession. Their results are of varied magnitude and when investigating whether the ratio of material assets relative to total assets and current assets to total assets they cannot find significant implications as to whether these proportions have changed. Except for this, little research has been done on the subject for Swedish companies and little has been done to improve the ability to connect this to the performance of the firm. With this background, it becomes interesting to expand their research in the sense of looking at how a financial crisis, or a state of recession if you will, affect how companies compose their assets and how they can increase their return on these.

The recent crisis was to a large extent caused by the distorted and wrongly structured balance sheets of large companies and institutions, greatly affecting the magnitude of the crisis (Baker & Martin, 2011). Professor Didier Cossin (2009) recognizes that one way of reducing the risk the company is exposed to can be to return to the core business. During the financial crisis many companies reduced their investments (Kahle & Stulz, 2012) which could be a sign, among other indications, of companies turning to their core processes rather than expanding their scope of business. The increased operational risk that companies are exposed to during times of crisis, characterized by lower demand and tighter economic conditions, also increases the need for operational efficiency. To realize which assets are key drivers to a company's potential return is therefore of great importance. In order to add to previous research and to encourage more extensive research, this study will acknowledge these matters and analyze their implications.

Moreover research has not been focusing on the matter if certain key drivers do affect the company's result as much as one might think, whereas the focus has mainly been on capital structure. Even more so research has not in great detail acknowledged potential non-linear effects and how certain amounts of assets, or ratios, affect the firm differently. Apart from examining if there are any certain assets driving company performance this study aims to examine if there is an existing non-linear effect and how this might affect the firms' choice of asset composition. Thereby the purpose of this study is to link and add to earlier research by examining if there exists an optimal balance sheet composure given a certain industry.

1.3 Research questions

In order to respond to the discussion above and to examine whether companies through their asset structure and balance sheet formation can affect their return on total assets the following questions have been outlined:

- How does firm specific variables affect a firm's return on assets during a time of economic recession?
- Are there any significant differences between industrial and technology firms regarding the presented variables and their effect on return on assets?

1.4 Purpose/Aim and objectives

With the aim of assessing variables that affect return on assets, the purpose of this study will be to evaluate eight variables and see whether they affect the return on assets and in which direction this relationship goes as well examine whether there are any non-linear effects in the relationship between the variables and ROA. The objectives, aside from bringing forward the results, will be to analyze and present interpretations that further deepens the understanding and knowledge of why the presented relationships occur and examine the relevance of the given variables when explaining company and industry performance.

Additionally, based on a sample of 42 companies with 21 being industrials and 21 being technological firms all listed on the Nasdaq OMXS, the study will see whether there are any distinctions between these types of industries during the years 2007-2012.

1.5 Scope and limitations

This study hopes to provide insights as to how the different sectors could reach higher return on asset during a time of economic recession and if the outcome can provide any distinct guidelines for managers and corporations alike. In order to capture this the period of 2007-2012 has been used in gathering of data and as neither the return on asset nor many of the variables used can be considered as being stable over time, panel data has been used.

The 21 companies that have been chosen from each sector with the selection criteria that the company had to have been listed during the entire period, after which the 21 largest based upon their market capitalization on 27-03-2015 was included. This gives a total sample of 252 observations. Given the choice of exchange and the two sectors, the number of observations has been somewhat limited and thereby also the potential generalizations from the results.

1.6 Target audience

To further deepen the knowledge in what the key drivers for positive returns are this study aims to target academics, professors, students and others interested mostly in the field of corporate finance. Also private investors and to some extent managers and decision makers involved in the chosen sectors can take interest in the results of the study.

1.7 Disposition

Chapter	Title	Content
2	Literature review	In this chapter the underlining theories relevant to the area of research will be presented. As the most central theories have been presented a brief review of current research will be presented where the relevance of the field of study is brought forward.
3	Research design	This section will start with describing how the research will be conducted after which the motivation of how and why the current sample has been chosen. The data collection process will then be elaborated upon, followed by a presentation of the statistical method chosen, outlining the variables used in the regression and the hypotheses. Some critics and areas of interest to the choice of method will finish the chapter.
4	Results	The results generated from the regressions and statistical tests will be presented both for each individual variable and as one component.
5	Analysis	In this part the authors will compare the results presented in the previous chapter to the hypothesis posed in the methodological section. This will be put into perspective by a discussion of the underlying assumptions and the implementations of the results.
6	Concluding remarks	The authors will present their reflections related to the study and conclude by suggesting where future research can add value to the subject.

Chapter 2 Literature review

This chapter will provide a comprehensive literature review in order to set a framework for this study. The theories and research presented have contributed to the selection and formulation of the variables and also allowed for expectations to be formed. In the end of the chapter, a summary of the more central theories and studies is presented and is to enhance the overview of the fundaments of this paper.

2.1 Fundamental Theories

2.1.1 Capital structure

A fundamental aspect of corporate finance is how a firm should finance its operations and what mix of equity and debt is preferable, in other words the firm's capital structure. The subject has been debated for decades, where the paper by Franco Modigliani and Merton Miller in 1958 surprised researchers at the time. Further theories will be described in order to set a framework for our research and hopefully give the reader some insight to the implications and complexities of capital structure and its effect on firm performance. There are three theories that are in the center of this issue, all of which have been the basis for more recent research, which makes it important to understand these theories in order to be able to fully capture the implications of modern research. Furthermore much of the modern research adopt the approach used by Modigliani and Miller when analyzing other aspects of firm value and performance.

2.1.2 Modigliani-Miller

The original publication by Modigliani and Miller was surprising in the sense that they claimed that a company's capital structure did not affect the value of the company. The common view at the time was instead that increased leverage would lead to a higher value for the company, even with perfect capital markets (Berk & DeMarzo, 2014). Modigliani and Miller proposed in their paper that rational investors would demand compensation for an increased level of leverage in form of a higher expected return. The increase in value when adding debt to the capital structure is then completely offset by a higher expected return on equity, making it irrelevant what kind of capital structure the firm chooses (Modigliani & Miller, 1958). In order to fully understand how Modigliani and Miller reached this conclusion, one must look at the underlying assumptions. In their paper they assumed three conditions constituting the concept of perfect capital markets:

1. There are no taxes or transaction/issuance costs when trading securities.
2. The financing decision does not affect the cash flow from investments of firms, and they do not reveal new information concerning the cash flows.
3. Securities trade at competitive market prices that reflect the present value of cash flows.

These assumptions lead to the conclusion referred to as MM Proposition I, that a firms' total value is not affected by its capital structure. From this standpoint, the two researchers derived Proposition II, which stated that the cost of capital with leverage increased with the firm's debt-equity ratio. The intuitive consequence of Proposition I and II is that a firm can increase profitability with a higher level of leverage, but that increase is exactly offset by the rise in cost of capital leading to the value of the firm remaining constant. Modigliani and Miller (1963) later revised their initial conclusion that the value of the firm is not affected by its capital structure. Since interest expenses on debt are deductible, they create a tax shield that the firm can benefit from. The presence of debt then creates a tax shield that increases the value of the firm as the debt-equity rises. To maximize firm value, a firm should then maximize its level of leverage. As it would stand, this conclusion would come under debate by future research.

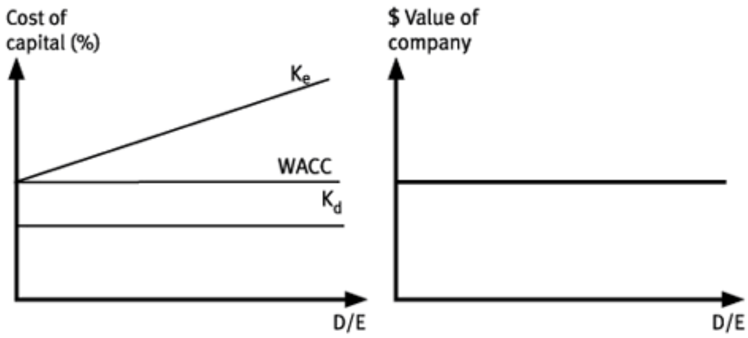

Figure 1. Explaining the Modigliani and Miller proposition I. K_e means the cost of equity, WACC is the Weighted Average Cost of Capital and K_d is the cost of debt.

2.1.3 The tradeoff theory

Kraus and Litzenberger (1973) put forth a theory on capital structure that has been highly influential since its publication, known as the trade-off theory. The study continues on the revision proposed by Modigliani and Miller in 1963, but adds the existence of bankruptcy costs to the mixture. When a firm cannot meet its debt obligations, it is forced into bankruptcy. In a perfect market the risk of bankruptcy is in itself a disadvantage of debt, since bankruptcy simply shifts the ownership of the firms' assets from equity holders to debt owners. But relaxing the assumption of perfect markets yield both direct and indirect costs associated with bankruptcy, also known as financial distress costs. Introducing financial distress costs leads to the intuition that a firm reaches a level of leverage where it must trade the benefits of the tax shield against the costs incurred from a potential bankruptcy. The value of a levered firm then becomes the value of a firm without leverage plus the present value of the tax shield, less the present value of bankruptcy costs. In order to maximize the market value of the firm, leverage will be adjusted so that the marginal profit from the tax shield equals the marginal loss incurred from bankruptcy costs. This equilibrium is referred to as the firm's optimal capital structure, and it is important to note that it differs from firm to firm due to different bankruptcy costs and other heterogeneous aspects. This theory brings forward an important aspect of choosing levels and compositions of other assets as well, not only capital structure. The idea of looking at non-linear relationships and not only linear ones, affect much of the analysis on the issue as it deepens the understanding and comprehensibility of how the specific variable might affect the firm.

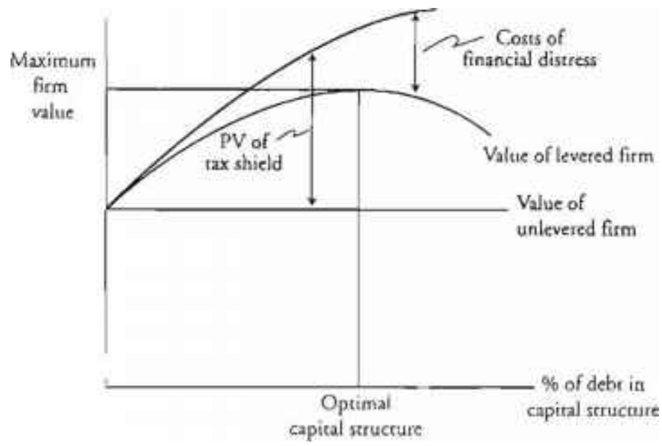

Figure 2. The trade off theory with an optimal capital structure

2.1.4 The Pecking Order theory

The pecking order theory presented by Myers (1984) is often put in contrast to the trade-off theory discussed above. Deviating from the trade off theory where the financing decision is a search for a predetermined debt-equity ratio, referred to as its optimal capital structure, this theory suggests that the firm prefers internal to external financing and debt before equity if the firm needs to issue new securities. In the pecking order theory there does not exist a target debt-equity ratio, compared to the trade-off theory. The pecking order does not attempt, and should not be used, to explain everything concerning capital structure. As Myers puts it: "There are plenty of examples of firms issuing stock when they could issue investment-grade debt." (p.582) Instead the pecking order explains how firms act when funding new investments, and the costs associated with each type of financing. This is why internal financing, according the Myers (1984), is preferred over external, and debt over equity, since the required cost of capital is higher for external financing and especially equity.

2.2 Previous research of tested variables

2.2.1 Dependent variable - Return on assets (ROA)

There are numerous ways to measure and evaluate firm performance, both by looking at absolute values from income statement entries such as EBIT(DA), net income, revenue etc or by looking at ratios. The most commonly used accounting based ratios are return on equity (ROE), return on assets (ROA), return on investment (ROI) and return on sales (ROS) (Alibadi, Dorestani, & Balsara, 2013). Even though the distinctions between these are clear, the rationale of choosing one over the other as an indicator of performance and profitability might not be as evident. The motivation as to why ratios are more widely used is their increased comparability since absolute line items are not sufficient to conduct a comprehensive comparison (Alibadi, Dorestani, & Balsara, 2013). Also important to take into consideration is the use of market measures such as the share price, stock returns, the market to book ratio and Tobin's Q. To a large extent, these measures encapsulate the markets', arguably irrational, expectations of future performance and also have a greater number (and in this study irrelevant) variables affecting the outcome. Additional reason to use accounting based ratios over market measures is to follow the aim of this study which is to specify firm or industry specific aspects rather than macro economical tendencies. To capture the unsystematic and hence more specific variations can be accomplished to a larger degree by using accounting based measures rather than market-based measurements as the latter tend to reflect more systematic trends and response rather to unexpected changes than projected ones (McGuire, Sundgren, & Schneeweis, 1988). Although disadvantages exist when using accounting based measures such as the lack of risk adjustments, the exposure to managerial manipulation and the disregard to the cost of capital, these measures estimate performance in a superior way than the market based measures. (Alibadi, Dorestani, & Balsara, 2013)

By evaluating the above-mentioned ratios the apparent choice would be using the return on asset seeing as it aligns with the purpose of the study. However there are other rationales for using ROA over ROE.[1] ROE is based on the formula of:

Return on equity (ROE) = Net income/Average Stockholder's equity

Whereas ROA is computed by:

Return on assets (ROA) = Net profit/Average Total assets

Except from the apparent difference in the numerator, ROE is commonly used to compare companies within the same industries whereas it is not as applicable when comparing companies across sectors or countries. This is because the numerator puts a lot of importance to the capital structure and it is commonly acknowledged that different types of industries have different balance sheet compositions. This makes some industries more likely and suitable to have a relatively larger or smaller debt to equity ratio (Berk & DeMarzo, 2014) and hence, comparing ROE:s of different industries can be misleading and inaccurate. ROA as a measure can also experience the same sorts of concerns when juxtaposing results from different types of businesses, however this study will look at the drivers of performance over a period of time rather than benchmarking absolute figures across industries.

[1] ROI is in this instance considered too narrow as it is intended to measure the profitability of a separate and identifiable part of the firms' operations rather than the entire performance. Reversely ROS would be a too wide measurement and even though it is appropriate when measuring the overall efficiency of the firm, it takes into account the performance of a great number of areas such as operational, financial and other items present in the income statement which would derive focus away from the performance of the specific assets.

To further motivate the use of ROA, it can be presented as another formula:

*Return on assets (ROA) = (Net profit/Revenue) * (Revenue/Average Total assets)*

This notation of ROA is derived from the well-known DuPont-formula and it expresses ROA as the net profit margin multiplied by the asset turnover. This opens for the interpretation that in order to increase the ROA, a company must either achieve higher margins or reach higher outputs with existing assets. How companies can achieve the latter is partly the purpose of this study whereby ROA becomes the most well connected measurement. A decreasing average of total assets means that capital expenditures are lower than depreciation, ceteris paribus, meaning that fewer assets are producing the same amount of output as previously. This provides the rationale behind incorporating one of the independent variables presented below but this distinction is important to mention as it further motivates the use and implications that can be used by having ROA as the performance measure.

2.2.2 Independent variables

2.2.2.1 Leverage (Debt to total assets (D/TA))

Extensive research has been done in the area of how capital structure affects performance and the ways to measure it are also numerous. Margaritis and Psillaki (2010) recognizes the costs that comes with increased leverage (agency costs), whereas Brendea (2014) underlines that a high debt to equity ratio can constrain the managers and make them act in the shareholders' best interest. El-Sayed Ebaid (2009) conducted research that finds a significant negative relationship between short-term debt and ROA as well as for total debt when looking at all publicly traded companies on the Egyptian stock exchange during 1997-2005. High leverage can also affect performance in that it can be a complement to dividends since it forces managers to produce continuous payments. This restricts wasteful spending of free cash flow usage and thereby aligns with the interest of the shareholders (Jensen, 1984).

Vithessonthi and Tongurai (2014) provide evidence that leverage has a negative non-monotonic effect[2] on operating performance, which holds for their full sample. However, as they look into firm size these results start to vary. Other ways of relating capital structure to performance can be done by looking at efficiency where higher efficiency can serve as insurance, thereby lowering expected costs of financial distress (Berger & Bonnacorsi di Patti, 2006). Higher expected profits, generated by high internal efficiency, have the potential to act as a substitute for equity as a risk minimizing factor, indicating that a more debt-heavy capital structure could be suitable (Berger & Bonnacorsi di Patti, 2006). The implications of the *"efficiency-risk hypothesis"* is that with higher expected returns due to high profit efficiency, would mean higher levels of D/TA, a positive relationship.

Evidently there are few practical apprehensions and little consensus where the trade off theory suggests a positive relationship between leverage and value whereas the pecking order theory proposes a negative relationship (El-Sayed Ebaid, 2009). Yet again, when looking to theories relating to agency costs the relationship shifts, indicating that higher leverage in the sense that it also brings lower agency costs, diminishes inefficiencies and hence increases firm performance (Berk & DeMarzo, 2014). Confirming the inconclusive results and including the aspect of local differences Weill (2008) compares a large sample of medium sized firms from seven European countries and measures how their performance was affected by leverage. When looking at the years 1998 to 2000 he proves that some countries have a significantly positive relationship between the two, whereas some have a significantly negative relationship and some does not show any correlation between the two. The complexity of the subject combined with the lack of uniform results makes predictions hard to accomplish which in turn increases the value and benefits of further researching potential relationships between leverage and firm performance.

[2] A monotonic effect is a sequence or function consistently increasing and never decreasing or consistently decreasing and never increasing in value. A non-monotonic effect is therefore any other function.

