Norwegian School of Economics

Bergen, V2017

Business Cycles and Capital Structure

Can Firms Strategically Adapt Their Capital Structure In Order to Gain Superior Profits?

Stian Frøsland Arnesen

Supervisor: Lasse Lien

ENE

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

This paper tests whether firm capital structure can be strategically adapted to the different phases of the business cycle. Relevant theoretical works are presented. Data sourced from SNF/NHH on all firms registered in “Brønnøysundregisteret” in the period 2000 untill 2013 is used together with regression analysis in order to find statistically significant relationships. Evidence is found for an optimal debt ratio. Furthermore this optimum changes with time opening up for the potential possibility of strategically adapting the debt ratio to the cycle in order to maximize firm performance.

Acknowledgements

This thesis concludes the study program Master of Science in Economics and Business Administration at the Norwegian School of Economics (NHH). During my studies I have developed a particular interest in strategic business management, finance and econometric analysis. These interests cumulate in the work presented in this paper. In my opinion, business decisions have the best possible foundation when based on actionable insights derived from data analysis. Business decision-making will always be a trade-off between the marginal returns of increased analytical precision and the cost of gaining this precision. This such analysis particularly valuable when made in relation to decisions with wide reaching effects and high impact on the business.

Writing this thesis has been among the most challenging tasks performed during my time at NHH. It has given me valuable insights into many new areas of research, and also added to my experience with working on larger projects. I would especially like to thank my thesis supervisor, Lasse Lien, for his support and guidance throughout this process.

Stian Frøsland Arnesen

Bergen, 2017

Table of Contents

1 Introduction

In this section I will provide a brief introduction to the theory behind business cycles. Then, I will take a look at the potential predictability of such cycles. Finally I will highlight some ways companies can take advantage of the change in macroeconomic activity that business cycles represent.

In the words of Eugene F. Fama:

> "Finally, the perceptive reader will surely recognize instances in this part where relevant works are not specifically discussed. In such cases my apologies should be taken for granted."

Due to the rich nature of this area of research, and the need to stay within the scope of this paper, I am unfortunately forced to limit myself to a smaller sample of select works. However, it is my opinion that the works selected help to provide a good foundation for the main theoretical concepts that I presented later, as well as the subsequent analysis and discussion.

1.1 Purpose

The purpose of this paper is to answer the main research question and its underlying hypotheses.

Can superior firm performance be gained by strategically adapting the capital structure to business cycle fluctuations?

. Multiple studies have measured the impact of business cycles on firms. However, to my knowledge few to have chosen to focus directly on how firms might be able to strategically adapt to these changes. It is my hope that this a paper will contribute to the field with by setting the stage for further research.

1.2 Business cycles

Economists have recognized the importance of business cycle for a long time. At the same time, it has been clear that cycles in aggregate economic output do not necessarily "swing" in a symmetrical fashion. The economy tend to move in cycles of booms and busts, but these positive and negative shocks are not mirror images of each other. As W. C. Mitchell notes "Business contraction seem to be a briefer and more violent process than business expansions." (Mitchell, 1927, p. 333) Put differently, the economy moves in cycles of booms and recessions, but these are not mirror images of each other. This brevity and amplitude of the downswing makes them particularly interesting from a business perspective, both from a perspective of managing risks as well as capturing opportunities.

When referring to recessions it is important to note that I am not referring directly financial phenomena such as the financial crisis (Grytten & Hunnes, 2010), but rather fluctuations in the real economy. Financial market fluctuations can most certainly have strong implications on business performance. In fact financial turmoil is often correlated with real economic problems (Goldsmith, 1982) (Kindleberger & Aliber, 2005). However, business cycles refer principally to movements in real economic output. Where financial market aspects are mentioned they will be discussed mainly in the context of their impact on the real economy.

1.2.1 Phases

There are multiple ways of defining a business cycle. The American way is based on a set of indicators developed by the NBER. The main indicator of a recession in the NBER model is two or more consecutive quarters with negative growth in GDP (Benedictow & Johansen, 2005). However, even in periods of extended growth the economic output can still exhibit a cyclic behavior. It has therefore become common to view the economic growth in contrast to an underlying trend (Benedictow & Johansen, 2005). In this model a period of economic output below the trend is defined as a recession. Conversly, a period of economic output above the trend is defined as a boom. Moverover, the points at which distance between the trend and economic output is at its most positive and negative are considered the cyclical top and bottom respectively. These definitions also gives rise to a set of distinct phases that each cycle will tend to follow. There is some difference between the european and american definitions here. For this paper I will follow the line of previous works (Henriksen &

Kvaslerud, 2012) (Fjelltveit & Humling, 2012) (Brynhildsrud, 2013) (Bolle & Hundvin, 2015)and use the european definition.

The european definition divide the cycle into 4 phases; expansion, slowdown, downturn and recovery. The expansion phase takes place when economic output is above the trend line and is progressing towards the cyclical top. When the cyclial top has been reached and the difference in output and trend is diminishing the economy is in a slowdown phase. The downturn phase starts when the output falls below the trend and towards an eventual cyclical bottom. When the output passes the cyclical bottom and the negative difference between trend and economic output is dimishing the economy has entered the recovery phase (Benedictow & Johansen, 2005).

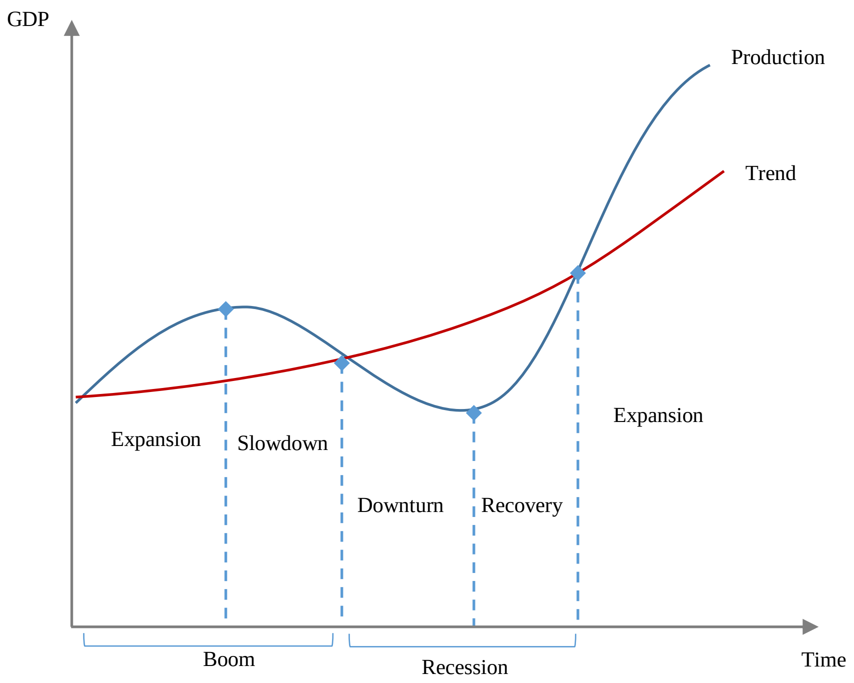


Figure 1: Phases of the Business Cycle, adapted from Benedictow & Johansen (2005)

1.2.2 The Trend

As discussed above the phases of an economic cycle is typically defined according to the difference between economic output and an underlying trend – the output gap. It therefore follows that the identification of the trend is of considerable importance (Canova, 1998). A balance must be struck between a static linear trend that does not account for long-term changes to the economy and following every movement the economy makes.