2.2.2.2 Size (Ln(Net sales))

The size of a company provides many bases of analysis when trying to explain economic performance and structures. Brighi and Venturelli (2014) studied Italian holding companies and recognized that larger firms more easily capture the potentials of economies of scale, and to some extent also scope. Their reasoning behind the importance of size can be applied beyond the scope of their study, as they argue that economies of scale is something that is highly likely to have a positive relationship to firm performance. The reasoning is developed with arguments that larger firms can reach a higher level of risk-management through diversification, however that a smaller size provides greater flexibility and an ability to tailor strategies (Brighi & Venturelli, 2014).

Vithessonthi and Tongurai (2014) conducts a panel regression analysis, much like the one conducted in this study, in which they find that company size, defined as the natural logarithm of net sales, has a significant positive relationship to ROA in their sample. The use of the natural logarithm of net sales is justified, since it makes comparisons across observations easier than would be the case if comparing absolute values. This relationship is, even though previous studies not always show that firm size influence its performance, expected to be positive and in line with previously mentioned scholars, the natural logarithm of the firm's book value of sales is used as measure (Yazdanfar & Öhman, 2015). Much of previous research uses this measure to depict firm size, likely because of the reasons mentioned above. (Dang, Kim, & Shin, 2014; Margaritis & Psillaki, 2010)

2.2.2.3 Growth (ΔSales)

Firm performance is often related to sales growth, as it is believed that this can enhance the value of the firm. This does not however come for granted as the firm needs to increase its efficiency as well in order for the actual return to increase. Brush, Bromiley and Hendrickx (2000) measures how yearly growth in sales can improve performance and also include corporate governance, free cash flow and structural aspects into their analysis. They find a significantly positive relationship between sales growth and performance measured as ROA in their sample of 2316 firm observations during the period of 1988-1995. Kiviluoto (2013) to some extent contradicts these results in a study that relates sales growth to various performance measures where the author finds that sales growth alone describes too little of the very complex issue of firm success. This indecisive relationship is affirmed by Raposo, Smallbone, Balaton, Hortovanyi (2011) whom in their comprehensive literature review conclude that previous research proves everything between strong positive results, to weak negative results to no relationship at all. Their conclusion is that the measures of growth and profitability are commonly used, but often in the wrong relations.

However some researchers goes deeper into the issue and recognizes that sales growth on its own is not beneficial, as a company easily can increase sales by producing at market rates and selling for less (Davidsson, Steffens, & Jason, 2008). Their study builds upon the assumption that there needs to be high levels of profitability in order for growth to be beneficial and their results encourage their audience to further deepen the understanding of the relationship between sales growth and profitability. The issue when assessing how to measure growth is that it is a relative measure of size over time when conceptualizing organizational size (Weinzimmer, Nystrom, & Freeman, 1998). This motivates why growth is defined as change in sales and not any other variable seeing as Size is defined by sales. Even though other measure of growth such as growth of employees and assets could be used, using change in sales provides sufficient information to the purpose of which growth is included in this study. The authors affirm this, as they mention that sales is amongst the most commonly used measurements for growth (Weinzimmer, Nystrom, & Freeman, 1998).

2.2.2.4 Intangible Assets to Total Assets (Intang)

Intangible assets have been playing a bigger part for companies in their asset structure for some time. The mere definition has historically limited the valuation and therefore the use of intellectual property in asset-backed loans, but this seems to change (Shadab, 2014;Raymond, 2009). For growth-oriented firms, like many in the technology-sector, this could open up a new venue for financing since asset-backed loans sometimes are the only type of loan that lenders guarantee (Shadab, 2014). This underlines the importance of intangible assets and emphasizes the intuition behind setting intangible assets to total capital as a variable. Would it be found significant when analyzing the variance in return on assets, or firm performance, it could deepen the understanding of a well-debated asset type.

Given this insight of the importance of intangible assets, it would be of interest to analyze if these types of assets can influence performance in any way. Grimaldi and Cricelli (2009) found several key sources that drive company performance and also singled out what type of intangible assets influenced value creation the most. Even though the distinction of parameters Grimaldi and Cricelli used in their study falls beyond the scope of this paper, it is important to note their finding of connection between intangibles and company performance. In addition, previous research state that intangible assets drive long-term value creation, which makes the analysis on a short-term basis even more interesting (Kaplan & Norton, 2004).

The valuation of intangible assets is also an aspect that needs addressing, since it is a difficult task usually conducted by highly skilled experts (Raymond, 2009). This inconvenience derives from the fact that they usually can be valued in three different ways; the cost approach, the market approach and the income approach (Raymond, 2009). All three are being used to measure the value of different types of intangible assets where the first two are more suitable when estimating trademarks and the third more suitable for estimating intellectual property (Raymond, 2009). The fact that intangibles can be measured differently between companies could be a source of criticism to using it as a variable in this study, yet as previously stated these assets remain crucial for the performance of many companies and investors. Earlier studies concludes that 80-90% of investors considers expenditures on intangible assets as beneficial for future economic growth and company value (Ballester, Garcia-Ayuso, & Livnat, 2003). This affirms the relevance of the subject in modern business and thereby also increasing the need to further examine this relationship.

2.2.2.5 Property, Plant and Equipment to Total Assets (PPETA)

Tangible assets can be defined as assets that produce economic benefits for more than one year and hence not such that are used up during the fiscal year (Fraser & Ormiston, 2013). Compared to intangibles, they are easy to measure both with respect to actual value and their physical aspects. This makes PPE, or tangible assets, an important part of any company. These features also provide the opportunity to use tangible assets as security and back loans in order to gain lower costs of debt. Building on the relative ease to gain credits with high levels of tangibles, firms also increase the value to their creditors in case of bankruptcy as the creditor then seize control of the asset. However the effect tangibles may have on firm performance is not as clear. Almeida and Campello (2007) finds that tangibility has no effect on cash flow sensitivities and hence no direct link to performance. However they do recognize the positive effect it has on the credit status of firms and that this allows them to easier reach credit markets. Falling in line with the resource-based view of a company where it is advised that one look at companies as portfolios of resources rather than portfolios of products one can identify types of resources, which can lead to high profits (Wernerfelt, 1984). Even though this view has been developed by further studies (Amit & Schoemaker, 1993; Petraf, 1993; Wernerfelt, 1984) the knowledge contribution that some types of resources and hence assets can be relatively more important for a firm's profitability and competitiveness is still relevant. The varied use and importance of the variable in studies similar to this, motivates its use and the occurrence in recent analysis and research helps to fully depict in what ways tangible assets affect firms (Dang, Kim, & Shin, 2014; Ferri & Jones, 2012)

2.2.2.6 Cash flow from operations to Sales (CF)

The ratio cash flow from operations to sales measures how much cash the firm generates compared to how large turnover (sales) the firm has. Earlier studies indicate that this variable is relevant when explaining companies' profitability and therefore examine the assets ability to generate cash (Kadapakkam, Kumar, & Riddick, 1998). The variable also provides precise estimates of a company's well being, since cash flow is less affected by earnings management than other items in the balance sheet. The ratio shows how much of the actual revenue becomes net cash flow and thereby measuring operational efficiency. Accordingly this study will use cash flow to sales as an independent variable to ROA to approximate how efficiently the firm manages its operations and see its impact on ROA.

Realizing that firms does not operate in perfect capital markets, sources of new capital and external financing is more essential for companies. The pecking order theory, where firms are predicted to prefer internally generated funds, explains why companies today is much more keen on keeping a high cash flow in order to accumulate larger cash deposits (Bates, Kahle, & Stultz, 2009). Modern research has also proven that accumulation of cash can reduce operational risk, (Chopra & Sodhi, 2004) which further underlines the benefits from high operational efficiency. Therefore the ratio cash flow to sales should be of relevance in this paper due to its ability to estimate a company's operating efficiency and therefore its level of risk reduction through cash holdings.

Reducing the general applicability of the variable, in the way it is presented in this study, is the fact that it does not examine the main driver of cash flow. This does however not affect the results of this study as other variables are included to explain that relation. It is included as a proxy for operational efficiency and thereby also to capture the general well being of the firms operations.

2.2.2.7 Capital expenditures to Total Assets (CEx)

Investment decisions correspond to a large part of the daily decisions for many companies and the issue whether to buy new, expand, decrease or keep the assets within the company is a struggle. To see whether capital expenditures on average pays off, in the shape of higher return, is therefore highly relevant and instead of using the measure where the yearly depreciation is subtracted from the yearly capital expenditures (which is a more informative way of expressing the change in book value of fixed assets) the ratio of capital expenditures to total assets have been used to highlight the dimension.

To look at how companies choose to invest in their fixed assets can entail information about the direction in which the company is heading. Skuras, Tsegenidi and Tsekouras (2008) found that amongst European small and medium sized enterprises, the percentage spent on investment in fixed assets (in their study defined as capital invested in fixed assets divided by total capital) during their sample period was strongly affected by the level of innovative activities and the size of a company. They draw the conclusion that there is a negative relationship between investment in fixed assets and innovative activity. This might make one believe that technological firms would present lower ratios of this variable which will be further examined in this study in order to tell whether one sector can be presented as more innovative than the other. Further on, their study showed that as firms grew bigger they tended to spend a lower percentage of their capital on fixed assets.

Dang et al. (2014) instead measures the net capital expenditures over fixed assets where they have lagged the fixed assets one year and they find a significantly positive relationship between the ratio of capital expenditures and the speed of adjustment in the companies' capital structure. Another way of using capital expenditures to improve a company's fixed assets is to make capital investment decisions so that it will maximize the firm's market value (Vogt, 1997). These studies, all with differing purposes and dependent variables that are affected by capital expenditures to some extent, implies that the pace with which a company renews its assets can affect a company in varying ways. There does not exist extensive research on the connection between capital expenditure and firm performance, as it is defined in this paper, which enhances the importance of involving the variable for further understanding.

2.2.2.8 Amortization of Intangible Assets (Amort)

Amortization of intangibles is defined as the yearly use or value decline of the intangible assets (Berk & DeMarzo, 2014). Following the publication of IAS 38, the accounting requirements surrounding intangible assets sharpened. Especially the rules surrounding goodwill changed, where yearly amortizations were to be replaced by continuous impairment tests to assess the value of the assets. This has made the valuation of goodwill and other intangible assets a specifically important accounting subject, where the guidelines surrounding the framework are not always clear-cut (Deloitte, 2015).

In addition, intangible assets are today a large part of many companies' balance sheets and that also includes companies with a traditionally larger amount of tangible assets. Therefore intangible assets are becoming a much larger and more crucial part in the work of estimating a company's value (Gu & Lev, 2010). The authors also show that during the last decades intangible assets have become a major driver of economic growth in many different sectors and that intangible assets produce future value for companies. However, also recognized by the authors, the difficult part is to estimate how much future value the assets can create, as they cannot be easily quantified. Given the increased importance of intangibles, it would be interesting to investigate the effect of value decline of these assets, represented by amortization.

A potential problem with this variable is that it is a subjective item in the income statement in the sense that it is adjustable when it comes to valuation and timing. The "Big Bath" theory states that companies with unusually low earnings will incur amortizations on assets to lower earnings even further. This indicates that the value decline associated with amortization might not always be representative when evaluating the effect it has on ROA. Since the Big Bath theory focuses more on a single year, the problems will certainly decrease when looking at a longer time period. It should however not be neglected since it might have an impact on the return and therefore ROA for companies (Jordan & Clark, 2011) and when looking at multiple years, the variable could indicate the underlying value of the companies' intangible assets and thereby its potential outcome on firm performance.

2.3 Expected results

Based upon the literature review above, with the purpose to further clarify the potential results from the empirical study, the expected relationships between each variable and ROA will now be presented as well as the predictions of differences between the industries. These are mere expectations that have been formed and reflect previous research on the variables and what that entails about potential effects on performance. In chapter five these tables will be elaborated upon further and complemented by the results generated from the empirical part of the study and are to be seen as estimations.

Relation to ROA	Leverage	Size	Growth	Intang	PPETA	CF	CEx	Amort
Expected	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative

Table 1. Expected relations between each variable and ROA.

Difference between sectors	Leverage	Size	Growth	Intang	PPETA	CF	CEx	Amort
Expected	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

Table 2. Expected differences between the sectors for each variable.

2.4 Summary of central theories

Title, author and year published	Time period	Purpose	Results
"A state-preference model of optimal financial leverage" - Kraus, Litzenberger (1973)	N/A	How firms can achieve an optimal capital structure when taking into account market imperfections.	The paper formally introduces the tax advantage of debt and bankruptcy penalties into a state preference framework. The market value of a levered firm is shown to equal the unlevered market value, plus the corporate tax rate times the market value of the firm's debt, less the complement of the corporate tax rate times the present value of bankruptcy costs.
"The most value relevant accounting performance measure by industry" - Alibadi, Dorestani, Balsara (2013)	2006-2009	To find what are the most relevant performance measures for companies in the same industry and that are using IFRS.	The study of both U.S. companies and non-U.S. companies that follow IFRS finds significant association between market performance and accounting performance measures. The findings also indicate that for the sample data the most relevant accounting measure is return on assets (ROA).
"Leverage and Corporate Performance: Does Institutional Environment Matter?" - Weill (2008)	1998-2000	To provide new empirical evidence on how leverage can affect corporate performance by looking at medium-sized firms from seven European countries.	They find that the relationship between leverage and corporate performance varies across countries, and that the influence of the efficiency of the legal system and in a lesser degree of the access to bank credit on the relationship between leverage and corporate performance.
"The effect of firm size on the leverage-performance relationship during the financial crisis of 2007-2009" - Vithessonti, Tongurai (2014)	2007-2009	To examine all registered firms in Thailand and whether firm size affects the relation between leverage and operating performance during the global financial crisis of 2007–2009.	The panel regression results indicate that leverage has a negative effect on performance across firm size subsamples, our year-by-year cross- sectional regression results show that the effect of leverage on performance is positive for small firms and is negative for large firms.

"Entrepreneurship, growth and economic development" - Raposo, Smallbone, Balaton, Hortovanyi (2011)	2011	Due to the inconclusiveness in previous research the authors found it necessary to review the literature in order to better understand how growth, performance and profitability are measured and what differences there are.	Their review draws on that when comparing the use of growth and profitability measures, it is much more common to use growth measures to assess performance.
"Intangible asset contribution to company performance" - Grimaldi, Cricelli (2009)	N/A	The paper aims to define a theoretical model that assesses and measures the intangible asset contribution to company performance.	The model presented identifies the sources of added value and competitive advantage in each business context and singles out those assets that can improve the performance.
"A Resource-based view of the firm" - Wernerfelt (1984)	N/A	The paper explores the usefulness of analysing firms from the resource side rather than from the product side.	In analogy to entry barriers and growth-share matrices, the concepts of resource position barrier and resource-product matrices are suggested. These tools are then used to highlight the new strategic options that naturally emerge from the resource perspective.
"The impact of cash flows and firm size on investment: The international evidence." - Kadapakkarn, Kumar, Riddick (1998)	1982-1991	This paper examines the degree to which cash flow availability influences firm investment in six OECD countries.	The study finds that the cash flow-investment sensitivity is generally highest in the large firms and smallest in the small firm size group. They also conclude that the degree of sensitivity of a firm's investments to its cash flows cannot be interpreted as an accurate measure of its access to capital markets.
"Asymmetric adjustment toward optimal capital structure: Evidence from a crisis" - Dang et al. (2014)	2002-2012	The authors employ dynamic threshold partial adjustment models to study the asymmetries in firms' adjustments toward their target leverage.	Amongst other findings, the authors find that firms with high capital expenditure have substantial cash flows and financing deficits and they also tend to have higher adjustment speeds than those with the opposite characteristics.
"Intangible assets: Measurement, Drivers and Usefulness" - Gu, Lev (2010)	1993-2004	The authors develop an economic approach to estimating the value of intangible assets that are not recorded on the firm's balance sheet.	Their results indicate that investments in R&D, advertising, brands, and information technology are important drivers of intangible capital, and in turn corporate value. Their approach is shown to be useful to investors seeking information on future performance on intangible-intensive firms.

Table 3. Summary of the most central theories to overview the fundaments of the paper

2.5 Theoretical relevance

Given the extensive description of the existing literature on each variable, it would be necessary to state where this paper can make its contribution. The investigation of capital structure started when Modigliani and Miller (1958) put forth their first proposition. Since then numerous articles and papers have been published, yet the combination of the variables presented in this thesis has not been thoroughly analyzed before. Further on most studies have been conducted on other countries than Sweden, where American and British companies are well represented. Sweden is an interesting country to analyze, given the performance of the Swedish economy during the period 2007 to 2012 (Carlstrom, 2013). In addition, little sector-specific analysis has been conducted in previous research, which could indicate a problematic exclusion of key sector-specific factors. Earlier studies have not yet concluded if there are certain variables that significantly affect performance within the two examined sectors and therefore it could be of interest for operators within the industry. To further investigate how much these variables affect firm performance gives an even larger scope when trying to answer this essays' research questions and in explaining the connection between the given variables and ROA.

Chapter 3 Research design

This chapter defines and motivates the research approach and brings forward how the study will be conducted. It will be followed by definitions for both regression models and also each individual variable in order to make the results evident and easily interpreted. Concluding the chapter, the hypotheses will be presented in combination with the assumptions necessary in order to conduct this study. Lastly a presentation of how the results are to be interpreted is brought forward together with a discussion of the reliability and validity of the paper.