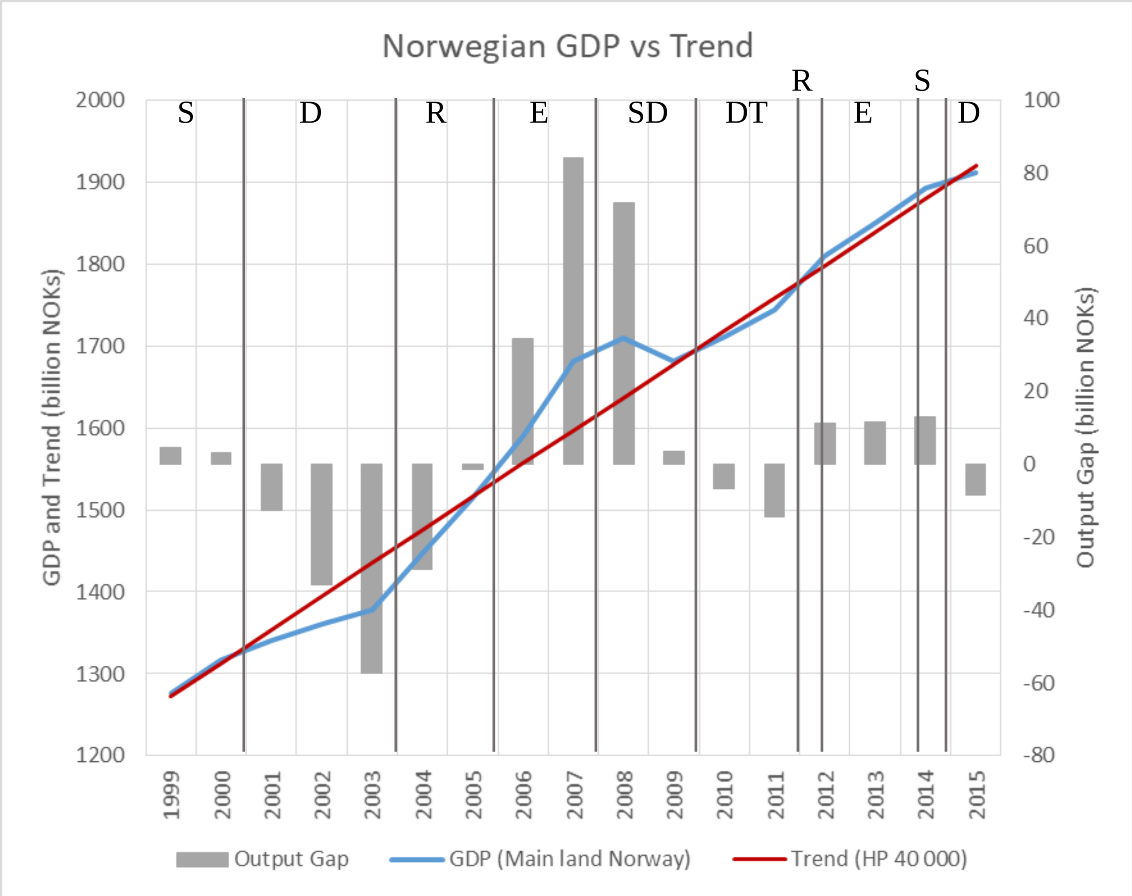
Today's standard method for identifying the trend was proposed by Hodrick and Prescott (1997), and is called the Hodrick and Prescott filter, or HP filter. The HP filter models the trend by applying an algorithm to mathematically smooth the actual production. Stated more formally, the method identifies the trend line by minimizing the following expression:

$$\Sigma[y - y^*]^2 + \lambda\Sigma[(y^*_{t+1} - y^*_t) - (y^*_t - y^*_{t-1})]^2$$

In the expression y represents the actual economic output while y^* is the "potential" output, or output level of the trend line. As can be seen the expression has two parts. The first sums the squared differences between the trend and the actual output, or output gap. When this part of the expression becomes smaller the trend will follow the economic output more closely. The second part sums the differences in growth between each consecutive year squared. When this part of the expression becomes smaller the trend will more closely resemble a straight line. This is because only a straight line has zero difference in growth between two consecutive intervals.

Finally λ determines the weighting between the two parts. A small value for λ will translate into a more sensitive trend line that follows the more minor changes in economic output, while a larger value for λ means a less sensitive trend following the larger tendencies in the economy. Given the correct value of λ the result is a trend line that follows the general tendencies of the economic output rather than the local tops and bottoms of the cycle.

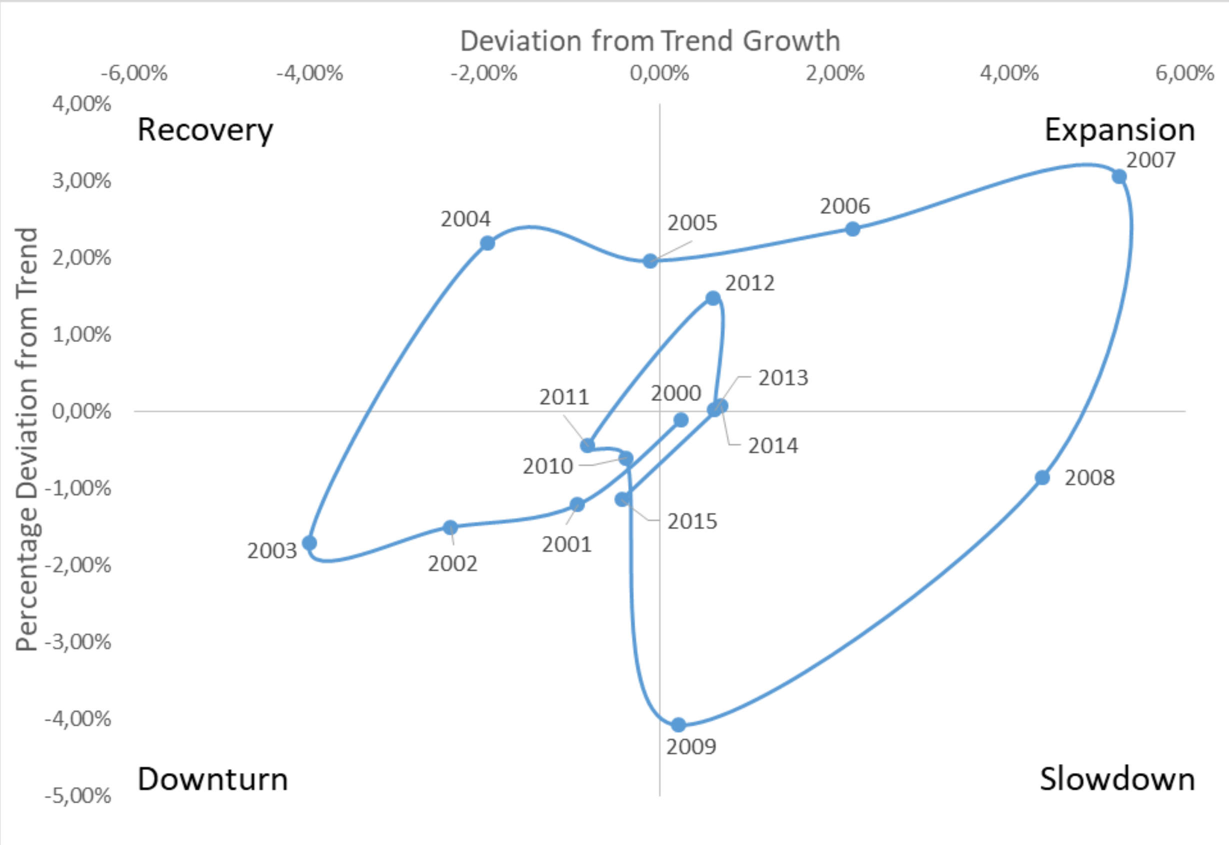
For this paper I will follow the guidelines set by the Norwegian Central Statistical Bureau (SSB) and use a filter with a λ-value of 40 000 (Johansen & Eika, 2000). A potential weakness with the HP filter comes from how it uses values of potential economic output that are 1 time period forward and 1 time period backwards. This causes it to become more sensitive to the actual level of output at the beginning and at the end of a data series, where the final value does not exist. However, I do not judge this issue to be detrimental for the purposes of this paper.



Graph 1: Annual GDP for mainland Norway vs Trend (HP 40 000) between 1999 and 2015, constant prices (base year = 2005)
Data sourced from Statistics Norway (SSB, 2016). All numbers in billion NOKs.

As can been seen from the graph above, the Norwegian real economic output fluctuate around the trend. By using the definitions outlined above these fluctuations can be separated into distinct phases of economic slowdown (SD), downturn (DT), recovery (RC) and expansion (EX). Note that the data used is reported in annual resolution. This level of granularity means that the separation between phases will not be perfect. Nevertheless, it does seem like the fluctuations around the trend follows a cyclic pattern.

Interestingly, within this time frame the output gap was at its most negative in 2003 following the dot-com bubble, and most positive in 2007 before the 2008 recession. The real GDP growth was the most above trend in 2007 and the most below in 2009 during the slowdown phase of the 2008 recession. A more clear illustration of the cyclic behavior of the Norwegian economy can be seen in the diagram below.



Graph 2: Business Cycle Phases 2000-2015, adapted from Johansen & Eika (2000).
Trend calculated using HP 40 000. Data sourced from Statistics Norway (SSB, 2016).

1.2.3 Potential Prediction

The predictability of macroeconomic activity has been disputed (Backman, 2014). However, studies seem to find evidence for the predictability of cyclic activity (Estrella & Mishkin, 1998). Multiple studies indicate that the interest rate spread, or yield curve, plays an important role in anticipating recessions (Wheelock & Wohar, 2009) (Plosser & Rouwenhorst, 1994). Joseph et al. (2011) also notes how the recession forecasting ability of the interest spread has remained remarkably stable across time. Previous master theses seem to indicate that the term structure holds similar predictive characteristics for the Norwegian real economy (Andersen & Frengstad, 2008). The use of newer analytical methods like neural networks also seem to support predictability of business cycles (Shaaf, 2000)(Qi, 2001)(Nyman & Ormerod, 2016). Neural networks, or deep learning algorithms, can be used to classify samples of data where traditional linear based methods tend to fall short (Goodfellow, Bengio, & Courville, 2016).

Such methods draw their inspiration from nature and the structure of neurons, and can show superior performance when attempting to find more non-linear and less apparent relationships (Goodfellow, Bengio, & Courville, 2016). A full breakdown of deep learning algorithms and their application to business cycle prediction is outside the scope of this paper. However, such methods are gaining popularity within the data analytics field and are being deployed by well-known market actors like IBM (Sedlak, 2016) and Google (Le & Schuster, 2016), as well as in artificial intelligence research (Hardesty, 2017).