3.1 Research approach

This study will attempt to explain firm performance in two different sectors with the help of several independent variables. In order to fulfill this purpose the study will be based on earlier published work of relevance to the subject. This indicates that a deductive approach is suitable. A deductive approach means forming hypotheses based on existing theory and research, which are then derived and tested. The drawback with a deductive approach is that the researchers may neglect useful information that they deem to be insignificant given previous knowledge (Svenning, 2003). In order to minimize this factor a comprehensive list of variables will be analyzed and tested for significance. A thorough review of theories and previous research will also help to minimize the risk of neglecting important information.

3.2 Quantitative method

A quantitative approach is best described as breaking down the reality into variables (Svenning, 2003). Following the purpose of this paper, the variables investigated are all of a quantitative nature, which emphasizes the choice of a quantitative approach. Based on the data collected in the different variables, statistical tests will be conducted to fulfill the purpose of the paper.

3.3 Sample

In order for this paper to investigate the posed research questions, a representative sample is necessary. The two sectors were selected since, at least intuitively, there could exist clear differences between them when it comes to several variables. The addition of another sector would not have added further depth to the analysis, since the view is that these two sectors are more distinct from each other than other sectors on the market. Furthermore these two industries contain several large and mature companies, which makes the sample more representative. In order to examine these aspects a sample must be formed out of the available companies. Several criterions were designed to find the most representative sample of the population, given the scope of the study. First off, the company must have been listed on Nasdaq OMXS between the years 2007-2012 since this is the time period of the study. As can be seen in figure 3, construction companies have been excluded due to their arguably unique and deviating characteristics. The remaining companies were ranked according to market capitalization (Nasdaq , 2015). Out of these rankings, the 21 largest companies in each sector were selected to be a part of the study. With a total of 42 companies, and therefore 252 observations, it can be assured that the data is representative of the population and therefore that our statistical tests should be of significance. Another reason for choosing to examine the technology and industry sector is due to their composition.

It could be argued that Ericsson make up a large part of the technology sector but it should not be neglected that this is the case for other sectors as well, where for example H&M make up a vast part of the consumer sector, whereas the selected sectors have relatively low variations in size. Hence, the two most suitable sectors for this study are therefore technology and industry. However there always remains doubt over how representative the sample is when conducting a study of this sort, therefore careful thought has been put into the sample method adopted. Strengthening this view is the fact that all companies have been listed during the entire sample period, and therefore governed by numerous laws and regulations, thus reflecting the truest relations in the firms regarding financial information.

First Step	Second Step	Third Step	Fourth Step	Fifth Step	Sixth Step
Select Nasdaq OMX Stockholm as the sample market	Select firms listed as either technology or industrial firms ➔72 Industrials, 30 Technology firms	Exclude firms not listed during the entire sample period, 2007-2012 ➔59 Industrials, 24 Technology	Exclude construction companies from the sample ➔56 Industrials, 24 Technology	List all firms in each sector in accordance to Market Capitalization as of 270315	Select the 21 firms with highest Market Capitalization in each sector, totaling 42 firms in the sample

Figure 3. Sampling procedure

3.4 Data collection

Broadly speaking there are two types of data, primary and secondary data. In this study secondary data will be gathered meaning that the research is based on previously gathered information, something that is preferable when using a quantitative approach (Bryman & Bell, 2005). The data will be retrieved from the databases Datastream and Worldscope by Thomson Financial, a trustworthy source used by many experts in the field of corporate finance. Even though Datastream is an acknowledged source, random selections in the sample will be compared to information from the respective annual report in order to validate the data. When certain data is missing, the information is gathered from the annual report so that the data is comprehensive. For market capitalizations the Nasdaq OMX Nordic website has been used to collect information. This source can also be deemed trustworthy and the data gathered therefore representative.

3.5 Time period

The period between 2007 to 2012 will be remembered in history as a time of recession for many European countries, including Sweden. This makes it a particularly interesting time period for this study, since it would not only give a broader understanding to the variables presented but also how these variables are affected during times of economic decline. The data collected is panel data, meaning that there is an observation for every company during the years 2007-2012, rendering 252 observations. The use of panel data is simply put the combination of cross-section data and time series data. The benefit is that the statistical analysis will take both firm specific and time specific aspects into consideration. Further the use of panel data will broaden the empirical evidence and therefore the analysis beyond one year or firm.

The financial crisis forced almost all companies to revalue their entire business and capital structure, combined with declines in asset value and difficulties of borrowing from both banks and the market, due to the economic turmoil. During those years there was unpredictable fluctuations in companies' revenues, results and therefore return on assets which further pushed companies in all different sectors to take action. This opens up for interesting results, which hopefully concludes given research questions and lead to further understanding.

3.6 Statistical Method

The statistical method used to describe the data and investigate the connection between our variables will be multiple regression analysis. Multiple regression analysis is the method of examining how different independent variables affect a dependent variable (Dougherty, 2011) In this study the dependent variable that is explained is return on assets, representing firm performance. The independent variables are characteristics of the firms and will be described and evaluated further in a later part of the study. The independent variables and their effect on the dependent variable is described by their respective parameter, denoted ß. A generalized form of a multiple regression analysis can be described as:

$$Y_{it}=\alpha+\beta_1X_{1it}+\beta_2X_{2it}+\ldots+\beta_nX_{nit}+u_{it}$$

where;

Y_{it}	is the dependent variable for firm i at time t
α	is the intercept
X_{nit}	is the independent variable n for firm i at time t
u_{it}	is the error term for firm i at time t

When estimating this model, the estimation output described as an equation is described as:

$$Y_{it}=a+b_1X_{1it}+b_2X_{2it}+\ldots+b_nX_{nit}$$

To clarify, the parameters α and β_n can never be observed, they are instead estimated using Ordinary Least Squares. The estimates are then denoted as "a" and "b_n". This estimation will minimize the sum of the squared residuals. The residuals are defined as the difference between the actual value of Y for an observation and the fitted value from the regression analysis. Residuals are not the same as disturbance terms, they are simply estimated using OLS and should not be misinterpreted as disturbance terms. Mathematically, the residuals can be described as:

$$e_{it}=Y_{it}-Y_{it}=Y_{it}-(a+b_1X_{1it}+b_2X_{2it}+\ldots+b_nX_{nit})$$

The initial regression equation tested, defined as Model 1A, will be described as:

$$ROA=a+b_1Leverage+b_2Size+b_3Growth+b_4Intang+b_5PPETA+b_6CF+b_7Cex+b_8Amort+ b_9Leverage^2+b_{10}Size^2+b_{11}Growth^2+b_{12}Intang^2+b_{13}PPETA^2+b_{14}CF^2+b_{15}Cex^2+b_{16}Amort^2$$

This equation will show what variables were of significance during the given time period for the companies in the sample. Thus, this regression equation will illuminate the problem regarding what factors drive ROA. The estimated coefficients (b_1, b_2, b_3… b_{16}) will show each variable's marginal effect on ROA. The marginal effect is defined as the increase in ROA when increasing a variable by 1%, since all variables will be noted in percent. Important to note at this point is that the marginal effect is not always linear, why the inclusion of squared variables has been made to show if there is a non-linear marginal effect on ROA. For example if the coefficient on CF^2 is negative, it shows that the marginal effect decreases as CF increases. The logic behind this inclusion is derived from the trade off theory and is efficient in deepening the understanding on how each variable affects ROA. Given the sample of this study, another regression equation will be analyzed with consideration for outliers. If the companies are too volatile, this might affect the estimations of the coefficients and therefore should be accounted for. The logic behind this is that extreme values, or outliers, will increase the standard errors of the estimations and therefore increase the possibility of rendering a significant variable insignificant. To account for this, Model 1B will be introduced, which include observations where ROA lies between -25% and 25%.[3] This interval has been chosen due to the dispersion of the observations, where observations outside of this interval can neither be regarded as representative nor consistent. The equation will be the same as the one defined as Model 1A, the difference being the exclusion of extreme values and therefore more reliable results. This will most likely reduce the number of included observations, something that also leads to more efficient estimates. The loss of observations is thereby weighted against the increased reliability in the regression results of Model 1B.

In order to investigate the other problem of this thesis, whether or not there is a significant difference between the technology and industry sector, another regression equation will be analyzed. This equation will incorporate a dummy variable that divides the sample in accordance to the respective sector. The equation will have the same appearance as Model 1A

[3] This interval has been chosen intuitively in order to check whether a more suitable model is presented when excluding values outside the interval.

and 1B, except for the inclusion of the dummy variable. The logic behind introducing a dummy variable is that it will show differences in how each variable affects companies in the two different sectors. Adding a dummy variable to both the squared and non-squared variables creates an interaction term that will show the difference in marginal effects across sectors. Thus, the regression defined as Model 2A will have the following appearance:

$$ROA=a+b_1Leverage+b_2Size+b_3Growth+b_4Intang+b_5PPETA+b_6CF+b_7CEx+b_8Amort+$$
$$b_9Leverage^2+b_{10}Size^2+b_{11}Growth^2+b_{12}Intang^2+b_{13}PPETA^2+b_{14}CF^2+b_{15}CEx^2+b_{16}Amort^2+$$
$$b_{17}Leverage*Dummy+b_{18}Size*Dummy+b_{19}Growth*Dummy+b_{20}Intang*Dummy+$$
$$b_{21}PPETA*Dummy+b_{22}CF*Dummy+b_{23}CEx*Dummy+b_{24}Amort*Dummy+$$
$$b_{25}Leverage^2*Dummy+b_{26}Size^2*Dummy+b_{27}Growth^2*Dummy+b_{28}Intang^2*Dummy+$$
$$b_{29}PPETA^2*Dummy+b_{30}CF^2*Dummy+b_{31}CEx^2*Dummy+b_{32}Amort^2*Dummy$$

To enlighten readers with little or no experience of econometric models, the estimation of b_1 will show the marginal effect of leverage on ROA for companies in the industry sector. The estimation of the b_9 coefficient will show if the marginal effect increases or decreases as leverage increases, in other words if there is a non-linear marginal effect of the variable. There is of course the possibility that the estimation of b_9 is insignificant, which would indicate a linear marginal effect. To compare this to the technology sector, the estimation of b_{17} shows the difference in marginal effect, juxtaposed against b_1. To complete the analysis of the effect of leverage, the estimation of b_{25} will show if the technology sector has an increasing or decreasing marginal effect as leverage increases compared to industrials. In order to underline the proper estimations and present the material in an intuitive way, the focus of this model will be on the difference between the sectors and therefore the estimations of coefficients where the dummy variable is included. For example, to check if there is a significant difference between the sectors regarding the effect of leverage the estimation of coefficients b_{17} (Leverage*Dummy) and b_{25} (Leverage^2*Dummy) should be analyzed. The presentation of variables and regression equations should not diffuse the reader, which is why graphs will be presented on significant marginal effects for further discussion. To further clarify for the reader, when referring to a linear effect it should be viewed as line A in figure 4 below. A linear effect indicates in which direction the variable affects ROA, and the effect on ROA will remain constant regardless of the value of the independent variables.

To account for the fact that different values of a variable will affect ROA differently, the non-linear effects have been introduced. For example, it will answer the question if the marginal effect is increasing or decreasing as the value of the variable increases. Looking at the graph, it is showed by the curve of the line. This yields the result that the total marginal effect of each variable will consist of both a linear and a non-linear effect.

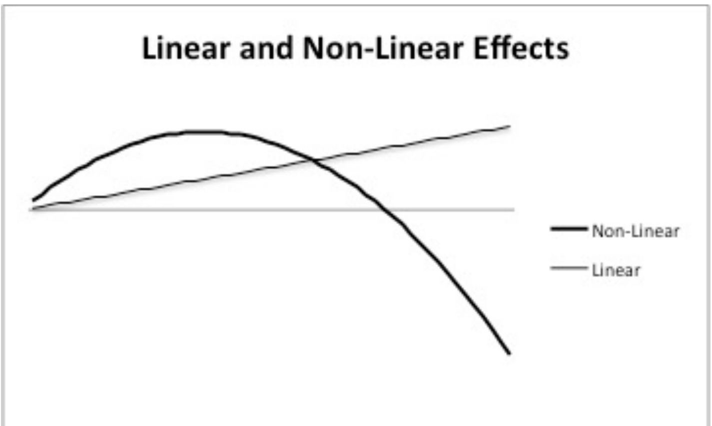

Figure 4. Mapping linear and non-linear relationships

3.6.1 Definition of variables

Here follows a presentation of how the variables are defined in this study. All definitions are collected from the Datastream and Worldscope databases to fully depict the content of the variables. The denotations seen in the parentheses represent how the variables are defined in the regression output. In chapter 2 each variable has been described and backed by previous research, therefore this section will briefly touch on the definitions of the variables. All variables are denoted in percentage, except for the Size-variable.

3.6.2 Dependent variable

The purpose of the study is to investigate a set of variables' effect on firm performance. The measure of firm performance used in this paper is Return on Assets, ROA. In this study ROA is defined as it is used in the Datastream database:

*(Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Average of Last Year's and Current Year's Total Assets*

3.6.3 Independent variables

3.6.3.1 Leverage (DTA_{it})

Extensive research has been conducted on leverage ratios and their effect on firm performance. There is inconclusive evidence on how leverage affects ROA and therefore the variable has been included in order to further understand the relationship between the two, as well as recognize potential sector-specific aspects. In this study the variable has been defined as:

(Long Term Debt + Short Term Debt & Current Portion of Long Term Debt) / (Total Capital + Short Term Debt & Current Portion of Long Term Debt)

3.6.3.2 Size ($Size_{it}$)

To ensure that the data accounts for size, the natural logarithm of net sales has been analyzed. Bearing in mind that simply using the absolute numbers would yield abnormal differences in the data, the natural logarithm of net sales has been chosen. This makes analyzing differences in size easier and is a method adopted in previous studies (Vithessonthi & Tongurai, 2014). The reason behind the introduction of this variable is to investigate if larger or smaller firms earn higher ROA:s. The variable is defined as:

Ln(Net sales or revenues = gross sales and other operating revenue less discounts, returns and allowances).

3.6.3.3 Growth ($Growth_{it}$)

When analyzing the growth of a company there are multiple ways to find a figure that can be evaluated across industries and firms. One approach that is often used in theory is looking at the yearly growth of net sales. (Weinzimmer, Nystrom, & Freeman, 1998) This variable is then used as a proxy for the growth of companies, in order to investigate if growth alone can yield a high ROA. In this study this growth variable is defined as:

(Net sales(year 1) - Net sales (year 0))/ Net Sales (year 0)

3.6.3.4 Intangible Assets to Total Assets (*$Intang_{it}$*)

Compared to PPE, intangible assets do not have a physical presence or value. Examples of intangible assets are goodwill, patents, deferred charges, copyrights, trademarks etc. They have become increasingly important in the economy, which urges the question of whether there exists a significant relationship with company performance (Kaplan & Norton, 2004). Throughout this paper, this variable will be defined as:

Total Intangibles Assets / Total Assets

3.6.3.5 Property, Plant and Equipment to Total Assets (*$PPETA_{it}$*)

PPE stands for property, plant and equipment and is interchangeable with tangible and fixed assets. Studying the tangibility of assets for a company and the effect it has on firm performance has been done before with varied results (Almeida & Campello, 2007). Given the purpose of the study as well as the sample chosen, the tangibility would be an interesting aspect to investigate further. It has been defined as:

Property, Plant and equipment (net of accumulated depreciation)/Total Assets

3.6.3.6 Cash Flow from operations to Sales (*CF_{it}*)

There is a clear-cut difference between the profit generated by a company and the cash flow generated from operations. Cash flow to total sales is just like return on assets an efficiency indicator, yet it looks at efficiency in a quite varying way. What this variable indicates is how much cash is generated from operations out of the sales incurred. It is argued that cash flow is not as easily affected by accounting practices and therefore a valid estimate of efficiency (Fraser & Ormiston, 2013). The definition of this variable is as follows:

Funds from Operations / Net Sales or Revenues

3.6.3.7 Capital expenditures to Total Assets (CEx_{it})

Capital expenditure is referred to as additions to fixed assets. Fixed assets, or property, plant and equipment as it is noted above, are assets that render economic benefit for more than just a fiscal year (Fraser & Ormiston, 2013). Therefore additions to these assets will also have long-term effects, which is why the variable is defined as the capital expenditure in relation to total assets for the previous year (t-1). The definition of the variable is defined as:

Capital Expenditures / Last Year's Total Assets

3.6.3.8 Amortization of Intangible Assets ($Amort_{it}$)

The variable of amortization of intangibles is put in relation to total intangibles. The amortization of intangibles consist of all intangible assets, such as goodwill (which is normally depleted based on a yearly evaluation), patents etc. The reason behind the use of this variable is to find potential connection between value decline in intangibles and firm performance. Intuitively, larger amortizations and depletions of these intangible assets would indicate that their potential to generate cash flow has decreased which would affect the company's income and therefore the return on assets. The definition used in the data is:

Amortization of all intangible assets/Total Intangible Assets

3.6.3.9 Dummy Variable

Following the purpose of the paper, to investigate sector-specific characteristics of performance and the independent variables, a dummy variable has been included. When conducting a quantitative research there are often one or more variables that are qualitative in nature, in this case the type of sector. One way to account for this would be to run separate regressions on the sectors, another would be to use a dummy variable. The use of dummy variables has the benefit of analyzing the impact of the qualitative factor, as well as making the regression estimates more efficient, given certain circumstances (Dougherty, 2011). With the sample, a dummy variable D has been produced given the following results:
For technology companies, the dummy variable will give (D=1), whereas companies in the industry-sector will have a dummy variable (D=0). This will be used to analyze differences

between the two sectors and therefore benefit the potential of fulfilling the purpose of the study.