1.2.4 Firm Adaption

There are multiple ways a firm can adapt to and exploit the movements of business cycles. Navarro (2004) (2009), Ghemawat (2009) and Gulati et al. (2010) highlight a range of managerial decisions that can help a business increase profitability through a cycle.

These tend to revolve around investment decisions and the firm cost structure. Because large expansion investment decisions rely on an assumed level of demand (Pergler & Rasmussen, 2014) they could be sensitive to business cycles. An investment needs to generate more revenues than costs in order to be profitable. With a drop in demand the investment may no longer be able to generate adequate returns to justify the costs.

Furthermore, a leveraged operational cost structure with a high share of fixed costs can benefit the company when demand is increasing. However, with a recessionary drop in demand these fixed costs can become a burden, dragging the firm’s profit levels down. This holds true both for operational leverage, that is the cost structure of firm operations, as well as financial leverage which springs from the capital structure.

A central element to exploiting these effects is understanding what part the cycle the economy is in. With no overview, the financial risk of committing resources straight before a demand drop must be balanced with the competitive risk of not committing resources at the onset of a boom (Ghemawat, 2009). By gaining some level of macroeconomic insight firms can go from blind risk balancing to strategically adapting to the different phases of the cycle.

In this paper I will focus on financial leverage. This is partly due to the difficulties related with measuring operational leverage. The available data does not provide a clear categorization of fixed and variable costs. Such a lack of distinction in the data material is understandable. Some cost types can show both variable and fixed characteristics. An example of this is labor costs, where it can be argued that overtime is a relatively variable cost while the base pay is relatively more fixed.

Additionally, operational leverage can also be related to the choice of production technology. When such decisions require large and long term investments in production facilities it also becomes more difficult to vary such cost structures strategically with the business cycle. On the other hand, the liquidity of financial markets should allow firms to make changes in the capital structure faster and more easily than in its real capital.

2 Theory and Literature review

In this section I will present relevant theory and works that has been done in relation to corporate structure and recessions. First I will briefly explain my chosen financial statement metrics. Then I will dive deeper into corporate structure and its implication for business cycles. Finally I will present some key works from the field of strategy. Based on the insights from these theoretical foundations I will formulate own hypotheses. An overview of the hypotheses can be presented at the end of this section.

2.1 Financial Statement Analysis

In this sub section I will outline the dependent variables, explanatory variables and control variables that I will use in my analysis. A short explanation and justification for each metric follows.

2.1.1 Return on Assets

The return on assets (ROA) measures the firm's ability to produce returns given the assets under its control. It is similar to the return on capital (ROC) but includes all assets whereas the ROC excludes current liabilities. Another measure of returns include economic value added (EVA) and return on equity (ROE). The ROE is an interesting metric, but can be problematic as equity value may fluctuate during turbulent periods like a recession. The ROA would arguably be more stable and thus better suited for the purposes of this paper. There are multiple ways of calculating the ROA. In order to better facilitate comparability I will follow the line of previous master theses (Fjelltveit & Humling, 2012) (Brynhildsrud, 2013) (Bolle & Hundvin, 2015) and use the following definition.

$$ROA = \frac{Net\ income}{Total\ Assets}$$

It should be noted that the use of ROA to measure profitability comes with some drawbacks. The metric compares net income to book-value assets. As Brealy et al. (2014) explains, other value assets such as brand value may not be properly accounted for. However, this limitation is hard to over-come and ROA is still considered a good measurement of firm performance.

Firm returns can further be split into margin and turnover. This relationship is sometimes referred to as the Du Pont formula after the chemical company Du Pont that made it popular (Brealey, Myers, & Allen, 2014).

$$ROA = Margin \times Turnover = \frac{Net\ Income}{Total\ Revenues} \times \frac{Total\ Revenues}{Total\ Assets}$$

The Du Pont formula helps break down the drivers of a firm's ROA. The margin is defined as the proportion of sales revenues that the company retain while the turnover measures the firm's ability to generate sales from its assets. Thus to truly capture the firm performance it will be useful to add another metric. The EBITDA margin is a commonly used metric for firm performance. It measures the Earnings Before Interests, Tax, Depreciation and Amortization divided by the total revenues.

$$EBITDA\ Margin = \frac{EBITDA}{Total\ Revenues}$$

Note that the EBITDA differs from net income. This means that the EBITDA margin will deviate somewhat from the margin outlined in the Du Pont formula. However, for the purposes of this paper the general principle still holds. Furthermore the EBITDA margin allows easier comparison between firms as it is not influenced directly by capital structure through interest costs. This also makes it easier to isolate other effects of capital structure on firm performance.

2.1.2 Debt Ratio

A prime focus of this paper is the effect of capital structure on firm performance throughout the business cycle. As outlined by Brealey et al. (2014) there exists several ways of measuring financial leverage. The two common methods are the debt-to-equity ratio and the debt to assets ratio. The debt-to-equity ratio yields the debt as a multiple of the equity of the firm. Debt to assets on the other hand measures what percentage of the capital base is financed by debt. I will measure financial leverage by the debt to assets ratio because it returns a value between 0 and 1 and is relatively easy to interpret. I define it as follows:

$$Debt\ Ratio = \frac{Total\ liabilities}{Total\ assets}$$

2.1.3 Firm-level Control Variables

2.1.3.1Delta Equity

When measuring the corporate capital structure of firms I will primarily use the debt ratio. It is important to note that the debt ratio is a relative measurement. It looks solely on the balance between the book values of equity and debt. This means that the debt ratio will also be influenced by changes in equity. If the firm is forced to take write-downs during harsh economic periods like a recession, the debt ratio might increase even though the firm made no direct changes to their financing. In order to control for this I will include change in book equity as a control variable.

$$\Delta Equity_t = \frac{Equity_t - Equity_{t-1}}{Equity_{t-1}}$$

2.1.3.2Firm Growth

Firm growth has been shown to impact firm performance by multiple (Geroski & Gregg, 1993) (Davidsson, Steffens, & Fitzsimmons, 2009) (Senderovitz, Klyver, Steffens, &

Davidsson, 2010) studies (Lien & Knudsen, 2012). However, the relationship is not always clear. Senerovitz et al. (2010) points out that two divergent theoretical positions exist. One argue that entering a market rapidly will aid firms in becoming more profitable through first mover advantages and economies of scale. The other argues rapid growth can lead to internal challenges related to internal fit. These include rapid changes in decision making, management, structure, etc. For these reasons I will include firm growth as a control variable. There are multiple ways to measure growth (Delmar, Davidsson, & Fartner, 2003). In this paper I will use the following metric:

$$Firm\ Growth = \frac{Total\ Revenues_t - Total\ Revenues_{t-1}}{Total\ Revenuest_{t-1}}$$

2.1.3.3Prior Profitability

Lien and Knudsen (2012) report that prior profitability tend to predict future profitability for Norwegian firms. This autocorrelation makes sense from a view point of strategic resources. Firms with inimitable resources could display superior profit levels due to sustained competitive advantages (Barney J. B., 1991). Furthermore, Fitzsimmons et al. (2005) found that firms pursuing profitability were substantially more likely to see superior profitability and growth in the following years. Therefore I find it prudent to control for prior profitability.

$$ROA_{t-1} = \frac{Net\ Income_{t-1}}{Total\ Assets_{t-1}}$$

$$EBITDA\ Margin_{t-1} = \frac{EBITDA_{t-1}}{Total\ Revenues_{t-1}}$$

2.1.3.4Firm Age

As Knudsen (2015) points out younger firms are more likely to experience decline during recession due smaller financial reserves, and learning curve effects like less established production line. Customers and suppliers may also disfavor younger firms because of the relatively shorter track record to show for. Furthermore, younger firms have had less time to build brand value and accumulate strategic resources as will be discussed in more detail below. Limited access to credit may further impact younger firms' performance, especially during recessions when creditors tend to prefer firms with strong balance sheets (Bernanke, Gertler, & Gilchrist, 1996). For these reasons it seems prudent to control for firm age effects.

I expect firm age to have a diminish impact as age increase. That is, it seems logical that the difference between year 1 and 2 has a larger impact on firm performance than the difference between year 50 and 51. For this reason I will use the natural logarithm of age.

$$Firm\ Age = \ln\left(T_{Year\ of\ analysis} - T_{Founding\ year} + 1\right)$$

In line with previous theses (Bolle & Hundvin, 2015) I will add 1 to the firm age. This is to ensure that the log transformation can be performed when the firm is founded in the current year of analysis. Because firms tend to grow with time it is possible that a large share of the firm age effect would be captured by firm size. However Fort et al. (2013) show how age and size has distinct effects on the firm, specifically in how sensitive such firms are to business cycles. For this reason I will include both variables.