3.7 Hypotheses

In the previous section the independent variables have been defined, as well as the dependent variable. In order to understand the effect each variable has on ROA, null-hypotheses will be defined. Given the different regressions that will be analyzed in this study, there will be multiple null-hypotheses for each variable. The first null-hypothesis will be defined as follows:

$$H_{0A}: \beta=0$$

Where H_{0A} refers to the variable's linear marginal effect on ROA. As always, the null-hypothesis states that there is no significant marginal effect of the variable. This will later be tested using the p-value of the estimation, which will be described further. The second null-hypothesis is defined as:

$$H_{0B}: \beta=0$$

This null-hypothesis will instead test if there is a non-linear marginal effect on ROA. That means that the Beta referred to will be the estimates on the squared variables effect on the dependent variable. As mentioned earlier, the null-hypothesis states that there is no non-linear marginal effect on ROA for the variable in question. The third and last null-hypothesis will be defined as:

$$H_{0C}: \beta=0$$

In Model 2A and 2B, a dummy variable will be introduced which will create different marginal effects for the two sectors. The null-hypotheses, referred to as H_{0C} will then state that there is no significant difference between the two sectors.

As mentioned above, the null-hypotheses always state that the estimations are insignificant. The alternative hypotheses will therefore state that there does exist a significant effect or difference. The interpretation of the regression results will be discussed further in a later section of this study, in order to convey the importance of the estimates as well as to indicate what to look for in the results.

3.8 Regression Model Assumptions

In order for the multiple regression analysis to yield reliable and correct estimations, six assumptions need to be fulfilled. The assumptions below are widely referred to the Gauss-Markov assumptions. The theorem developed by Gauss-Markov proves that as long as these assumptions hold, OLS (Ordinary Least Squares) will be the most efficient estimator of the parameters in the model. This also holds for panel data, the difference being that the parameters are estimated using a method called Panel Least Squares, which is an application of OLS on panel data (Dougherty, 2011). All assumptions and implications presented below follows the presentation that Dougherty (2011) puts forth:

1. The model is linear in parameters and correctly specified.
That the model is linear in parameters means that each term on the right side of the regression equation involves a β as a simple, linear factor and there is no relationship among the β:s. For example a model that is not linear in parameters is: $Y_i = \beta_1^X$. The inclusion of squared variables does not affect this assumption, since non-linearity in variables does not affect the precision of estimates. Correct specification ensures that the model does not leave out necessary independent variables as well as involve redundant variables.

2. There is not an exact linear relationship among the regressors present in the sample
This assumption is necessary in order to ensure that the model does not suffer from multicollinearity. According to Dougherty (2011) a higher correlation between the explanatory variables will increase the variance of their coefficients distribution and therefore yield inefficient estimates. As such multicollinearity is a serious problem that should not be neglected. The problem is normally more recurrent when working with smaller samples, which is why this aspect is given further attention in this paper to ensure that the results are significant and reliable. A correlation matrix will be calculated with the variables in the sample, and analyzed in order to control for this potential problem. If the correlation between any two variables is over 0.7, there is cause for concern over multicollinearity in the model.

3. The disturbance term has zero expectation.

This assumption allows the disturbance term to be positive in some cases and negative in others, as long as there does not exist a systematic tendency in either way. If an intercept is included in the regression equation the assumption usually holds, since the intercept automatically picks up any systematic yet constant tendency in the data. Intuitively it can be explained as if the intercept has absorbed the non-zero component of the error term and thus leading to an application of OLS to be efficient.

4. The disturbance term is homoscedastic

The term homoscedastic refers to a constant variance of the disturbance term for all observations. The disturbance term should still be greater for some observations than others, but there should not exist a tendency for greater variance of the disturbance term for different observations. If this assumption is not satisfied, the OLS method will not yield efficient coefficient estimates, the data suffers from heteroscedasticity. This problem can be investigated using a White test of each variable in Eviews. With panel data, there is not one preset test for heteroscedasticity. Instead, it can be done manually using a Wald-test. Heteroscedasticity can then be remedied either by using the method Weighted Least Squares or by using robust standard errors through White's heteroscedasticity-consistent standard errors.

5. The values of the disturbance term have independent distributions.

If this assumption is not satisfied, there is autocorrelation in the data. Autocorrelation refers to a systematic association between disturbance terms between observations. In other words, the disturbance term for one observation should be completely independent of the disturbance term of any other observation. If this is not the case, the OLS will again give inefficient estimates and all statistical tests will be useless. This problem can be alleviated with the use of Newey-West standard errors, yielding robust standard errors. In this study, the Durbin-Watson statistic will be analyzed in order to check for autocorrelation. The Durbin-Watson statistic can take a value from 0 to 4. If the statistic is close to 2, the data does not suffer from autocorrelation and can thus be used in statistical tests (Dougherty, 2011).

6. The disturbance term has a normal distribution

That the disturbance terms are normally distributed is often assumed, since this has major implications on the further regression analysis. If the disturbance terms follow a normal distribution, so will the regression coefficients and this will be of importance later when performing statistical tests for significance. According to the Lindeberg-Fuller central limit theorem, if a random variable is affected by a large number of other random variables, it will be approximately normally distributed, as long as none of the affecting variables is dominant. With a relatively small sample it should however not be neglected, which is why a graph of the residuals will be analyzed.

3.9 Interpretation of regression results

The regression coefficients show the marginal effect of the independent variables on the dependent variable, ROA. The null-hypotheses put forth for each variable will then be judged, using the p-value. In order to reject the null-hypothesis, the p-value of the estimated coefficient will be analyzed. If the p-value is lower than 0.10 the estimated coefficient is said to be significant and therefore the null-hypothesis can be rejected. The critical p-value of 0.10 has been chosen to ensure that the relative small sample of this study still remains reliable. The p-value can be viewed as the probability to reject a null-hypothesis that in fact is correct.

The null-hypotheses for the second regression equation state that there is no significant difference between the sectors, regarding the variables. The p-value used for the null-hypotheses in the second regression will be the same as in the first case (0.10).

For both the regression equations, the F-statistics will be reviewed. The F-statistic shows the joint explanatory power of the variables, that is if the model specified can explain the variation in the dependent variable (Dougherty, 2011). The F-statistic and its accompanying p-value will be checked, with the same critical p-value as for the t-tests in the regressions (0.10). The null-hypothesis of the F-test is that there is no linear relationship between the independent variables and ROA and it will be rejected if the p-value is lower than 0.10.

Another statistic of interest when conducting regression analyses is the R-squared statistic. The R-squared is referred to as the coefficient of determination and measures the proportion of the variation in the dependent variable that is explained by the model (Dougherty, 2011). An inherent problem with the R^2 statistic is that it can never decrease when adding variables to the model. This means that a model containing more variables will always be preferred when only looking at the R^2. In econometrics, this is adjusted for by looking at the adjusted

R^2. The adjusted R^2 attempts to compensate for the upward shift in R^2 by introducing a penalty for adding another independent variable (Dougherty, 2011). The use of this statistic has come under criticism, since it does not always follow that an increase in adjusted R^2 is an improvement of the model (Dougherty, 2011). Regardless of which of these statistics is analyzed, it should be remembered that a high R^2 does not always indicate a correctly specified model or vice versa. Therefore the R^2 and adjusted R^2 will be viewed as one of many diagnostic statistics that can be used to evaluate a given regression model.

When working with panel data, one aspect that requires attention is how the data is categorized. If the observations in the sample can be assumed to have identical characteristics, a pooled regression model is best suited. Since this study is based on two differing sectors, it will not be used. The two alternative regressions are fixed effects regressions and random effects regressions. Fixed effects can, simply put, be described as estimating an intercept for each observation in the sample (Dougherty, 2011). Random effects instead assume that the variation across observations is random and not dependent on the observations, in this study the companies. Which effects to use can be tested with a Hausman-test in Eviews (Dougherty, 2011). The mere distinction between the fixed effects and random effects model does however lie outside of the purpose of this study.

3.10 Reliability and Validity

3.10.1 Reliability

The term reliability refers to whether two studies with the same population, purpose and method yield the same results, making the results reliable. Since a quantitative study normally tries to generalize a given problem, the demands on reliability are tougher (Svenning, 2003). Problems with reliability can arise during any part of the research process, for example incorrect sample specifications or misinterpretation of results. This insight has influenced the entire process of writing this paper, in order to ensure reliability and therefore that the results are representative for the population as a whole.

When gathering data on the firms of the sample, the Datastream and Worldscope databases by Thomson Financial has been used as well as Nasdaq OMX. These are well acknowledged databases used by financial analysts and experts in the financial industry. The use of these databases was necessary in order to collect the data needed for the study. Datastream and

Worldscope collect its data from financial statements of the firms, and should therefore be deemed representative of the firms. To further enhance the reliability, randomly selected ratios has been checked with actual financial statements of the respective firms.

In addition, the reliability has been enhanced by using a time period of 2007 to 2012, encapsulating the period both before and after the time a severe financial crisis. The research method and sampling procedure has also been thoroughly specified which will aid future replication of the study.

3.10.2 Validity

A study can differ in its ability to depict reality. There are many different factors that need to fall into place. The literature refers to this as a study's validity, its ability to measure what is actually intended to measure. First off, validity is divided into two parts: (i) internal and (ii) external validity (Svenning, 2003).

(i) Internal validity is often referred to the study itself and its direct connection with theory and empirical results. Therefore the internal validity reflects the input of the study and its different aspects. If the different inputs of the study cannot achieve validity, then the research as a whole cannot achieve validity. The design and structure of the study is therefore of utmost importance to the internal validity. The simplest and most common way to measure validity is face validity, where the authors subjectively estimate if there exists a connection between theory and empirical results (Svenning, 2003). In order to maximize the internal validity of this paper, each variable has been carefully selected given the existing theories in the subject. Further on, the sampling criterions have been determined in order to replicate previous studies, as well as attempt to give additional insight to the complex and interesting subject.

(ii) External validity refers to the study as a whole and the possibility of generalizing beyond the given sample of the study (Svenning, 2003). A basic precondition for quantitative studies to achieve external validity is that the empirical foundation is solid. Thus a faulty sample can completely jeopardize all attempts to estimate population characteristics. Theoretical definitions are generally broadly defined, which could be problematic for quantitative studies where these definitions are boiled down to more specific and narrow variables. Careful thought has therefore been put into selecting representative variables, in order to correctly translate the theory into the research conducted in this paper. The purpose and sample of this paper still remain within two different sectors on the Nasdaq OMX Stockholm exchange, industry and technology, and it should be acknowledge that generalizations should not extend beyond these two sectors in the economy.

Chapter 4 Empirical results

This chapter will present general characteristics seen in the sample together with a correlation matrix to allow for deeper insight to the sample. This is followed by a presentation of the results from both regression models and the means of interpreting the results.

4.1 Summary of sample statistics

The table below presents a summary of sample characteristics. The panel “total” is based on the full sample whereas the “technology” and “industrial” panels are represented of the 21 companies from that respective industry, where averages are based upon the arithmetical average. Even though the analytical contribution of this table is somewhat limited, it provides an overview of the observations and general characteristics that the firms in the sample has, which is important in order to build a deeper analysis around the results.

Total

	ROA (%)	Leverage (%)	Size (LN)	Growth (Δ%)	Intang (%)	PPETA (%)	CF (%)	CEx (%)	Amort (%)
Average	7,1500	20,9525	14,8762	10,4102	32,5944	9,7104	9,4785	2,5818	8,8206
Median	7,7750	16,9600	14,6606	7,7703	31,1918	5,6276	9,3550	2,0150	3,7691
St.Dev.	11,8265	19,3619	2,1563	21,6790	17,6250	9,0800	8,3972	2,1479	20,2814

Technology

	ROA (%)	Leverage (%)	Size (LN)	Growth (Δ%)	Intang (%)	PPETA (%)	CF (%)	CEx (%)	Amort (%)
Average	5,9739	8,4612	13,4497	14,0774	35,9549	3,0210	9,0100	1,6398	12,2364
Median	6,2800	1,2700	13,5298	7,7196	36,1517	2,7317	8,3800	1,2000	4,7649
St.Dev.	15,6784	11,9227	1,7504	26,1597	18,8735	1,8828	10,8018	1,5680	24,8601

Industrial

	ROA (%)	Leverage (%)	Size (LN)	Growth (Δ%)	Intang (%)	PPETA (%)	CF (%)	CEx (%)	Amort (%)
Average	8,3260	33,4439	16,3027	6,7431	29,2339	16,3998	9,9471	3,5238	5,4049
Median	9,0850	37,8100	15,9879	7,7703	26,2823	14,2605	10,1800	3,0650	2,8860
St.Dev.	5,6792	17,2061	1,4731	15,2409	15,6459	8,4732	4,9465	2,2398	13,5798

Table 4. Descriptive statistics based on the sample. As total, for technology firms and industrials.

4.2 Correlation Matrix

In order to satisfy the second assumption for a regression analysis, that there is not an exact linear relationship among the regressors present in the sample, a correlation matrix has been produced. This entails how much the independent variables correlate with each other. The second assumption is satisfied when the correlations does not measure above 0,7 in which case there are no indications of collinearity and the regression does not need further adjustments (Gujarati & Porter, 2011). As is evident from the matrix below, the assumption holds for the variables included in this study.

Correlation matrix	CF	CEx	Intang	PPETA	Size	Amort	Leverage	Growth
CF	**1,00**	0,02	-0,08	0,06	0,14	-0,23	0,01	0,26
CEx	0,02	**1,00**	-0,34	0,03	0,37	-0,11	0,51	-0,06
Intang	-0,08	-0,34	**1,00**	0,17	-0,18	-0,13	0,06	0,00
PPETA	0,06	0,03	0,17	**1,00**	0,22	-0,07	0,19	-0,03
Size	0,14	0,37	-0,18	0,22	**1,00**	-0,23	0,64	-0,21
Amort	-0,23	-0,11	-0,13	-0,07	-0,23	**1,00**	-0,20	-0,14
Leverage	0,01	0,51	0,06	0,19	0,64	-0,20	**1,00**	-0,11
Growth	0,26	-0,06	0,00	-0,03	-0,21	-0,14	-0,11	**1,00**

Table 5. Correlation matrix proving no indications of collinearity.

4.3 Regression diagnostic tests

In order to make sure that the regression models are correctly specified and reliable, several tests have been conducted. The tests are based on the underlying assumptions of OLS and are constructed in a way so that efficient estimates are generated.

Further on, a Wald-test for heterscedasticity was conducted, where the null-hypothesis is that the data is homoscedastic and therefore that the regression can be continued. The results in this study showed however that the data is heteroscedastic, since the p-value of the test was 0,000 the null-hypothesis was rejected. To adjust for this characteristic of the data, White cross-section standard errors were used in the regressions. Cross-section refers to that the firms have different error terms, depending on the unique features of each firm. The violation of OLS-assumption 4 does thus not affect the results negatively, since the standard errors are corrected. Therefore, the estimates can be deemed reliable.

A Hausman-test was conducted and showed that fixed effects were more suitable for the regression models. Again this result is not surprising, since fixed effects will treat the firms as individual observations. Fixed effects were also applied on the time periods, meaning that the different years and their influence were observed as well. Given the time period chosen for this study, it seems likely that the business environment of 2007 differs from 2012 and this should therefore be accounted for in the models.

To conclude the tests conducted, a normality test of the residuals has been considered. Remember that OLS-assumption 6 states that the disturbance term is normally distributed. Even though the residuals should not be mistaken for the actual disturbance terms, they indicate if the data is too volatile. If the residuals are clearly not normally distributed, this will affect the standard errors of the estimates, yielding too many insignificant variables in the regressions. A graph of the residuals was checked to view the dispersion of the residuals, which can be found in the appendix. The results indicate that the mean lies around 0, but the assumption of normal distribution is affected by some extreme values. To account for this, as mentioned above in section 3.6 the extreme values was excluded from the regressions in order to yield significant results. Thus, Model 1B and 2B yielded more robust estimates than 1A and 2A, and therefore are of larger interest to the study.

4.4 Regression 1

The results from the regressions are presented in table 6. There are some figures more relevant to study than others, and starting by looking at the top row for each variable in model A, this value represents the coefficient (which is the beta of each variable, meaning the direction and the slope of the marginal effect to ROA). The results from regression model 1A show that half of the variables have a negative relationship to ROA. Leaving model A and applying these interpretations to model B, one finds that the relationships have changed slightly both in their direction but also in what variables are significant. Since model B provides the most accurate results based upon the fact that the regression model has been cleared from extreme values, it will be presented more thoroughly. This choice is further motivated by the fact that a higher number of variables proved significant in model 1B which is a result of smaller standard errors and thereby more applicable results. The significant variables in this model are Growth, Intang, CF, CEx and Amort. It should be noted that CEx is the only one of these variables that is not significant on the 5% level. This means that H_{0A} is rejected for all these variables. H_{0B} however is rejected for all variables except for Intang where it is accepted. In the following section only the ones proven to be of significance will be presented since they are the most interesting results and the ones on which conclusions can be drawn. Further, chapter five will bring forward the variables that did not prove to be statistically significant.

Variable	Model 1A (non-squared variables)	Model 1B (non-squared variables)	Model 1A (squared variables)	Model 1B (squared variables)
Constant	34.80320 (102.9685) **(0.7357)**	66.67913 (52.37607) **(0.2047)**	-	-
Leverage	0.04749 (0.04834) **(0.3272)**	-0.01006 (0.03701) **(0.7860)**	-0.001863 (0.00085) **(0.0293)****	-0.00101 (0.00080) **(0.2064)**
Size	3.96258 (12.92231) **(0.7595)**	-7.23160 (8.32348) **(0.3861)**	0.10903 (0.39253) **(0.7815)**	0.22076 (0.33671) **(0.5129)**
Growth	-0.03237 (0.06845) **(0.6368)**	0.09596 (0.03263) **(0.0037)****	0.00072 (0.00065) **(0.2658)**	-0.00078 (0.00035) **(0.0289)****
Intang	-0.52223 (0.20655) **(0.0123)****	-0.22693 (0.05935) **(0.0002)****	0.00599 (0.00281) **(0.0340)****	0.00092 (0.00100) **(0.3595)**
PPETA	1.59008 (0.47551) **(0.0010)****	0.04130 (0.17261) **(0.8112)**	-0.03436 (0.00885) **(0.0001)****	-0.00407 (0.00460) **(0.3776)**
CF	0.74059 (0.08843) **(0.0000)****	0.59715 (0.06835) **(0.0000)****	-0.00306 (0.00452) **(0.4991)**	-0.00710 (0.00324) **(0.0299)****
CEx	1.39928 (1.13927) **(0.2209)**	1.15956 (0.63016) **(0.0674)***	-0.09847 (0.07496) **(0.1906)**	-0.07691 (0.04331) **(0.0775)***
Amort	-0.27806 (0.08919) **(0.0021)****	-0.20685 (0.04061) **(0.0000)****	-0.00011 (0.00055) **(0.8384)**	0.00194 (0.00022) **(0.0000)****
Adj R2	0.86630	0.82827	-	-
F-statistic	27.23012	19.38449	-	-
No. Observations	252	239	252	239

Table 6. Results from regression model 1A and 1B.

*Note: The value in parenthesis represent the standard error of each variable and is of less practical use. The value in bold parenthesis presents the probability and if this value is smaller than 0.1 there is a statistically significant relation between the variable and ROA, denoted with *. If however the variable is statistically significant at the 5% level, a p-value lower than 0.05, it is denoted by **. The squared variables present the values for the non-linear marginal effect on ROA that each variable has. A negative coefficient value will have a decreasing marginal effect on ROA whereas a positive coefficient on the squared variable indicates an increasing marginal effect.*

By looking at the variable Growth one finds that it, as expected, is positively related to ROA whilst it has a negative non-linear marginal effect. This entails that for each increase in Growth, the positive increase in ROA will be smaller. This relationship is depicted in figure 5 and shows that past a certain point of growth, companies experienced a relatively smaller increase in ROA. These figures are mere estimations based on the values from EViews but they do provide understanding of how the variables does relate to ROA. Also to be note is that the X-axis represents values in the range 0-100%. These results imply that firms with a lower rate of growth experienced a higher marginal effect on ROA whereas larger growth rates would not yield the same impact, however the total effect is always positive. Given the current sample, an equation for the marginal effect Growth has on ROA could be defined as:

$$ME_{ROA}(Growth) = 0.09596Growth - 0.00078Growth^2$$

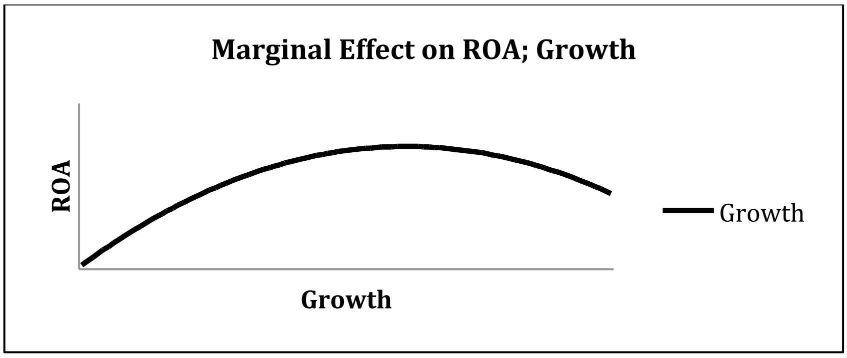

Figure 5. Displaying the marginal effect Growth has on ROA.

The variable Intang also proved statistically significant in its negative relation to ROA, which deviates from the expectations. This implies that a larger ratio of intangibles to total assets generates a lower ROA. However the squared variable is not significant for this variable and therefore means that we cannot with certainty prove anything about the non-linear effect of this variable. This is illustrated in figure 6 where the slope is negative and linear. The conclusions that can be drawn from this result is that it is certain that the ratio of intangibles did affect ROA negatively during the time period, however it cannot be confirmed whether this decrease in ROA was the same for all levels of Intang or if some degrees of intangible asset holdings generated larger offsets in ROA. The equation for Intang is defined as:

$$ME_{ROA}(Intang) = -0.22693Intang$$

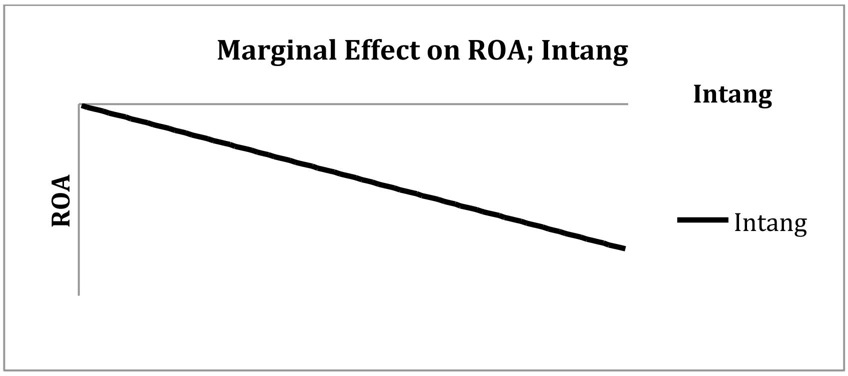

Figure 6. Displaying the marginal effect Intang has on ROA.

The variable CF however proved to have a positive relation to ROA, aligning with the expectations as the variable to some extent measures operational efficiency. Despite its positive effect on ROA the squared variable is significant and negative meaning that its marginal effect is reduced the higher the ratio. At this point it is important to remind of the fact that the figures presented are mere representations based on the output from Eviews. This becomes important when looking at figure 7 where one finds that past a certain point the effect passes zero and becomes negative. The implications of this could be of interest, however when looking at the total average of the variable for all firms from the descriptive statistics in the sample it is roughly 9,5% which means that the figure is somewhat misleading and irrelevant for high values. This fact makes it possible to see the result in the way that higher efficiency generates greater ROA however its marginal effect is decreasing as the efficiency increases. The marginal effect on ROA is defined as follows:

$$ME_{ROA}(CF) = 0.59715CF - 0.00710CF^2$$

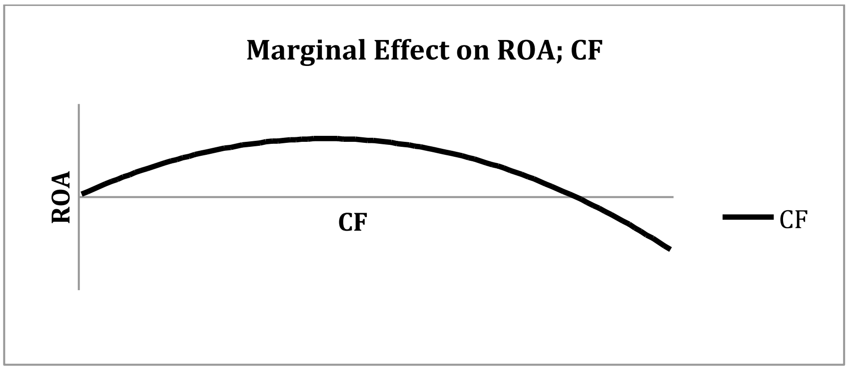

Figure 7. Displaying the marginal effect CF has on ROA.

The variable CEx proved to be significant from the regression and as expected the relationship to ROA was positive. However, there is a negative non-linear marginal effect for this variable as illustrated in figure 8. The coefficient for this variable is very high relative to the other comparable values, explaining why the slope becomes negative at a certain point. By paying some attention to the descriptive statistics the average of the sample is about 2.5% which is considerably below the intersection of the X-axis. The standard deviation for this variable is amongst the lowest in the sample, proving that firms on average keep about the same pace in their capital expenditures. An equation on the marginal effect that the variable has on ROA could be defined as:

$$ME_{ROA}(CEx) = 1.15956CEx - 0.07691CEx^2$$

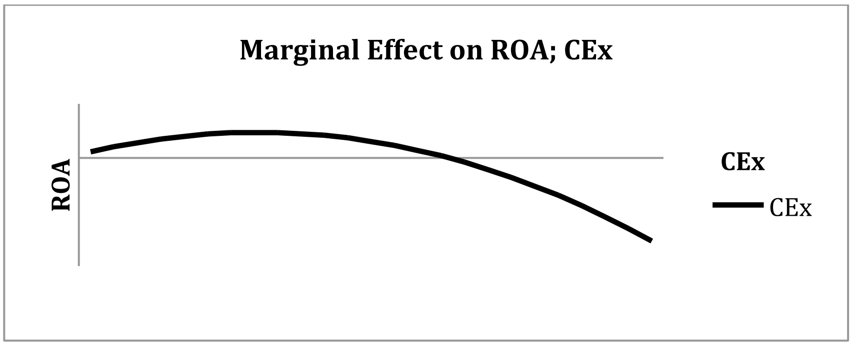

Figure 8. Displaying the marginal effect CEx has on ROA.

The Amort-variable shows a statistically significant negative relationship to ROA, confirming the expectations. The squared variable for Amort is positive which means that a higher ratio of Amort will generate larger marginal effect on ROA. In this case it means a smaller decrease in ROA for every extra unit Amort. The U-shape shown in figure 9 is motivated by the fact that for lower ratios of amortization (ratios less than 50%) the negative effect of Amort grows. However, past the flat part of the curve this relationship changes and every extra unit of Amort has a smaller negative effect. An equation that represents the marginal effect that Amort has on ROA could be defined as follows:

$$ME_{ROA}(Amort) = -0.20685Amort + 0.00194Amort^2$$

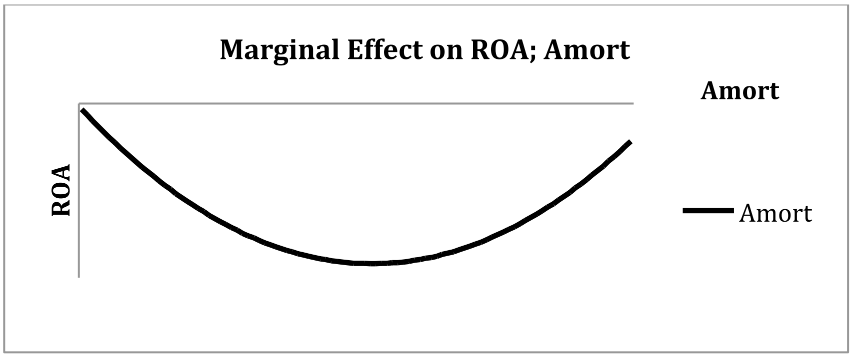

Figure 9. Displaying the marginal effect Amort has on ROA.

In the bottom of table 6 there are three descriptive statistics. The adjusted R^2 value at 0.82827 for model 1B, meaning that about 82% of the variation in ROA is explained by the regression model. The appropriateness of the model is further proven by looking at the F-statistic where it is indicated, with a high value, that the model used is solid when it comes to explaining the variance in ROA. This again, similar to the R^2 value, indicates the appropriateness of the variables included in the model rendering the results generated useful and important. The mere values of the statistics are not of particular interest, instead the results show that the model presented has explanatory value.

The means of interpretation that has been used in this section can, and should, be used to understand all values presented in table 6. This study does not include a presentation of all results in order to enhance simplicity and to encourage the readers to think independently.

Relation to ROA	Leverage	Size	Growth	Intang	PPETA	CF	CEx	Amort
Expected	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative
Proven	Negative	Negative	Positive	Negative	Negative	Positive	Positive	Negative
Significant	No	No	Yes	Yes	Yes	Yes	Yes	Yes
H_{0A}	Accepted	Accepted	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
H_{0B}	Accepted	Accepted	Rejected	Accepted	Rejected	Rejected	Rejected	Rejected

Table 7. Summary of results and hypotheses tests.

4.5 Regression 2

The results from the second regression will be presented in the same manner as the first one. As the residuals yet again proved volatile the data has been corrected in the same manner as for model 1 and hence model 2B will be used for the following interpretation and analysis. Even though many of the ways of interpretation will be the same, the results are slightly different. If looking at table 8, to find what variables are statistically significant one should turn to model 2B both for the non-squared and squared variables. As explained in chapter three the dummy entails whether there are significant differences between the two sectors and the results are to be interpreted in the following manner: When looking at the non-squared variables, if statistically significant this variable presents linear differences between the sectors. Because there is no sector-specific intercept included in the equation this difference is represented by the difference in the slope for the two sectors. The squared variables present a slightly more advanced relationship as they entail the difference in the non-linear marginal effects between the sectors. Since the dummy variable is defined as 1 for technology firms, the difference between the sectors will have technology firms as its base. Holding all else equal, a negative value of the marginal effect (when the line is below the X-axis) will indicate that the technology firms have a lower marginal effect than industrials.

The generic relationship can be explained by looking at figure 10 below. When the line moves towards the X-axis the difference between the sectors decreases, and vice versa. In the following sections, the sector-specific graphs will not be presented, instead a graph showing the difference for the respective variables will be analyzed. The variables that resulted in a statistical significant difference in the test are: Growth, Intang, PPETA, CEx and Amort and these will therefore be more thoroughly interpreted below in order for the reader to further understand the results. The variables Leverage, Size and CF did not prove to be of statistical significance and will therefore not be treated in this chapter but will be analyzed in chapter five. In order to fully understand this relationship table 8 comes in handy where a positive coefficient value for the non-squared variable means that technology firms experienced higher linear marginal effects whereas a negative value means that industrial firms presented higher linear marginal effects. The squared variables entail the difference in the non-linear marginal effect. A negative value for this coefficient entails that the difference in non-linear marginal effects is decreasing for higher values of the independent variable.

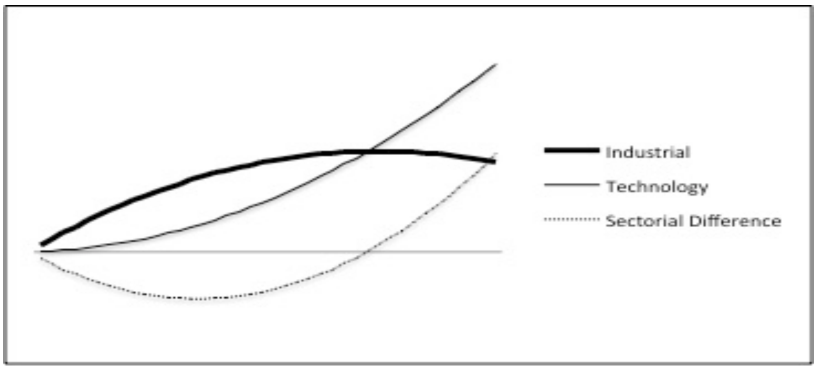

Figure 10. Generic relationship in differences between the sectors.

Variable (difference between sectors)	Model 2A (non-squared variables)	Model 2B (non-squared variables)	Model 2A (squared variables)	Model 2B (squared variables)
Constant	120.87420 (76.38129) **(0.1154)**	140.4806 (89.40320) **(0.1181)**	-	-
Leverage	-0.06708 (0.22865) **(0.7696)**	-0.16503 (0.16870) **(0.3294)**	-0.00174 (0.00559) **(0.7558)**	0.00153 (0.00399) **(0.7014)**
Size	3.71329 (14.54412) **(0.7988)**	-5.56021 (28.17464) **(0.8438)**	-0.11764 (0.50242) **(0.8152)**	0.16407 (1.06207) **(0.8774)**
Growth	0.05960 (0.05161) **(0.2498)**	0.14591 (0.04672) **(0.0021)****	-0.00102 (0.00068) **(0.1346)**	-0.00201 (0.00093) **(0.0315)****
Intang	-0.65120 (0.20767) **(0.0020)****	-0.60945 (0.16699) **(0.0004)****	0.00921 (0.00232) **(0.0001)****	0.00779 (0.00127) **(0.0000)****
PPETA	0.32653 (1.29311) **(0.8009)**	-1.57466 (0.50063) **(0.0020)****	-0.001173 (0.10899) **(0.9914)**	0.16533 (0.02704) **(0.0000)****
CF	0.17945 (0.16799) **(0.2869)**	-0.19603 (0.16773) **(0.2443)**	-0.00256 (0.00682) **(0.7077)**	0.00159 (0.00804) **(0.8432)**
CEx	2.70031 (0.59757) **(0.0000)****	2.36306 (0.39931) **(0.0000)****	-0.15141 (0.09173) **(0.1006)**	-0.10683 (0.05917) **(0.0729)***
Amort	-0.38111 (0.12285) **(0.0022)****	-0.22489 (0.06280) **(0.0005)****	0.00013 (0.00082) **(0.8715)**	0.00071 (0.00092) **(0.4402)**
Adj R2	0.86630	0.82827	0.90880	0.84074
F-statistic	27.23012	19.38449	33.06802	17.10837
No. Observations	252	239	252	239

Table 8. Results from regression model 2A and 2B.