2.1.3.5Firm Size

In accordance with microeconomic and strategic theory firms could potentially realize economies of scale with increased size (Besanko, Dranove, Shanley, & Schaefer, 2013). The ability to spread costs from certain administrative functions, marketing, etc. would benefit its performance (Brealey, Myers, & Allen, 2014). Increased size could potentially improve a firms' negotiating power towards suppliers and customers (Bykowsky, Kwasnica, Sharkey, & W, 2016). However, increased size could also cause the firm to become more rigid and less able to respond to and adapt to changes in the environment due to structural inertia (Hannan & Freeman, 1984). Furthermore Bloom et al (2007) show how large firms are more adversely affected by demand uncertainty because investment decisions are less easily reversed. For this reason I find it reasonable to control for firm size. I will use the natural logarithm of total assets due to it being a more stable metric than for instance sales revenues

$$Firm\ size = \ln(total\ assets)$$

2.1.3.6Liquidity Ratio

The liquidity ratio, also known as the current ratio, measures the balance between current assets and current liabilities. It is a common metric for measuring firm liquidity. Current assets are generally considered more liquid, hence a large liquidity ratio signifies that a firm holds good amounts of assets that could be liquidated with relative ease if needed. (Brealey, Myers, & Allen, 2014)

However, some assets are closer to cash than others. As Bearley et al (2014) points out, inventories may have a very different value during a fire sale. Because the liquidity ratio incorporates multiple types of assets of varying liquidity it can alone be misleading. For this reason I will complement it with other metrics that measure more specific relationships.

$$Liquidity\ ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

2.1.3.7Receivables to Assets Ratio

A large share of receivables could expose firms to credit risk. A receivable is an uncertain payment as debtors could potentially default. If the general probability of financial distress increase during a recession then the share of receivables being converted to payments could drop. Firms with large accounts of receivables would then be more exposed. For this reason I will control for firms' exposure to receivables risk by measuring the receivables to assets ratio. The ratio measures the proportion of firm assets that consist of uncertain receivables. Firms with low shares of receivables are less exposed to default risks.

$$Receivables\ to\ assets\ ratio = \frac{Receivables}{Total\ assets}$$

2.1.3.8Cash to Assets ratio

A common expression states that "cash is king". If creditors start tightening credit extensions and short term loans become less available (Bernanke, Gertler, & Gilchrist, 1996) firms will be more dependent on their sales revenue in order to cover their obligations. However, during recessionary periods firms may experience credit restrictions and demand reductions simultaneously (Lien & Knudsen, 2012). Cash reserves may then provide the firm with a "war chest" to stay solvent until market conditions improve as well as the possibility to act upon opportunities. The cash to assets ratio measures the proportion of firm assets that are cash. All else equal firms with large cash to assets ratios would be able to stay "afloat" for a longer period of time. Firms with lower cash to assets ratio would be more sensitive to worsening market conditions.

$$Cash\ to\ assets\ ratio = \frac{Cash}{Total\ assets}$$

2.1.3.9Cash Coverage ratio

The cash coverage ratio is similar to the interest coverage ratio (Besanko, Dranove, Shanley, & Schaefer, 2013), but considers instead the entire operating profit to be available for interest coverage. During crises like recessionary periods it seems sensible to assume that firms would prefer to skip renewal of capital for a limited period of time in order to stay solvent. For this reason I will use the EBITDA instead of the EBIT. Firms with a large cash coverage ratio are able to endure more severe drops in earnings before reach insolvency problems. Conversely, firms with poor cash coverage ratios would be more sensitive to sudden reductions in firm operating profits.

$$Cash\ coverage\ ratio = \frac{EBITDA}{Interest\ payments}$$

2.1.3.10 Compensation

Traditionally, labor costs has been seen as something that reduces firm profits and that should be minimized. However, higher than average wages can also have a positive effect on firm profitability. By increasing wages, Henry Ford was able to reduce employee turnover and improve production (Worstall, 2012). Firms that offer higher than average compensation would be better equipped to attracted talent. Conversely, equity theory explains how subpar compensation can lead to reduced employee output (Adams, 1963) (Huseman, Hatfield, & Miles, 1987). In order to measure compensation I will use the following metric:

$$Compensation = \ln\left[\frac{Total\ labor\ costs}{Number\ of\ employees}\right]$$

2.1.4 Industry-level Control Variables

The primary focus of this paper relates to firm level differences in profits. However, it is important to note that a substantial share of profitability variation stems for industry-level effects (Schmalensee, 1985) (McGahan & Porter, 1997) (Powell, 1996). Thus it is prudent to control for some main industry-level variables. The industry control variables will be similar to those included on the firm level, but calculated for the average of the industry.

2.1.4.1Industry Firm Size

The industry firm size is measured as the natural logarithm of the average total assets of firms within the industry.

$$Firm\ size_{industry} = \ln\left[\frac{1}{n}\sum_{j}^{n}(Total\ Assets)\right]$$

2.1.4.2Industry Return on Assets

The industry-level return on assets is calculated as the sum of net earnings divided by the sum of total assets within each industry.

$$ROA_{Industry} = \frac{\sum_j^n Net\ Income_j}{\sum_j^n Total\ Assets_j}$$

2.1.4.3Industry EBITDA Margin

The industry-level EBITDA margin is calculated as the sum of EBITDA divided by the sum of total revenues within each industry.

$$EBTIDA\ Margin_{Industry} = \frac{\sum_j^n EBITDA_j}{\sum_j^n Total\ Revenues_j}$$

2.1.4.4Industry Debt Ratio

The industry-level Debt Ration is calculated as the sum of total debt divided by the sum of total assets within each industry.

$$Debt\ Ratio_{Industry} = \frac{\sum_j^n Total\ Debt_j}{\sum_j^n Total\ Assets_j}$$

2.1.4.5Industry Prior Profitability

Industry prior profitability is measured as the sum of last year's industry net income divided by the sum of last year's industry total assets, and sum of last year's EBITDA divided by the sum of last year's total revenues.

$$ROA_{Industry,t-1} = \frac{\sum_j^n Net\ Income_{t-1}}{\sum_j^n Total\ Assets_{t-1}}$$

$$EBITDA\ Margin_{Industry,t-1} = \frac{\sum_j^n EBITDA_{t-1}}{\sum_j^n Total\ Revenues_{t-1}}$$

2.1.4.6Industry Receivables to Assets Ratio

Industry receivables to assets ratio is measured as the sum of industry receivables, divided by the industry total assets

$$Receivables\ to\ assets\ ratio_{Industry} = \frac{\sum_j^n Receivables}{\sum_j^n Total\ Assets}$$

2.1.4.7Industry Cash to Assets Ratio

Industry cash to assets ratio is measured as the industry sum of cash, divided by the industry total assets

$$Cash\ to\ assets\ ratio_{industry} = \frac{\sum_j^n Cash}{\sum_j^n Total\ Assets}$$

2.1.4.8Industry Cash Coverage Ratio

The industry cash coverage ratio is measured as the industry sum of EBITDA, divided by the industry sum of interest payments.

$$Cash\ coverage\ ratio_{Industry} = \frac{\sum_j^n EBITDA}{\sum_j^n Interest\ Payments}$$

2.1.4.9Industry Firm Age

Industry Firm Age is measured as the natural logarithm of the average age of firms + 1 year within the industry

$$Firm\ Age_{Industry} = \ln\left[\frac{1}{n}\sum_j^n (T_{Year\ of\ analysis} - T_{Founding\ year} + 1)\right]$$

2.1.4.10 Industry Compensation

The industry compensation as measured as the natural logarithm of the industry sum of total labor costs, divided by the total number of employees within the industry.

$$Compensation_{Industry} = \ln\left[\frac{\sum_j^n Total\ labor\ costs}{\sum_j^n Number\ of\ employees}\right]$$

2.2 Capital Structure Theory

Firm debt was a hot topic of debate following the Great Recession of 2008. Shortly after the fall of Lehman Brothers, the Guardian reported that the bank had leveraged its books by a factor of 44 (Clark, 2009). That is, its total debt was 44 times larger than its equity. Such figures may seem outrageous. However, it is not immediately clear that increasing debt is an intrinsically bad strategic decision. Capital structure theory helps us understand how the balance between debt and equity of a firm can influence its value through its risk and expected profit stream. Given these mechanisms a firm should be able to optimize its capital structure in order to maximize its value.

2.2.1 Capital Asset Pricing Model

As illustrated by Miller & Modigliani (1958) (1961) in their classical work on financial theory, it can be argued that the level of a firm's indebtedness is irrelevant in a world without taxes. Equity and debt are simply two versions of the same thing, capital. From an investor's perspective buying a firm's equity or debt is the same as buying the rights to a cash flow. When the investor buys debt he typically receives the rights to a safe and stable cash flow. When buying equity the cash flow is more volatile, in other words it varies more, but the expectancy is usually higher than that of the debt cash flow. In financial terms equity investment is called "risky" because its return varies, while a debt investment with zero variance is considered "risk-free".

Note that there are debt investments that are risky as well. In fact all investments carry some level of risk as debtors may end up defaulting on their debt. However, some debtors are deemed so unlikely to default that the debt is considered virtually risk-free. These debtors are usually governments in countries with strong and stable economies. For example, the return on the US Treasury Bill is often used to measure the risk-free rate.

Corporate bonds, holding a level of risk, would thus be considered risky assets. For simplicity, when explaining the CAPM I will look away from the possibility of investing in corporate bonds and consider the choice between investing in risky equity positions of risk-free bond positions. However, the results will still be the same.

In accordance with the Capital Asset Pricing Model (CAPM) outlined by William Sharpe (1964) a rational investor will seek out the investment with the best Sharpe ratio, that is the best return adjusted for risk.

$$Sharpe\ ratio = \frac{E[r_{asset}] - r_f}{\sigma_{asset}}$$

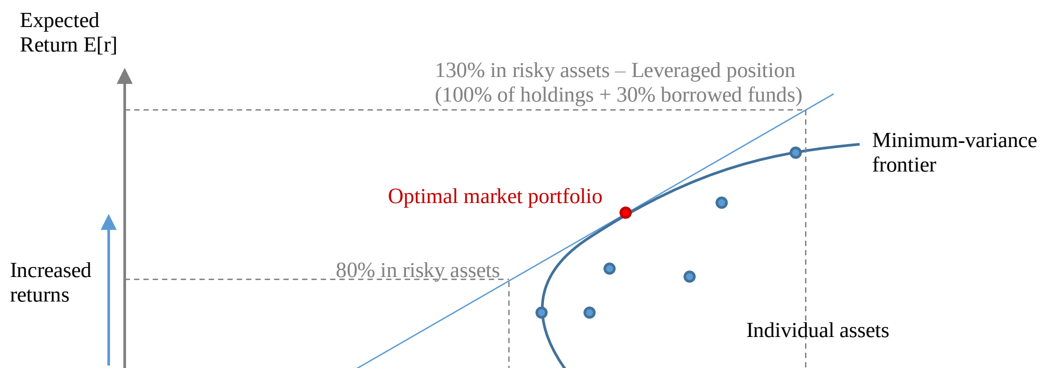


Figure 2: CAPM and portfolio leveraging

The investor can then adjust his investment according to his risk preference by investing more or less in the risky equity investment compared to the risk-free debt investment. As shown by Tobin (1958), this draws on implications from Markowitz's model (Markowitz, 1952) (Markowitz, 1959) highlighting how an optimal investment decision can be divided into two parts. First the investor will find the combination of assets that maximize the risk-adjusted return. This is risk premium divided by standard deviation (the Sharpe Ratio). Secondly, when this optimal portfolio of risky assets has been found, the investor can adjust how much risk (and return) they are willing to accept by investing a share of their holdings in the risk-free, low return asset and the rest in the risky high return asset.

As seen in the figure above, this balance of risk and return can be expressed as a line going from the risk free investment to the risky investment and beyond. Investors with low tolerance for risk can invest a larger share in the risk-free debt investment. Investors with a high tolerance for risk will invest a larger share in the risky equity investment and gain higher expected returns. In fact, investors whose appetite for risk is high enough, can borrow and invest even more in the risky investment. In effect these investors are leveraging their own portfolio. In good times these investors will receive a high return on the money they borrowed, but only pay the lower risk-free return to debt owners thus earning more. In bad times the same investors will receive very low returns on the money borrowed while at the same time having to pay the risk-free return to the debt owners, thus earning less.

As mentioned, the corporate debt is not completely free of risk as firms may end up defaulting on their debt. However, interest payments are always prioritized above equity returns. This is because the returns to equity holders is what is left after costs like interest payments have been subtracted. Thus the cash flow from a debt investment should be comparatively more stable than that of an equity investment, and the principle of the CAPM model still holds for the purposes of this paper.

2.2.2 Miller & Modigliani Theorem

As we can see, rational investors can adjust the risk-return balance of their own portfolio by leveraging their position. This is congruent with a key point in Miller & Modigliani (1958) (1961)'s work. When investors are buying stocks in a firm that is leveraged to the point where debt equals 50% of the firm's assets, they are in essence leveraging their own portfolio. The same effect could be achieved if the investors borrowed until their debt equaled 50% of their total assets, and then invested everything in an identical firm with no leverage. The risk-return characteristics of both portfolios would be the same. Alternatively, the investor could buy 50% of the firm's equity and 50% of the firm's debt 50%. This would be equivalent to deleveraging the portfolio. The position would yield the same return characteristics as buying 100% equity in a fully equity financed firm, all else equal.

This relationship can be shown formally (Modigliani & Miller, 1958). First assume that firm market value consist of two components; the market value of firm shares and the market value of firm debt.

$$V = (S + D)$$

Where V = firm value, S = market value of firm shares, D = market value of firm debt, X = expected net cash flow on firm assets, p = rate of return in firm's risk class. We are here assuming that firms are homogenous within each risk class. This is because it is assumed that firms could acquire the same assets given the same level of capital. Thus for comparative purposes the assets and by extension the returns X that they yield are considered to be identical.

Furthermore, firm market value must also be equal to firm returns X divided by the required rate of return, that is the sum of expected future earnings before interests discounted to account for risk:

$$V = (S + D) = X/\rho_k$$

This is because the required rate of return is set by the market price. Investors are bidding for the rights to firm returns. The price or market valuation V will fall to rest at a level where investors are receiving the required rate of return for the given risk class k of the firm:

$$\frac{X}{S + D} = \frac{X}{V} = \rho_k$$

As can be seen, capital structure is irrelevant for market return. The underlying dynamic that forces this to be true is based on a no arbitrage argument. This can be shown mathematically.

Assume two firms; one levered (L) and the other unlevered (U). An investor owns fraction α of the total firm stock worth S_L. Returns of firm L are defined as Y_L, and can be described as follows:

$$Y_L = \alpha(X_L - rD_L)$$

X_L denotes net cash flows or firm earnings before interests. D_L is the firm debt and r the interest rate. $(X_L - rD_L)$ is therefore the firm profits of which the investor receives the share α.

Now assume that the investor sells the entire position in firm L. Because the investor owned the fraction α of the total stock worth S_L the resulting cash received from the sale will equal

αS_L. Furthermore, the investor borrows funds equal to the sum of αD_L. This means that the total cash holdings of the investor are now equal to $\alpha(S_L + D_L)$, and more importantly, that the investor's leverage is now the same as that of Firm L.

The investor can now position the entire holdings of $\alpha(S_L + D_L)$ in firm U stock. If the total worth of firm U stocks is denoted as S_U then the investor will now own a share of the stock pool equal to:

$$\frac{\alpha(S_L + D_L)}{S_U}$$

Firm returns for firm U are equal to X_U. Because the firm is unleveraged there are no interest payments. Thus the returns of the investors new position Y_U will equal X_U multiplied by the share of stocks owned, minus the costs of borrowing αD_L at rate r.

$$Y_U = \frac{\alpha(S_L + D_L)}{S_U} X_U - r\alpha D_L$$

Assuming homogenous firms in the sense that all firms have the same investment opportunities, are able to acquire the same assets and thereby have the same returns. Therefore: $X_L = X_U = X$. We also know from before that $V = (S + D)$. This means that the value of firm L can be described as $V_L = (S_L + D_L)$ and the value of firm U as $V_U = (S_U)$ because firm U is unleveraged. We then have:

$$Y_U = \frac{\alpha V_L}{V_U} X - r\alpha D_L$$

$$Y_U = \frac{V_L}{V_U}\alpha(X - rD_L)$$

$$Y_U = \frac{V_L}{V_U}Y_L$$

The final equation shows that if firm L is valued higher than firm U, then the return of firm U is larger than the return of firm L. Rational investors will then sell firm L and buy firm U due to the superior returns and lower price. The value of firm L depreciate and the value of firm appreciate. This will continue until an equilibrium is reach where $Y_L = Y_U$ which in turn means $V_L = V_U$. Thus we can see that the value of a firm is not affected by its capital structure. (Modigliani & Miller, 1958)

As we can see, this model makes several assumptions. In the real world the cash-flow from interests and equity returns are often taxed differently. Interests are viewed as a cost and thus exempt from normal corporate taxation, while the returns to equity (EBT) are not. Of course, both cash flows will incur capital income tax for an investor. However, this comes in addition to the tax paid by the firm. This create a tax incentive towards debt financing. The debt effectively reduces the amount of tax paid, it creates what is sometimes referred to as a "tax shield" (Brealey, Myers, & Allen, 2014).