*Note: The value in parenthesis represent the standard error of each variable and is of less practical use. The value in bold parenthesis presents the probability and if this value is smaller than 0.1 there is a statistically significant relation between the variable and ROA, denoted with *. If however the variable is statistically significant at the 5% level, a p-value lower than 0.05, it is denoted by **. The variables should be analyzed in the same way as for Model 1B, with the difference being that the coefficients state the sectorial differences of the variables' linear and non-linear effect.*

To apply this to the variable Growth, as figure 11 and table 8 together present, it is statistically significant that there is a difference between the sectors in how Growth is related to ROA and that for lower values of Growth technology firms have a higher marginal effect. As the figure 11 entails, this marginal effect is decreasing which also can be interpreted by looking at the squared variable, which for Growth is negative. The figures regarding sectorial differences all have the same characteristic that when the curve crosses the X-axis, the relationship reverses. In the case for Growth this means that for higher ratios than at the point where the curve crosses the X-axis, technology firms experienced lower marginal effects than firms in the industrial sector. Noted should be that for this to happen very high levels of Growth needs to be achieved, levels well above the averages for both sectors. Looking at the descriptive statistics it is found that technology firms present an average growth rate at about 14% indicating that this scenario is rather unlikely. Taken together Growth had larger linear marginal effects for technology firms over the sample period which essentially means that technology firms gained more from each unit increase in growth than did industrials. Furthermore technology firms proved a higher average growth rate than industrials but also a higher standard deviation, which can be seen in the descriptive statistics. This means that technology firms had a more volatile and in some sense unpredictable growth as it can vary more extensively in both directions than it does for the industrials.

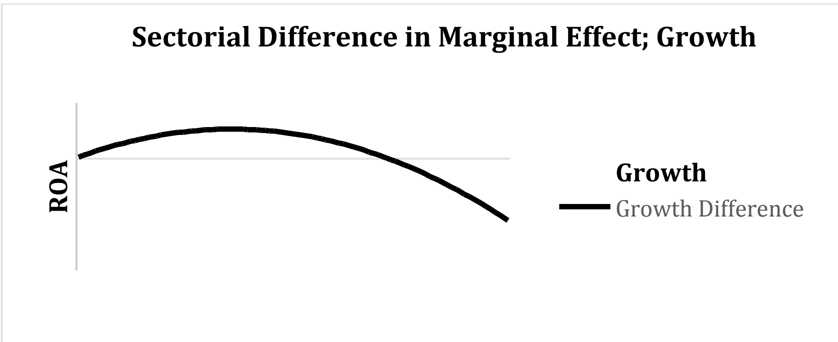

Figure 11. Sectorial difference in marginal effect for Growth.

The ratio of Intang proved, as expected, to be statistically significant in differences between the sectors and as can be extracted from table 8 it is significant both for the linear and non-linear differences. The relationship is depicted in figure 12 where technology firms experienced a lower linear marginal effect but with a positive non-linear marginal effect. This results in that for values of Intang above the point where the curve crosses the X-axis, the technology firms would experience higher marginal effects than industrials. However this point is of less interest, evident when comparing the descriptive statistics to the curve as technology firms on average presented values of Intang at about 35% whereas the curve crosses the axis at a considerably higher point, rendering the situation rather unlikely. Most companies from the sample are to be found in the flat or downwards sloping part of the curve hence, it is possible to say that most technology firms experienced a significantly lower and decreasing marginal effect of its intangible assets during the sample period. By looking at the descriptive statistics above, both sectors present rather high standard deviations meaning that the average values should be analyzed with caution.

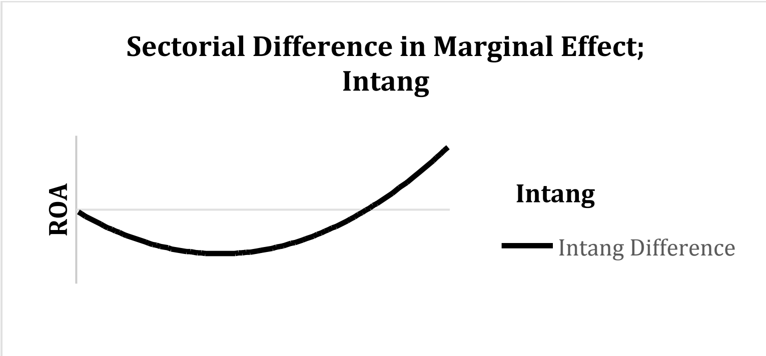

Figure 12. Sectorial difference in marginal effect for Intang.

Property plant and equipment to total assets was expected to have a positive relation to ROA. It did not prove to be significant in Model 1B, but the results in Model 2B was of interest. In Model 2B there proved to be a significant difference in marginal effect of PPETA between the two sectors. Based on figure 13, it can be observed that technology firms have a lower marginal effect than industrials for lower values of PPETA but that the relation then reverses as PPETA increases. This point occurs for relatively low values of the variable, which would indicate that technology firms could enjoy a better effect of PPETA on ROA than industrial firms. Based on the descriptive statistics, the average ratios of PPE to total assets are 3% for technology firms and 16% for firms in the industrial sector. Figure 13 should be viewed with extra caution as the relationship between the sectors might not be as clear-cut in reality, which encourages deeper analysis.

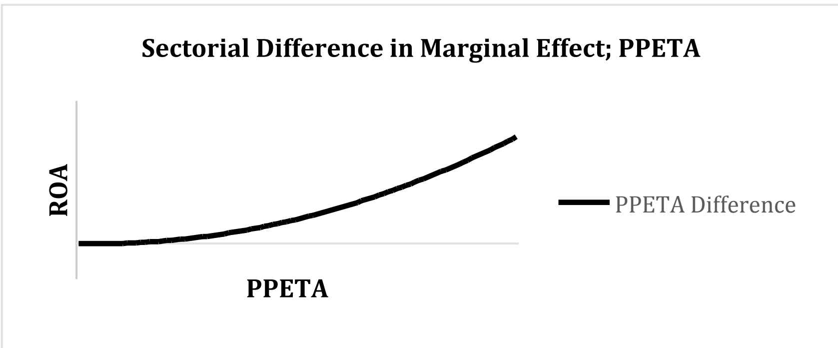

Figure 13. Sectorial difference in marginal effect for PPETA.

Capital expenditures to total assets, CEx, was expected to prove different between the two sectors and this was affirmed by the regression model 2B. Both the non-squared and squared variables proved statistically significant, with the former having a positive coefficient and the latter a negative. The results can be seen in figure 14 where it shows that for relatively low values the technology firms experienced a larger marginal effect, which implies that it was more beneficial for technology firms to invest in tangible assets than for industrials during the sample period. The descriptive statistics for this variable presents averages at about 3% at its highest which means that the firms in the sample experienced this scenario. The point where the curve crosses the X-axis is well above the values experienced by the companies. This raises the possibility of seeing technology firms as having had a higher return on investments on tangible assets during the sample period than did industrials, combined with the fact that technology firms on average spent a relatively smaller amount on these assets.

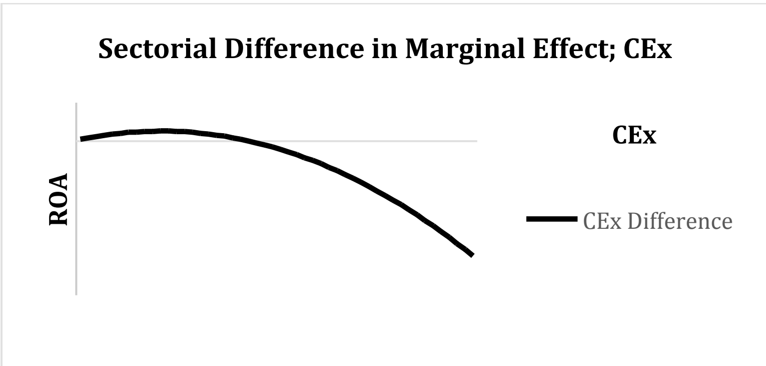

Figure 14. Sectorial difference in marginal effect for CEx.

Similar to CEx, the result of significant differences between sectors in the variable Amort was expected. However, statistical significance was only found for the non-squared variable and not for the squared variable. This result shows that for all ratios of Amort, technology companies had a lower marginal effect on ROA. Due to the fact that the squared variable did not prove significant, nothing can be proven regarding its non-linear marginal effects. This results in a difference between the sectors as depicted in figure 15 where technology firms have a lower marginal effect for each ratio of Amort. Technology firms also presented higher averages of Amort according to the descriptive statistics. Technology firms on average have a higher level of intangibles and a lower marginal effect of amortizations than industrials, implying that this is a critical point for many firms in the technology sector.

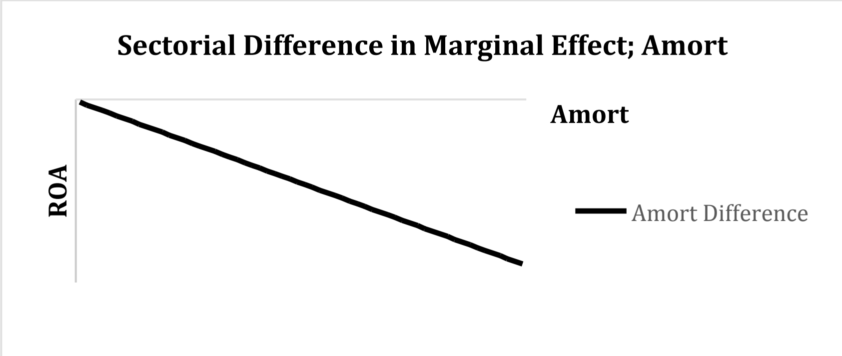

Figure 15. Sectorial difference in marginal effect for Amort.

Difference between sectors	Leverage	Size	Growth	Intang	PPETA	CF	CEx	Amort
Expected	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Proven	No	No	Yes	Yes	Yes	No	Yes	Yes
Significant	No	No	Yes	Yes	Yes	No	Yes	Yes
H_{0C}	Accepted	Accepted	Rejected	Rejected	Rejected	Accepted	Rejected	Rejected

Table 9. Summary of results and hypotheses tests.

Chapter 5 Analysis

In order to concretize the results presented, this chapter will include comprehensive analysis of each variable. This will be done in relation to previous research and expectations but should however not be extended beyond the sample used nor the sample period of 2007-2012.

5.1 Leverage

After testing the relationship between the independent variable Leverage and ROA it shows that the variable is not statistically significant for any regression model. Therefore it is not possible to conclude that a firm's capital structure within the two different sectors, during 2007 to 2012, has a certain impact on firm performance. It is also clear that the authors' predictions and beliefs about existing differences between sectors, and a positive relationship between leverage and ROA, can now be rejected. This result may seem bland at first but when connecting to theories brought up in this study, especially Modigliani and Miller, it builds upon their irrelevance theorem by proving that leverage is irrelevant for ROA and firm performance as well. Furthermore the trade off theory presented that for firm value there is negative non-linear marginal effect and hence that firms can reach an optimal capital structure. This finding cannot be applied to ROA according to this study and thus an optimal capital structure for firm performance could not be identified.

Why the capital structure has no evident effect on firm performance in this case could be that decisions concerning capital structure are not solely based on how large return a company has on its assets. When it comes to external financing a company usually takes a bank loan, issues bonds or new equity. The costs of debt for these alternatives may vary, but they are all reported among financial costs in the income statement and therefore left out when measuring ROA. To explicitly measure leverage's effect on ROA one must then include the costs of debt intended only for investments in assets, something which would be of interest but is beyond the scope of this study due the difficulties in distinguishing different types of financing and the associated costs for each company. Accordingly this means that ROA is defined by how the assets perform rather than how they are financed and that this affects the results of this study.

Another important aspect to acknowledge is that there are large differences between the sectors when it comes to the average degree of leverage. Such conditions can of course depend on a variety of reasons, most likely that industrial companies have a larger amount of tangible assets that can be held as security towards debt. This makes the investment safer for the lender and highly relevant during the years 2007 to 2012 when companies, including creditors, had to restructure their risk strategies and lower their overall exposure to risk. In addition, the firms in the technology sector could be associated with a higher level of operational risk, which would make them less desirable for creditors. This combined with the degree of tangibility of the assets can provide an answer to the proven relations in the sample regarding the different levels of leverage. However, the result of non-significance of the variable in the regression models is not surprising. This is due to the inconsistent results and conclusions from historical research and theories and the fact that much of the costs for debt are excluded from the measure ROA.

5.1.2 Size

The sample used for this study could not explain whether Size affects ROA in any certain direction even though previous research, as mentioned in chapter two, to some extent could prove that it has a positive relationship to ROA (Vithessonthi & Tongurai, 2014). The equivocal results from previous research and this study could be explained by the fact that the sample period used in this study is during a time of economic recession. Periods as such tend to come with fluctuations in demand, which might have altered the sales of the companies and thereby also skewing the relationship for this variable. It can further be argued that firms during such times might avoid expansions and investments that potentially could increase sales, in order to mitigate risks, and instead create a buffer. Due to the insignificant result of this variable in this study the possibilities to draw extensive conclusions are limited. Still, by relying on previous research a discussion about what a potential significance could explain should be put forward. Put differently; what conclusions can be excluded from this study? The benefits of being a larger firm, often narrowed down to economies of scale and scope, was either not present for the companies in the sample or the gains of it were limited. This could be explained by fluctuations in sales as this potentially distorts the relationship to ROA. In the same manner, it is inconclusive to state that companies benefit from being more flexible and adaptive during periods of economic recession, which are related to the benefits of being a smaller firm.

The findings of Brighi and Venturelli (2014) must then not be applicable to this study as it is possible that larger firms to a great extent were also able to be adaptive and flexible. This leaves the smaller firms without any comparative advantage and reduces much of the differences between the companies. This could be argued for economies of scale as well, saying that it could be small firms being able to capture these benefits earlier than predicted rather than large firms not fully exploiting the opportunity. That there is no difference between the sectors is perhaps less surprising as there are no sector specific characteristics derived from the sales of a company that would be expected to make one sector more profitable than the other. Nonetheless, industrial firms have a higher average size but this difference was not large enough to entail anything about the characteristics of the sectors. These results does imply that performance is not related to the sort of efficiency-gains discussed and that the size of the company is not increasing or decreasing its operational efficiency.

5.1.3 Growth

The results show that there is a significant effect of growth on ROA for the sample. As noted in the previous section, the effect is positive but decreasing as growth increases. This is in line with Brush et al (2000) and their findings, that growth had a significantly positive effect on firm performance. Introducing a more comprehensive analysis of the variable, this study develops this intuition, also proving a negative non-linear effect of growth. Looking beyond the estimations, it is important to note the limited implications of looking solely at growth when estimating firm success (Kiviluoto, 2013). With this in mind, the underlying factors yielding growth would be interesting to review as well. An example of this could be if the growth enjoyed by a company is due to a severe price reduction or perhaps an acquisition of a competitor. The complexity of this variable is further underlined when looking at the difference between the two sectors. The finding that technology firms have a larger effect, with the difference decreasing with increasing values of growth, indicates that the relationship allows for deeper analysis. The type of growth and the importance of the variable in the two sectors could differ, which could explain why technology firms have a higher effect of growth. Another interpretation could be that technology firms operate in a sector where innovation is crucial in order to survive the competition, whereas many industrial firms have a less interchangeable and more mature business environment. Hence, the finding that growth is more positive for technology firms is logically sound. Industrial firms might not need to grow at a rate equivalent to that of technology firms, which is why the variable is less crucial for these firms. Thus, other variables should be viewed as more influential for firm performance for companies in the industrial sector.

5.1.4 Intang

That regression model 1B proved intangibles to have a negative relation to ROA and that this deviated from the expectations helps answer the first research question of this study. As Ballester et al. (2003) showed the general perception of intangibles is that they are creating firm value. However the results from this study indicates that firms, when experiencing financially troublesome times, were not able to create a return on their intangible assets. This could be related to the fact that intangibles more seldom than often lack direct effect on the core operations of the firm. Rather they might work in the periphery and produce value that can be hard to identify and quantify. This lack of connection to the core operations might negatively affect the real value that intangibles can create and be the reason for the negative relation.

Related to this is the possibility that companies had not found the way to fully realize the potential of the assets and therefore used them inefficiently, something that limits their contribution to ROA. A third explanation to why this relationship occurred could be related to the difficulties in valuing intangibles. As mentioned this process is highly complex and estimating too high values can skew the relations and, holding all else equal, the return produced per unit of intangible is decreased. Estimating the value too low could also be a possibility however with a negative coefficient for this variable, this is more unlikely. This motivates companies to create and develop more accurate methods to measure the true value of their intangibles as they can have large implications on the profit.