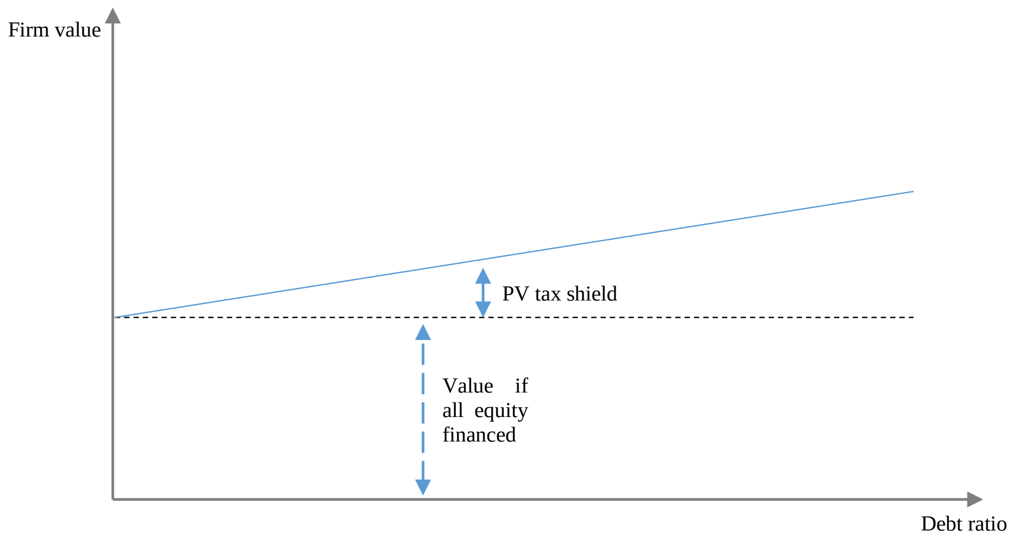


Figure 3: The Effects of Tax-Shielding on Firm Value. Adapted from Bearly, Myers & Allen (2014, p. 456)

Seen in isolation, increased use of debt financing will increase the expected return on assets that the firm is able to produce which in turn raises the market value of those assets – the firm value.

2.2.3 Trade-Off theory

Based on Miller and Modigliani(1958) (1961)'s work we would assume that firm indebtedness is not an inherently bad situation, nor merely a necessary evil to expand firm operations. In fact, in a world with taxes debt funding could be seen as favorable. Interests, the cash flow paid to debt owners, are often accounted as firm costs and are therefore exempt from corporate taxes. As discussed, seen in isolation this tax shield therefore incentivize investors to invest in indebted because of the higher returns. Firms would also prefer debt funding because it is effectively cheaper than equity due to the same exemption from corporate tax. Together these factors count towards firm indebtedness having a favorable effect on firm performance.

However, the problem with increased levels of debt lies in liquidity and the risk of bankruptcy. By its very nature, the return on equity is variable. It scales perfectly with firm performance because it is by definition whatever is left for the shareholders when costs have been covered (Brealey, Myers, & Allen, 2014). On the other hand, cost of debt or interests, is fixed. In general these incur regardless of firm performance. With manageable levels of debt a firm can reduce returns to equity in bad times to pay its interests and compensate by increasing returns in good times. This is the mechanism by which increased leverage also increases volatility, or variance in returns.

However, when a firm increases its debt to unmanageable levels paying its interests and other costs become problematic (Fama & French, 1992) (Rajan & Zingales, 1995). In the short-term, it may mitigate these problems through credit solutions like delaying the settlement of its payables or taking short-term loans. However, these solutions are not viable in the long-term. Given an extended period of low earnings firms with high levels of debt the firm run the risk of not being able to cover its liabilities and thus fall into financial distress. Such a situation could lead to the liquidation of important firm assets, potentially harming the value generating capacity of the firm which is ultimately bad for the investors, and of course the firm itself.

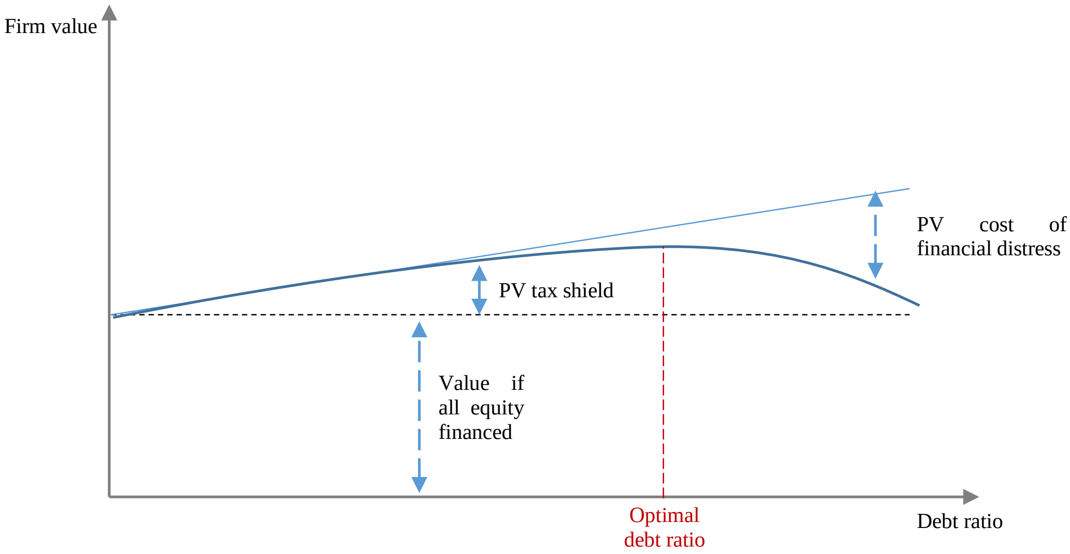


Figure 4: Optimal Debt Ratio with Cost of Financial Distress. Adapted from Bearly, Myers & Allen (2014, p. 456)

These examples highlight the negative aspect of firm indebtedness. At first increasing levels of debt provides a beneficial tax shield for the firm, effectively reducing its costs and increasing returns to investors. However, at high levels of debt the probability of financial distress starts increasing notably. For this reason the value of marginally increasing the tax shield must be weighed against the marginal increase in expected losses due to the heightened probability of financial distress. These two effects give rise to the concept of an optimal debt ratio. As can be seen from figure 4 the optimal debt ratio is the point where marginal gains from increased debt equals marginal expected losses (Brealey, Myers, & Allen, 2014).

This lays the foundation for my first hypotheses.

Hypothesis 1: For each year of the business cycle there exists an optimal debt ratio that maximizes ROA

Hypothesis 2: For each year of the business cycle there exists an optimal debt ratio that maximizes EBITDA Margin

2.2.4 Credit Restrictions

As discussed the increased probability of financial distress must be considered when setting the debt level. Firms have a given debt capacity at which higher levels of debt become unmanageable. This is logical due to the variable nature of demand in the economy during normal times. Given the variance of demand in their industry firms can calculate their own optimal level of debt. During a recession, these parameters can change dramatically. Sudden and dramatic drops in demand, far beyond what has been seen in the near past, would increase the firm’s need for credit in order to meet its obligations and “ride out the storm”. Furthermore, during recessionary periods credit can be exceedingly hard to come by (Bernanke, Gertler, & Gilchrist, 1996), adding to the challenges.

During normal times financial markets are usually deemed strategically irrelevant (Peteraf, 1993) (Barney, 1986) due to the high level of market efficiency. In efficient markets prices will fully reflect the available information about the true value of an asset (Fama, 1970). In order to attract funding the firm would have to pay the market price of that funding to the financiers – interest payments to debt owners and expected returns to equity owners. By argument of no arbitrage, this would be the same price as other firms with the same risk characteristics would pay. As discussed under the CAPM model, investors will always seek the best return adjusted for risk. This means that the price for funding will be the same for all firms in a given risk category. Any firm offering submarket prices for debt and equity would not be able to attract financers. Thus there should be little potential for firms to make above-average profits in these markets. Any firm requiring financial resources can buy these at the market price at any given time, as long as the firm’s total debt remains at a manageable level and does not exceed its debt capacity.

Interestingly, this may not hold true during recessionary periods (Knudsen & Lien, 2014). As mentioned, when the economy falls into recession credit becomes increasingly more restricted (Bernanke, Gertler, & Gilchrist, 1996), and firms approaching their debt capacity may be dependent upon short-term financing of their fixed costs during periods of lower demand. Credit restrictions may therefore further increase the probability of financial distress and lead to a relatively reduce performance of high-leveraged firms during recessionary periods. Conversely, firms with low levels of debt should do relatively better during recessionary periods. Furthermore, firms that master the capability of strategically adapting to business cycles should reduce their debt ratio at the onset of a recession, and increase the debt level at the onset of a recovery.

2.2.5 Real Option Theory

Another important aspect is the firm's ability to act upon good opportunities. Miller and Modligani (1958) (1961) assumed homogenous firms, and that investment opportunities were unaffected by firm leverage. This may not be realistic for firms approaching their debt capacity, especially in recessionary periods.

In line with Myer (1977)'s real option view Ghemawat (2009) argues that recessions represent good opportunities for firms to make strategic investments. This is supported by the findings from Bain & Company's interviews of 90 senior executives in Fortune 500 companies (Rigby & Rogers, 2000). With lower levels of demand in the economy in general, prices on assets like physical capital and human capital should be lower Ghemawat (2009) (Navarro, 2009). Firms with available debt capacity should be better positioned to draw funding from financial markets during recessionary periods than fully leveraged firms (Knudsen & Lien, 2014) and acquire valuable assets at bargain prices (Rigby & Rogers, 2000) (Ghemawat, 2009). This ex ante limit to competition (Peteraf, 1993) for resources in strategic factor markets (Barney J. B., 1986) should mean that investments yield higher expected returns when better times arrive. In contrast firms with insufficient available debt capacity, and exhausted internal funding capacity, will be in a worse position to acquire these assets. This strategic cost of reduced investment opportunities should be particularly high during recessionary periods when funding can be extraordinarily scarce (Ivashina & Scharfstein, 2010).

The firm's possibility of acquiring such resources can be viewed as a "real" call option (Myers, 1977). The firm has the option to acquire assets. During recessions the value of this call option increase as the price for valuable assets decrease. By lifting its debt levels close to the debt capacity, the firm is also loosing value in the form of its real option. Therefore, when estimating an optimal debt level firms must also weigh the marginal gains from the tax shield with the marginal losses from reduced real options. Due increased uncertainty and increased availability of profitable investment opportunities should increase in a recession the real option value should increase during recessionary periods (Bloom, Bond, & Van

Reenen, 2007) (Rigby & Rogers, 2000) (Ghemawat, 2009). Hence the optimal debt level should shift downwards at the onset of a recession. Gardner & Trzcinka (1992) find that there is a negative relationship between growth options and the probability of borrowing.

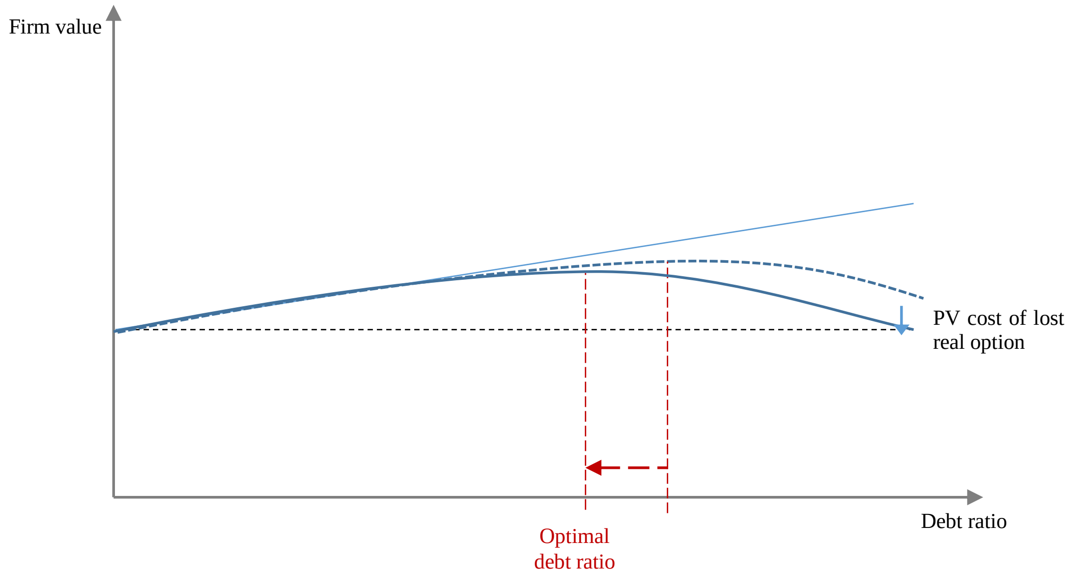


Figure 5: Optimal Debt Ratio with the Cost of Lost Real Option. Adapted from Bearly, Myers & Allen (2014, p. 456).

This indicates that there should be an incentive for firms to reduce their debt ratio in order to strategically adapting to business cycle. Based on this I make the following hypotheses:

Hypothesis 3: The optimal debt ratio for the ROA shifts towards less debt at the beginning of the recession

Hypothesis 4: The optimal debt ratio for the EBITDA Margin shifts towards less debt at the beginning of the recession

Hypothesis 5: The optimal debt ratio for the ROA shifts towards more debt at the beginning of the boom.

Hypothesis 6: The optimal debt ratio for the EBITDA Margin shifts towards more debt at the beginning of the boom

2.2.6 Size

A firm's preference, and also availability, to debt financing may also be influenced by its size. Smaller firms tend to be less established in the market than their larger counterparts (Knudsen E. , 2015). This in turn would make them comparatively more risky (Myers, 2001). Seen from creditors' perspective these firms would need to pay a higher interest rate in order to compensate for the higher risk level. From the firms' perspective this increase in fixed costs would represent a higher probability of financial distress, ceteris paribus. Smaller, riskier firms would therefore be incentivized to apply a lower financial leverage than larger firms. Kurshev and Strebulaev (2015) find empirical backing for this relationship.

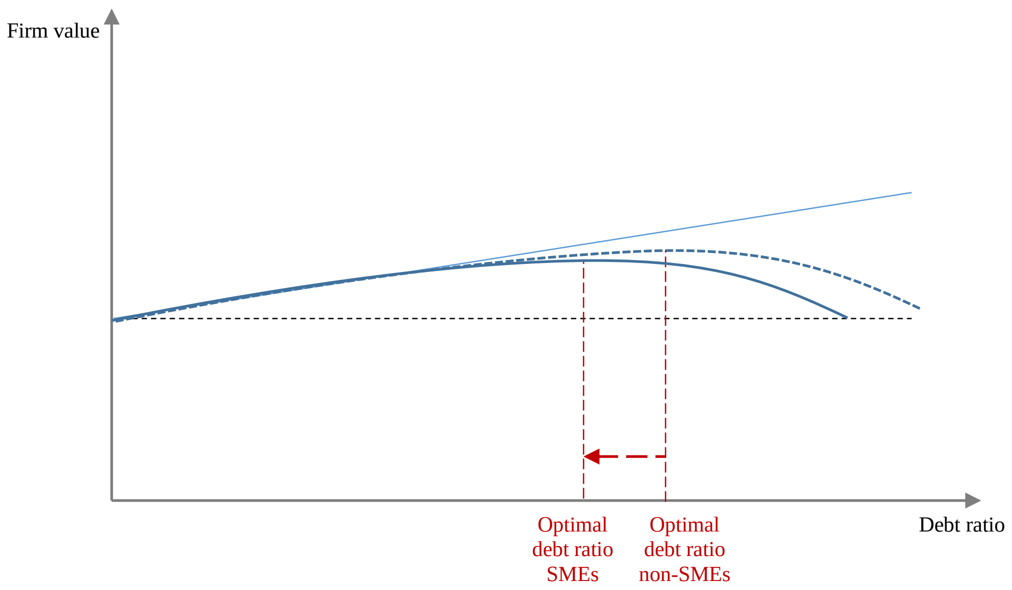


Figure 6: Optimal Debt Ratio difference between SMEs and Large Firms

This lays the foundation for the following hypotheses:

Hypothesis 7: The optimal debt ratio for the EBITDA Margin shifts towards more debt at he beginning of the boom

Hypothesis 8: The optimal debt ratio for the EBITDA Margin shifts towards more debt at the beginning of the boom

2.3 Strategic Advantages

A strategic advantage, or competitive advantage, is often defined as a firm's ability to generate profit levels beyond that of its competitors. Ceteris paribus, these super profits must stem from lower costs, higher revenues or a combination of both.

$$Profits = Revenues - Costs$$

In a perfect free-market, all firms are equal all firms within the market are the same. No one firm hold an advantage over the others, and profits are thus competed away through market forces. A strategic advantage is therefore something that allows the firm to separate from other market players, either by differentiating its products and services and thereby reduce competitive pressures, or by reducing its costs.

2.3.1 The Resource Based View

As previously mentioned, multiple works within academia discuss how business leaders can take strategic actions to manage the effects (Ghemawat, 2009). Furthermore, it seems that most firms do not fully master this capability. This difference in capability is congruent with the Resource Based View within the strategic literature (Barney, 1991). In the Resource Based View a firm's competitive advantages springs from unique portfolio of resources that the firm possesses. These resources are distributed (or rather acquired and accumulated) heterogeneously among firms, giving grounds for differences in profit levels. Previously developed frameworks like Porter(Porter, 1980) (Porter, 1985)'s Five Forces focused on the differing profit levels between industries and assumed conditions within these groups to be homogenous (Caves & Porter, 1977). However, profit levels within industries can vary significantly (McGahan & Porter, 1997).

The resource based view attempts to shed light on variation of competitive advantages within industries. In order for a resource to bring a sustained competitive advantage for a firm the resource must satisfy the VRIO criteria outlined by Barney (1991). The resource must be valuable meaning it has the potential to bring some sort of value to the company. It must be rare so that the firm's competitors do not already have the same resource. It must also be inimitable in such a way that competitors cannot level the playing field by gaining the resource later. Finally it must be organized signifying that the firm must be able to reap the benefits the resource provide.

The VRIO Framework
Valuable
Rare
Inimitable

Crook et al. (2008) find empirical evidence for the relationship between firm resources and firm performance. Furthermore, this relationship seems to stronger when the VRIO criteria are satisfied.

2.3.2 The Imitability of Strategic Resources

In line with Schumpeter's argument for the temporary nature of profits (Schumpeter, 1939), more recent works put in question how sustainable any competitive advantage can be in the long run (Wiggins & Ruefli, 2002) (Wiggins & Ruefli, 2005) (D'Aveni, Dagnino, & Smith, 2010). It seems a resource is never truly inimitable, but rather holds some level of difficulty in being imitated. Barney(1986) also argued that resources can be acquired in strategic factor markets and that, through market imperfections like luck and information asymmetry, firms can gain competitive advantages by acquiring resources with higher firm-specific value than acquisition price.