That there are significant differences between the sectors indicate, as expected, that technology firms are more heavily reliant on intangibles. However the fact that for most companies the non-linear effect is lower than for industrials proves that not only do technology firms have more intangibles, they are also not as efficient in using them. This raises the question of whether intangibles are capable of creating return on their own or if they need to exist in combination with other assets. The fact that industrials on average have higher levels of PPE, lower levels of intangibles and higher ROA support the idea that in order to make more efficient use of intangibles they need to be secondary and perhaps supporting other assets rather than be the drivers of value. This view is of course limited by the fact that highly technological companies (or companies with high levels of intangibles) can often be profitable as well, indicating efficient use of intangibles. However the implication is that by connecting intangibles closer to tangible assets, a higher efficiency could potentially be gained. A more speculative note is that when comparing the coefficients of Amort and Intang in model 1B, they have almost the same slope. This could indicate that it is rather the fact that amortizations are connected to intangibles that corresponds to most of the negative effect on performance, rather than the intangibles themselves. This would then mean that if companies were able to more accurately value the intangibles, much of the negative effects would disappear. Nonetheless, to be able to conclude that when a firm is financially pressured intangible assets are reducing performance and that they are doing so at a faster pace for technological companies offers interesting conclusions. These are related to whether firms should revalue their intangibles when expecting economic recession, if they should minimize the levels of intangibles or if they should attempt to connect their intangibles to the operations of their tangible assets to a greater extent.

5.1.5 PPETA

The results from Model 1B did not find any significant estimates of the effect of PPETA on ROA. A higher ratio, meaning a higher book value in combination with less accumulated depreciation, could indicate that the machinery is newer and therefore having a larger effect on ROA. This might not be the case as the choice of asset structure could be more complex amongst the firms in the respective sectors, during a time of economic decline. The same complexity goes for investment opportunities where they are to be scarce, in combination with a deterring internal and external supply of capital. Therefore, aspects that simply are hard to account for could affect the ratio of PPETA for each company.

The fact that the estimates were insignificant does not necessarily mean that the inclusion of the variable should be questioned, merely that the tangible assets in the companies did not contribute to the variation in ROA. Almeida and Campello (2007) found similar results, that tangible assets cannot explain firm performance. The effect of these assets should still not be neglected, since it may affect the availability of loans for companies, since asset-backed loans are favorable for creditors. As such, the ratio of PPETA could have an effect on other important issues for companies, for example the availability of external funding, the capital structure chosen and the pace of investments. This aspect could also aid in understanding the findings in Model 2B, where it is presented that technology firms have an initially lower effect of PPETA, but that this relationship changes for relatively low values of PPETA. An interpretation could thus be that technological firms, which are often exposed to a high operational risk, could by adding more tangible assets to their balance sheet reduce the risk to potential creditors and thereby increase the possibility of attaining loans. Explaining the increasing marginal effect, could be the fact that when technology firms progress in their life cycle to a period of more consistent production, they add PPE to their balance sheet, and thereby also experience an increase in ROA. This means that technological firms would benefit from adding more PPETA to their asset structure. However, by doing so the firms would partly deviate from the resource-based view that companies should focus on what internal resources create the most profit. The implications of this analysis should be handled with caution since this view is more firm specific than the analysis above. As mentioned above, the choice of asset structure could depend on other aspects that are of more irrational nature, but the result still points to important notions.

5.1.6 CF

Previous research has not to the knowledge of the authors brought this variable into the analysis when looking at firm performance, and that it proved significant to ROA is not surprising. Due to the fact of it being a proxy for efficiency, a significant and positive relation to ROA explains that if a firm can generate more cash from their operations (being more efficient) they will have a higher return (performance) holding all else equal. The finding that the non-linear marginal effect also proved to be significant and thereto negative means that the benefits of becoming more efficient are decreasing as a company gets increasingly efficient. As this is defined as the funds from operations in this study, it entails that there is only a certain amount of focus that should be put on generating increased operational efficiency in the firm. Even though this may sound obvious, the idea that firms should look at the firm as a whole is here highlighted. Thereby to also put effort and significance to the financial and investment decisions and not only stare blindly at the operational part of the firm, could have large implications. Important to note is the various benefits of generating more cash from the operations of the firm. For example as Chopra, Sodhi (2004) noticed, there are risk reducing effects from generating and accumulating cash in the company and a highly efficient operation is needed to do that. This entails that an operationally efficient firm will enjoy benefits of risk reduction and liquidity improvements, and adding to this the study conducted entails that the there is a level of maximum gain in performance from operational efficiency.

Bates, Kahle & Stulz (2009) indicates that it is becoming increasingly important for firms to accumulate cash but does not distinguish any relative importance based upon sector or firm specific characteristics. This was affirmed by the result in regression 2B where there is no proven difference between the sectors. Together with the relatively low standard deviation from the sample, it is entailed that the firms does not differ very much amongst each other. Put differently; there are no, or weak, industry-specific characteristics related to operational efficiency which aligns with the results of the previously mentioned authors. The ability to generate cash efficiently is important to all firms regardless of sector, however this study adds to this knowledge by indicating that this importance is decreasing for higher values.

5.1.7 CEx

Previous studies have not presented any consistent evidence on the effect of investments in fixed assets on firm performance, which makes the results in this study interesting to analyze. Since the variable proved significant it indicates that investments in fixed assets did have an effect on ROA, even when the investments were of smaller value. As investments increase, the availability of positive NPV[4]-investments will decrease which could explain why the non-linear effect is negative. It is intuitively sound that too high a ratio of capital expenditures to fixed assets is neither economically sound nor sustainable on a long-term basis. The companies that had a higher pace of investments in long-term assets, indicating a long-term focus, did experience more positive returns and therefore were also rewarded on their investments.

When looking at the difference between the sectors, the result is somewhat similar to that of Model 1B. This indicates that technology firms enjoyed a higher marginal effect per unit of additional capital expenditure for relatively small investments, until a certain point where the relationship reverses. On average technology firms made less investments in fixed assets than the firms in the industrial sector. Combining the findings of Skuras, Tsegenidi & Tsekouras (2008) with the regression results in this study, technology firms should increase investments

[4] Net Present Value

in fixed assets since they enjoy a higher marginal effect on those investments. The intuition could be compared to the discussion on the PPETA-variable, where a higher ratio of fixed assets for a technology firm could indicate that the firm has increased production and therefore reached another phase in its business cycle potentially associated with higher output. At that stage, tangible assets are needed to increase output and therefore investments in these assets need to be made in order for the company to improve its operations. This indicates that firms benefit from updating and renewing their fixed assets rather than fully wearing them out as the value of the output is reduced with time. As indicated by the results, the effect of additional investments will decrease when the invested amount increases. Therefore it becomes increasingly important to have sound investment decision rules for firms in both sectors, in order to find the optimal investment levels for fixed assets.

5.1.8 Amort

The variable amortization showed to have a significant negative relation to ROA when looking at the total sample, which was in line with the authors' expectations. This means that when companies incurred amortizations it affected return on assets negatively. The immediate negative impact on ROA is due to the effect amortization has on the treated years' result, since the amount will affect the return to a larger extent than the total assets and thus yield a lower ROA. To clarify, incurring costs from intangibles on a yearly basis (much like depreciations) is likely to have a relatively smaller effect on the eventual value of the assets. This is because a large depletion indicates a significant decrease in assets and thereby also the future value that these produce, making it likely that larger depletions answers to the bulk of the negative effect seen. A write-down of the assets means that they will not yield the expected revenues, and therefore in the coming years will not contribute as anticipated to the return. The results prove that amortizations conclusively negatively affect a firm's performance regardless of the ratio. Drawing on the discussion above it could be that firms need to more accurately evaluate the value of their intangibles in order for them to make annual depletions rather than unexpected and significant amortizations.

As earlier mentioned in part four when looking at regression 2B, the technology sector proved to have a stronger negative relation between amortization and ROA. This is not particularly astounding given that technology firms have a higher average ratio of intangible assets and they have a higher ratio of amortization on these assets. The interesting question here is why the technology sector in percentage amortize more than the industry sector. One explanation could be that technology firms rely more heavily on intangible asset due to the evident presence of such assets in their business model and therefore should also have a larger turnover on intangible assets. Intuitively, a company with a higher ratio of intangibles will depend to a larger extent on these assets. A corresponding value loss in the form of amortizations would then have larger influence on the company's current and future returns. With this motivation as to why technological firms suffer more from amortizations, it highlights the importance and necessity of being able to accurately value the intangibles. This understanding is deepened when realizing that if a firm would have for example an error margin at 5% when valuating intangibles, this would result in higher losses in absolute terms for a firm with higher levels of intangibles.

Having argued for the potential negative effects of amortizations, there are further issues related to the subject. The fact that management can use amortizations as a strategic tool, as indicated by the big bath theory, makes them even more subjective and harder to interpret correctly. The fact that this study proves a negative relationship to ROA implies that the big bath theory holds for the sample and that higher amortizations are likely to be incurred at times of negative results. This also presents the opportunity to exclude a form of earnings management, or earnings smoothing, when it comes to amortizations. This would be seen if high amortizations were incurred during times of positive results in order to smoothen the result over a period, though this effect was not present in this sample. These results combined with the discussions regarding evaluation of intangibles encourages companies to more carefully manage their amortizations and thereby grasp better control of the negative effect it brings.

Chapter 6 Concluding remarks

This chapter will amplify the results and analysis conducted above. It will thereby affirm the academic contribution but will be concluded with a discussion of where future research can add to the findings.

6.1 Academic contribution

The purpose of this study and the blank space it attempts to fill in academic research is whether (1) there are any firm specific variables that have a significant effect on a firm's return on assets during a time of economic recession and (2) if there are any significant differences between industrial and technology firms regarding the above mentioned variables and their effect on return on assets. This has been tested by two separate regression equations in which the results differ somewhat from what previous research has concluded, assuring the study's contribution to the subject at hand. By following the rationale that companies during economic recessions turn to their core operations in order to foster profitability, this study has found that some variables are of higher importance in driving performance looking at the period of 2007-2012. To maintain growth, to accomplish high operational efficiency through cash flow to sales and to further renew and update tangible assets proved to be of great importance for the performance of the firms in the sample. To employ intangibles and to conduct amortizations on these were proven to be negative for firms which further strengthens the reasoning that in struggling times, firms turn to their core business and that intangibles might have a weaker connection to this than other assets.

Throughout the analysis it has been noted that firms need to more accurately value their intangibles and even though IFRS-regulations have improved this area, there is still much to be refined. One way to improve in the area could be, as discussed above, to more explicitly estimate the value per unit created by the intangibles and to apply this to value creating operations. Furthermore this drives the idea that companies need to restructure their evaluation methods since much of the negative effect is likely to be derived from wrongly valued intangibles rather than the assets themselves. For the companies the results of this study entail that amortizations are negative for firm performance whereby firms must learn to manage and time these in order to minimize this effect.

The second research question was concerned with the differences between two highly different sectors and if this could add knowledge to what sector-specific assets might be of importance. There were significant differences in growth, the ratio of intangibles as well as PPE and also the rate of investments in tangible assets recognized by the ratio of capital expenditures. These present various implications for companies however, by taking the results from both regressions presented and adding the analysis from chapter five, these variables presents interesting ideas about how firms can improve their performance during times of economic recession. The fact that the non-linear marginal effect has also been brought forward in the data adds to previous research on these variables as it both entails whether there are levels of diminishing gains, such as proposed by the trade off theory in relation to capital structure, but also allows a deeper understanding of the relation of these variables to the firms' performance. It is important to note that even though the sample only consists of companies listed on OMXS, many of these firms have international operations and these results should not necessarily be limited to operations within Sweden.

6.2 Further research

Even though both regression equations proved robust and to a high degree explaining the variance in ROA, it is certain that variables that were not included in this study affect ROA as well. That no additional qualitative variables have been included has been motivated by the quantitative approach and its appropriateness in answering the research questions, especially the latter. However this does not deem them irrelevant, which make them suitable to be included in future research. Variables such as employee turnover rate, differences in salary and similar organizational aspects would add further to this area of study as to what drives firm performance. Also during the time period chosen, with a lot of macroeconomic movement, with countries starting to lose debt credibility and tightening bank regulations, the financing decisions of these firms are highly affected. This implies that a similar study conducted during a period of more stable conditions would be of great interest as there are many dimensions to the composition of a firm's balance sheet. If different results could be proven by such a study it would present a clear strategy for firms on how to handle and manage shifting economic states.

To extend the time period to cover more than six years extends the possibilities to find trends and more accurate relationships. This could also provide the opportunity to estimate the optimal levels for the variables that proved significant and non-linear. A study relating to this, similar to what the trade off theory provided to the subject of capital structure, could be of great interest and prove applicable in many businesses. In this study the differences between the sectors would likely generate altering results if for example more years or other sectors were included. A widened sample could also be achieved by gathering more firm observations and extending the geographical area to include parts of Europe or similar. Except for being able to have more observations, this could have more detailed implications for firms active on the international or European market. Another interesting separation would be to instead of looking at differences between sectors, look at differences between small and large firms and examine whether there are some guidelines as to how different types of firms can drive their performance. To conclude this, future research has many ways of how to further build on these results and many interesting results are likely to be achieved.

Chapter 7. Bibliography

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7.4 Databases

Thomson Datastream Advanced 5.0, Thomson Financial Ltd.

Chapter 8. Appendices

8.1 Appendix 1. Table of sample companies

[5]**Technology sector –** Company name, *market cap 27/3 2015*

A
Acando, *1 521 588 178*
Addnode, *1 495 316 405*
Anoto, *366 284 895*
Aspiro, *464 085 035*
Axis, *23 630 717 250*

C
Cybercom, *470 947 082*

E
Enea, *1 502 390 229*
Ericsson, *335 371 191 870*

F
Formpipe, *398 640 046*

H
HiQ International, *2 343 430 914*

I
Industrial &Financial Systems, *6 748 282 878*

K
Knowit, *1 043 577 566*

M
Micro Systemations, *684 204 000*
MultiQ Interantional, *106 714 626*

N
Net insight, *1 232 442 139*
Novotek, *165 620 000*

P
Prevas, *168 254 658*
Proact, *835 382 797*

S
Seamless Distribution, *674 755 411*
Softronic, *334 987 060*

T
Tieto, *14 985 846 191*

Industry Sector – *Company name, Market Cap 27/3 2015*

A
ABB, *103 154 203 794*
Addtech, *534 987 872*
Alfa Laval, *71 223 682 287*
Assa Abloy, *180 589 454 143*
Atlas Copco, *101 613 029 683*

B
Beijer Alma, *5 145 811 200*

E
Elanders, *1 129 558 460*

F
Fagerhult, *5 290 987 500*

H
Hexagon, *100 796 803 236*

I
Indutrade, *15 348 000 000*

L
Lindab, *5 686 639 995*

M
Mycronic, *5 238 533 232*

N
Nibe, *20 400 890 882*
Nolato, *4 862 663 652*

S
SAAB, *24 569 421 931*
Sandvik, 121 675 434 531
SKF, *92 729 841 114*
Sweco, *9 180 115 325*

T
Trelleborg, *40 703 545 187*

V
Volvo, *168 303 819 112*

Å
ÅF, 9 148 440 596

[5] Firm years excluded in model 1B and 2B: **Anoto** 2011, **Aspiro** 2008, 2010, 2012 **Axis** 2007, 2008, 2010, 2011, 2012, **Micro Systemation** 2007, 2008, 2010, **Seamless Distribution** 2007

8.2 Appendix 2. EViews outputs of regression results and tests

Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/11/15 Time: 12:48
Sample (adjusted): 10/01/2007 10/01/2012
Periods included: 6
Cross-sections included: 42
Total panel (balanced) observations: 252
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	34.80320	102.9685	0.337999	0.7357
LEVERAGE	0.047487	0.048344	0.982279	0.3272
SIZE	-3.962580	12.92231	-0.306646	0.7595
GROWTH	-0.032373	0.068450	-0.472940	0.6368
INTANG	-0.522231	0.206548	-2.528377	0.0123
PPETA	1.590083	0.475506	3.343979	0.0010
CF	0.740585	0.088429	8.374879	0.0000
CEX	1.399280	1.139269	1.228227	0.2209
AMORT	-0.278055	0.089187	-3.117655	0.0021
LEVERAGE^2	-0.001863	0.000848	-2.196355	0.0293
SIZE^2	0.109026	0.392533	0.277749	0.7815
GROWTH^2	0.000724	0.000648	1.116110	0.2658
INTANG^2	0.005990	0.002805	2.135553	0.0340
PPETA^2	-0.034357	0.008845	-3.884439	0.0001
CF^2	-0.003064	0.004524	-0.677268	0.4991
CEX^2	-0.098469	0.074961	-1.313604	0.1906
AMORT^2	-0.000113	0.000551	-0.204284	0.8384

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.899322	Mean dependent var	7.149960
Adjusted R-squared	0.866295	S.D. dependent var	11.82653
S.E. of regression	4.324452	Akaike info criterion	5.978766
Sum squared resid	3534.467	Schwarz criterion	6.861123
Log likelihood	-690.3245	Hannan-Quinn criter.	6.333808
F-statistic	27.23012	Durbin-Watson stat	2.229250
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/11/15 Time: 12:50
Sample: 10/01/2007 10/01/2012 IF ROA>-25 AND ROA<25
Periods included: 6
Cross-sections included: 42
Total panel (unbalanced) observations: 239
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	66.67913	52.37607	1.273084	0.2047
LEVERAGE	-0.010062	0.037010	-0.271884	0.7860
SIZE	-7.231603	8.323482	-0.868819	0.3861
GROWTH	0.095962	0.032625	2.941319	0.0037
INTANG	-0.226931	0.059352	-3.823500	0.0002
PPETA	0.041301	0.172612	0.239272	0.8112
CF	0.597152	0.068354	8.736200	0.0000
CEX	1.159564	0.630162	1.840103	0.0674
AMORT	-0.206849	0.040608	-5.093806	0.0000
LEVERAGE^2	-0.001010	0.000796	-1.268132	0.2064
SIZE^2	0.220761	0.336713	0.655637	0.5129
GROWTH^2	-0.000777	0.000353	-2.203002	0.0289
INTANG^2	0.000918	0.000999	0.918781	0.3595
PPETA^2	-0.004067	0.004599	-0.884492	0.3776
CF^2	-0.007098	0.003242	-2.189608	0.0299
CEX^2	-0.076910	0.043305	-1.776024	0.0775
AMORT^2	0.001939	0.000216	8.975807	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.872264	Mean dependent var	7.469038
Adjusted R-squared	0.827266	S.D. dependent var	7.093633
S.E. of regression	2.948207	Akaike info criterion	5.221489
Sum squared resid	1529.779	Schwarz criterion	6.137879
Log likelihood	-560.9679	Hannan-Quinn criter.	5.590769
F-statistic	19.38449	Durbin-Watson stat	2.223844
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/11/15 Time: 12:52
Sample (adjusted): 10/01/2007 10/01/2012
Periods included: 6
Cross-sections included: 42
Total panel (balanced) observations: 252
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	120.8742	76.38129	1.582511	0.1154
LEVERAGE	0.115745	0.058637	1.973919	0.0500
SIZE	-19.00792	14.97924	-1.268951	0.2062
GROWTH	-0.029822	0.025307	-1.178422	0.2402
INTANG	-0.091140	0.065840	-1.384257	0.1681
PPETA	-0.074322	0.183404	-0.405237	0.6858
CF	0.641302	0.118388	5.416958	0.0000
CEX	-0.499806	0.736629	-0.678505	0.4984
AMORT	0.074362	0.063300	1.174767	0.2417
LEVERAGE^2	-0.001861	0.000703	-2.648812	0.0088
SIZE^2	0.707802	0.515236	1.373743	0.1713
GROWTH^2	0.001154	0.000498	2.315676	0.0217
INTANG^2	-0.002337	0.001185	-1.971373	0.0503
PPETA^2	-0.001733	0.003714	-0.466459	0.6415
CF^2	-0.004288	0.004444	-0.964961	0.3359
CEX^2	0.030669	0.046749	0.656042	0.5127
AMORT^2	-0.000321	0.000589	-0.544777	0.5866
LEVERAGE*DUMMY_BRANSCH	-0.067080	0.228649	-0.293375	0.7696
SIZE*DUMMY_BRANSCH	3.713288	14.54412	0.255312	0.7988
GROWTH*DUMMY_BRANSCH	0.059600	0.051610	1.154819	0.2498
INTANG*DUMMY_BRANSCH	-0.651195	0.207667	-3.135762	0.0020
PPETA*DUMMY_BRANSCH	0.326526	1.293109	0.252512	0.8009
CF*DUMMY_BRANSCH	0.179451	0.167991	1.068217	0.2869
CEX*DUMMY_BRANSCH	2.700308	0.597572	4.518803	0.0000
AMORT*DUMMY_BRANSCH	-0.381106	0.122848	-3.102268	0.0022
LEVERAGE^2*DUMMY_BRANS	-0.001741	0.005588	-0.311489	0.7558
SIZE^2*DUMMY_BRANSCH	-0.117637	0.502421	-0.234140	0.8152
GROWTH^2*DUMMY_BRANSC	-0.001018	0.000677	-1.503240	0.1346
INTANG^2*DUMMY_BRANSCH	0.009207	0.002319	3.969964	0.0001
PPETA^2*DUMMY_BRANSCH	-0.001173	0.108990	-0.010762	0.9914
CF^2*DUMMY_BRANSCH	-0.002561	0.006819	-0.375518	0.7077
CEX^2*DUMMY_BRANSCH	-0.151407	0.091732	-1.650544	0.1006
AMORT^2*DUMMY_BRANSCH	0.000134	0.000824	0.162037	0.8715

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.937144	Mean dependent var	7.149960
Adjusted R-squared	0.908804	S.D. dependent var	11.82653
S.E. of regression	3.571460	Akaike info criterion	5.634673
Sum squared resid	2206.672	Schwarz criterion	6.741121
Log likelihood	-630.9688	Hannan-Quinn criter.	6.079885
F-statistic	33.06802	Durbin-Watson stat	2.093333
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/11/15 Time: 12:52
Sample: 10/01/2007 10/01/2012 IF ROA>-25 AND ROA<25
Periods included: 6
Cross-sections included: 42
Total panel (unbalanced) observations: 239
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	140.4806	89.40320	1.571315	0.1181
LEVERAGE	0.078927	0.051188	1.541916	0.1251
SIZE	-17.23092	18.48160	-0.932328	0.3526
GROWTH	-0.022297	0.023861	-0.934491	0.3515
INTANG	-0.048988	0.045545	-1.075611	0.2837
PPETA	-0.072946	0.253298	-0.287986	0.7737
CF	0.680769	0.122259	5.568250	0.0000
CEX	-0.882045	0.560380	-1.574011	0.1175
AMORT	0.073410	0.079169	0.927256	0.3552
LEVERAGE^2	-0.001489	0.000662	-2.246969	0.0260
SIZE^2	0.671556	0.626024	1.072732	0.2850
GROWTH^2	0.000853	0.000566	1.507989	0.1335
INTANG^2	-0.002604	0.001120	-2.324888	0.0213
PPETA^2	-0.001737	0.004700	-0.369674	0.7121
CF^2	-0.006212	0.004425	-1.403855	0.1623
CEX^2	0.052226	0.035655	1.464753	0.1450
AMORT^2	-8.94E-05	0.000619	-0.144442	0.8853
LEVERAGE*DUMMY_BRANSCH	-0.165026	0.168698	-0.978237	0.3294
SIZE*DUMMY_BRANSCH	-5.560207	28.17464	-0.197348	0.8438
GROWTH*DUMMY_BRANSCH	0.145906	0.046717	3.123212	0.0021
INTANG*DUMMY_BRANSCH	-0.609446	0.166988	-3.649631	0.0004
PPETA*DUMMY_BRANSCH	-1.574657	0.500630	-3.145351	0.0020
CF*DUMMY_BRANSCH	-0.196030	0.167730	-1.168724	0.2443
CEX*DUMMY_BRANSCH	2.363060	0.399305	5.917927	0.0000
AMORT*DUMMY_BRANSCH	-0.224891	0.062803	-3.580877	0.0005
LEVERAGE^2*DUMMY_BRANS	0.001534	0.003992	0.384183	0.7014
SIZE^2*DUMMY_BRANSCH	0.164073	1.062070	0.154484	0.8774
GROWTH^2*DUMMY_BRANSC	-0.002012	0.000928	-2.169152	0.0315
INTANG^2*DUMMY_BRANSCH	0.007786	0.001274	6.109178	0.0000
PPETA^2*DUMMY_BRANSCH	0.165331	0.027038	6.114818	0.0000
CF^2*DUMMY_BRANSCH	0.001593	0.008042	0.198071	0.8432
CEX^2*DUMMY_BRANSCH	-0.106827	0.059170	-1.805411	0.0729
AMORT^2*DUMMY_BRANSCH	0.000709	0.000916	0.773801	0.4402

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.892937	Mean dependent var	7.469038
Adjusted R-squared	0.840744	S.D. dependent var	7.093633
S.E. of regression	2.830845	Akaike info criterion	5.178825
Sum squared resid	1282.189	Schwarz criterion	6.327949
Log likelihood	-539.8696	Hannan-Quinn criter.	5.641891
F-statistic	17.10837	Durbin-Watson stat	2.133632
Prob(F-statistic)	0.000000		

Correlated Random Effects - Hausman Test
Equation: EQ01B
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	35.062524	16	0.0039

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LEVERAGE	-0.021138	-0.023799	0.001197	0.9387
SIZE	-6.252271	3.815717	67.253975	0.2196
GROWTH	0.118815	0.103257	0.000067	0.0581
INTANG	-0.258645	-0.146918	0.006371	0.1616
PPETA	0.028651	0.032075	0.068965	0.9896
CF	0.600520	0.702826	0.000970	0.0010
CEX	1.165188	0.990404	0.032319	0.3309
AMORT	-0.213500	-0.272421	0.000331	0.0012
LEVERAGE^2	-0.000716	-0.000386	0.000001	0.6462
SIZE^2	0.163635	-0.134815	0.093012	0.3278
GROWTH^2	-0.000953	-0.000919	0.000000	0.7390
INTANG^2	0.001088	-0.000009	0.000001	0.2173
PPETA^2	-0.003468	-0.004422	0.000022	0.8395
CF^2	-0.007026	-0.007433	0.000001	0.7358
CEX^2	-0.075480	-0.066528	0.000140	0.4497
AMORT^2	0.002109	0.002556	0.000000	0.0012

Cross-section random effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/25/15 Time: 16:45
Sample: 10/01/2007 10/01/2012 IF ROA>-25 AND ROA<25
Periods included: 6
Cross-sections included: 42
Total panel (unbalanced) observations: 239

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	65.72517	58.98641	1.114243	0.2667
LEVERAGE	-0.021138	0.065850	-0.320997	0.7486
SIZE	-6.252271	8.638164	-0.723796	0.4701
GROWTH	0.118815	0.019518	6.087360	0.0000
INTANG	-0.258645	0.114037	-2.268083	0.0245
PPETA	0.028651	0.326242	0.087822	0.9301
CF	0.600520	0.065565	9.159199	0.0000
CEX	1.165188	0.423034	2.754362	0.0065
AMORT	-0.213500	0.048730	-4.381257	0.0000
LEVERAGE^2	-0.000716	0.001213	-0.590523	0.5556
SIZE^2	0.163635	0.317594	0.515235	0.6070
GROWTH^2	-0.000953	0.000264	-3.615664	0.0004
INTANG^2	0.001088	0.001364	0.797927	0.4260
PPETA^2	-0.003468	0.006893	-0.503051	0.6155
CF^2	-0.007026	0.002721	-2.582218	0.0106
CEX^2	-0.075480	0.032937	-2.291653	0.0231
AMORT^2	0.002109	0.000398	5.293134	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Correlated Random Effects - Hausman Test
Equation: EQ02B
Test cross-section random effects

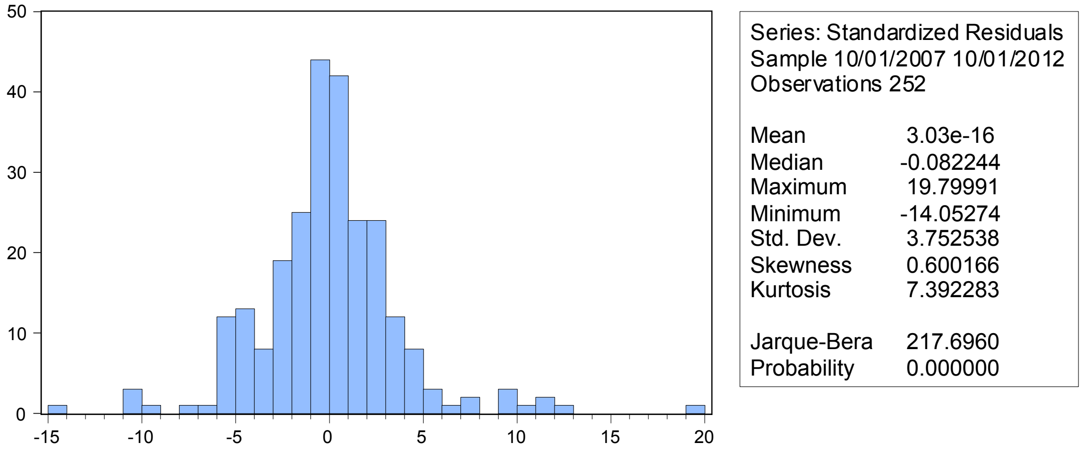
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	73.507302	32	0.0000

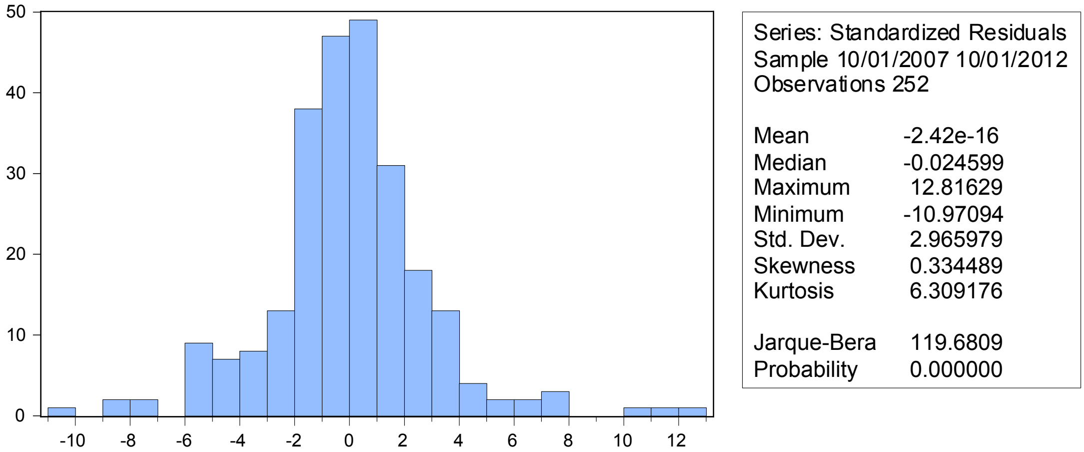
Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LEVERAGE	0.096650	0.194010	0.003262	0.0883
SIZE	-18.921389	6.051160	498.723635	0.2635
GROWTH	0.018599	0.044246	0.000486	0.2446
INTANG	-0.128801	0.096191	0.009016	0.0178
PPETA	-0.115850	-0.176976	0.164600	0.8802
CF	0.658649	0.657283	0.009135	0.9886
CEX	-0.533136	0.539546	0.145965	0.0050
AMORT	0.075844	-0.264774	0.007238	0.0001
LEVERAGE^2	-0.001278	-0.003070	0.000001	0.0293
SIZE^2	0.677047	-0.190294	0.528874	0.2330
GROWTH^2	0.000206	-0.000118	0.000000	0.5432
INTANG^2	-0.002505	-0.003567	0.000002	0.4600
PPETA^2	-0.001265	0.000282	0.000048	0.8228
CF^2	-0.002666	-0.000414	0.000069	0.7869
CEX^2	0.035717	-0.031539	0.000670	0.0094
AMORT^2	0.000029	0.002050	0.000000	0.0005
LEVERAGE*DUMMY_BRANSCH	-0.184503	-0.237110	0.010565	0.6088
SIZE*DUMMY_BRANSCH	4.341790	1.865703	746.052176	0.9278
GROWTH*DUMMY_BRANSCH	0.141569	0.095205	0.000658	0.0707
INTANG*DUMMY_BRANSCH	-0.457660	-0.402859	0.035671	0.7717
PPETA*DUMMY_BRANSCH	-1.344229	0.470265	0.645987	0.0240
CF*DUMMY_BRANSCH	-0.152800	0.030031	0.011247	0.0847
CEX*DUMMY_BRANSCH	2.026568	0.358703	0.254771	0.0010
AMORT*DUMMY_BRANSCH	-0.256725	-0.033944	0.009858	0.0248
LEVERAGE^2*DUMMY_BRANS	0.001486	0.001880	0.000005	0.8566
SIZE^2*DUMMY_BRANSCH	-0.213365	-0.088534	0.915090	0.8962
GROWTH^2*DUMMY_BRANSC	-0.001602	-0.001139	0.000000	0.4056
INTANG^2*DUMMY_BRANSCH	0.007041	0.005400	0.000005	0.4495
PPETA^2*DUMMY_BRANSCH	0.130938	-0.059830	0.004485	0.0044
CF^2*DUMMY_BRANSCH	-0.002360	-0.007890	0.000072	0.5156
CEX^2*DUMMY_BRANSCH	-0.090301	-0.009972	0.001834	0.0607
AMORT^2*DUMMY_BRANSCH	0.001275	0.001297	0.000001	0.9815

Cross-section random effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/25/15 Time: 16:44
Sample: 10/01/2007 10/01/2012 IF ROA>-25 AND ROA<25
Periods included: 6
Cross-sections included: 42
Total panel (unbalanced) observations: 239

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	133.7350	102.7739	1.301255	0.1950
LEVERAGE	0.096650	0.105650	0.914810	0.3616
SIZE	-18.92139	22.48858	-0.841378	0.4014
GROWTH	0.018599	0.036430	0.510538	0.6104
INTANG	-0.128801	0.154613	-0.833059	0.4060


Series: Standardized Residuals
Sample 10/01/2007 10/01/2012
Observations 252
Mean 3.03e-16
Median -0.082244
Maximum 19.79991
Minimum -14.05274
Std. Dev. 3.752538
Skewness 0.600166
Kurtosis 7.392283
Jarque-Bera 217.6960
Probability 0.000000


Series: Standardized Residuals
Sample 10/01/2007 10/01/2012
Observations 252
Mean -2.42e-16
Median -0.024599
Maximum 12.81629
Minimum -10.97094
Std. Dev. 2.965979
Skewness 0.334489
Kurtosis 6.309176
Jarque-Bera 119.6809
Probability 0.000000