Nevertheless, some resources seem more difficult to imitate than others than others. Dierickx & Cool (1989) point out that not all resources can be easily traded, and separates between acquired resources and accumulated resources. Competitive advantages based on acquired resources could rise and dissipate quickly due to their acquisition being based on luck and information asymmetry. Conversely, competitive advantages based on accumulated resources should be more difficult to imitate due to effects like time compression diseconomies, asset mass efficiencies, asset inter-connectedness, asset erosion and causal ambiguity.

Resources can be classified according to how difficult they are to imitate and hence how likely each resource type is of providing sustained competitive advantages.

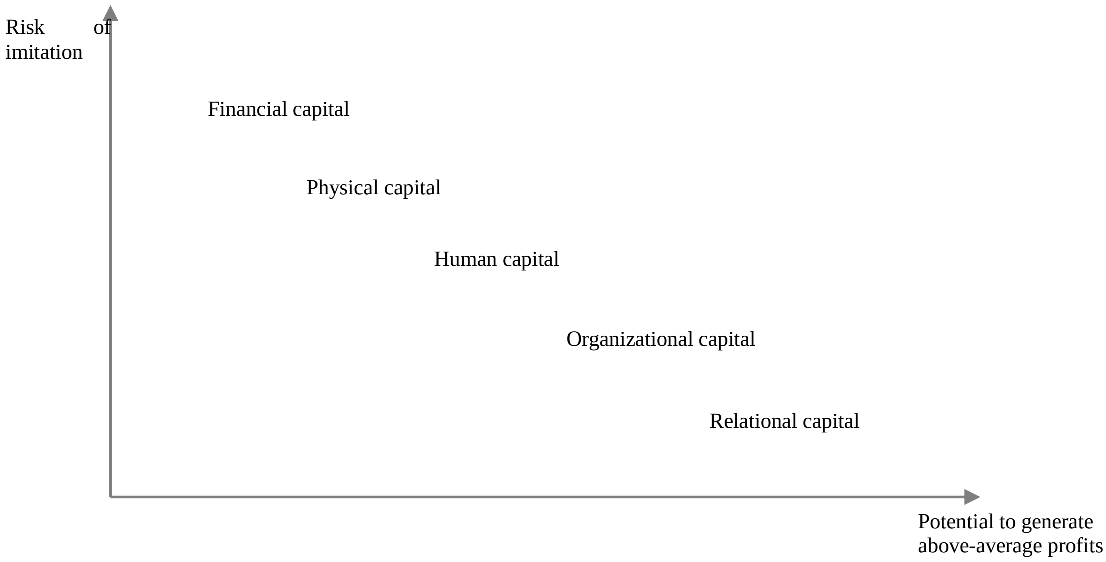


Figure 7:The potential to generate above-average profits depend on the risk of imitation (Lien, 2015)

2.3.3 Dynamic Capabilities

Many firms should be able to acquire the human capital needed to by hiring talent with the required expertise in business cycle management. However, the capability to cost effectively deploy of these assets may not be equal among all firms. For instance, the firms' ability to adapt its capital structure may depend on resources like reputation, history and relationship with its creditors and investors, etc. Dryer and Singh (1998) highlight how idiosyncratic interfirm linkages like relationships can be a source of competitive advantage. Furthermore, such resources are difficult to acquire and must be accumulated across time (Dierickx & Cool, 1989). Accumulated resources are often more difficult to imitate and thus yield advantages that are sustainable for longer periods of time.

Furthermore, a firm's ability to successfully manage the effects of business cycles could be seen as a dynamic capability (Teece, Pisano, & Shuen, 1997) (Winter, 2003). Dynamic capabilities govern how well a firm adapts to its environment and is able to change its operations (Zollo & Winter, 2002). In general, firms with strong dynamic capabilities are often viewed as better able to deliver superior results (Eisenhardt & Martin, 2000) compared to other firms.

This suggests that firms with the capability of adapting strategically to a business cycle are able to do so because they possess a dynamic capability to adapt. These capabilities stem from managerial and organizational processes (Teece, Pisano, & Shuen, 1997) that are not easily acquired or imitated (Lien L. , 2015), but must be accumulated. For this reason it seems likely that firms' competitive advantages from dynamic capabilities will be sustained for some time. This idea has some empirical support (Fitzsimmons, Steffens, & Douglas, 2005). Lien and Knudsen (2012) show how prior profitability is positively associated with firm performance during a recession.

If we assume that strategic adaption to business cycles is a dynamic capability with the potential for generating sustained competitive advantages. Then firms that display behaviors associated with strategic adaption to business cycles should be more likely to possess dynamic capabilities. Due to their dynamic capability these firms should enjoy higher profit levels than other firms. Furthermore, as this is an accumulated resources the firms have probably enjoyed these higher than average profit levels for some time and will continue to do so.

This leads me to my final hypotheses.

Hypothesis 9: Firms that reduce their debt levels at the onset of the recession shows better performance throughout the entire cycle relative to their competitors.

2.4 Hypotheses overview

Hypotheses	
Hypothesis 1:	For each year of the business cycle there exists an optimal debt ratio that maximizes ROA
Hypothesis 2:	For each year of the business cycle there exists an optimal debt ratio that maximizes EBITDA Margin

Hypothesis 3:	The optimal debt ratio for the ROA shifts towards less debt at the beginning of the recession
Hypothesis 4:	The optimal debt ratio for the EBITDA Margin shifts towards less debt at the beginning of the recession
Hypothesis 5:	The optimal debt ratio for the ROA shifts towards more debt at the beginning of the boom.
Hypothesis 6:	The optimal debt ratio for the EBITDA Margin shifts towards more debt at the beginning of the boom
Hypothesis 7:	The ROA optimal debt ratio is smaller for small firms than for larger firms.
Hypothesis 8:	The EBITDA Margin optimal debt ratio is smaller for small firms than for larger firms.
Hypothesis 9:	Firms that reduce their debt levels at the onset of the recession shows better performance throughout the entire cycle relative to their competitors.

3 Method

3.1 Research design

A prime concern for the methodology part of this study is to determine the proper design for the research. The fact that there exists a range of different of studies that can be performed, may complicate this selection process to some degree. Conveniently, Saunders et al. (2009) propose a framework for identifying the proper research design. In this framework the type of study is identified by classifying the research according to a few simple dimensions. Saunders et al. (2009) are mainly "concerned with the way you collect data to answer your research question" (Saunders, Lewis, & Adrian, 2009, p. 106). Thus it seems the framework is designed primarily with this objective in mind. In this study the data source has already been decided upon due to the rich nature of the data base. Nevertheless, the framework provides a good way of classifying the research design. For this reason it will be used as the basis when devising the research design of this study.

3.1.1 Research purpose

The basis for the design is the purpose of the research. Saunders et al. (2009) suggest a threefold classification of research purpose; exploratory, descriptive and explanatory. However, Saunders et al. (2009) points out that the purpose may change over time. Exploratory research seeks to clarify the understanding of some problem, to seek insights and to find out what is happening. The ways of achieving this will typically involve literature search, expert interviews and interviews of focus groups. Descriptive studies aim to create an accurate profile of a situation, etc. Explanatory studies attempt to identify and explain causal relationships between variables. This is typically achieved using statistical tests to find correlations.

The initial phases of the work behind this study might be described as a long series of exploratory research projects. This was conducted in an effort to establish an overview of the current frontiers in the relevant areas of research. Broad at first the area of focus gradually narrowed, closing in on the theories and research that became the bases of hypotheses in this study. However, the nature of the study as a whole is one more oriented towards identifying relationships and explain mechanisms based on empirical testing and theoretical backing. It therefore seems more correct to classify the research purpose as explanatory.

3.1.2 Research approach

In terms of research approaches Saunders et al. (2009) separate between two categories. The approach of deduction is the dominant research approach in natural sciences. An initial idea leads to the formulation of one of more hypotheses typically based on a theoretical foundation. The hypotheses are then tested using empirical data. The approach of induction follows a similar structure of deduction but in reverse. Observations or empirical data is the foundation. These are the backbone for formulating new theories that explain various observed or measured phenomena. Whereas the deductive approach is oriented towards proving ideas and theories, the deductive approach leans more towards discovery. In this study hypotheses are formulated on the basis of existing research and theoretical works. These hypotheses will then be tested empirically. This structure moves close to that of natural sciences and is characteristic of the deductive approach.

3.1.3 Data type

The empirical data used in this study is sampled from the SNF and NHH database for accounting and business information. The data base contains accounting information on Norwegian firms registered in the Norwegian Entity Registry database

(Brønnøysundregisteret) (Mjøs, Berner, & Olving, 2015). The type of data is decidedly quantitative. Due to the quantitative nature of the data the analytical techniques described closer in the following parts are also quantitative.

3.1.4 Strategy

Various strategy types may be followed when conducting a research project. However, there are typically 3 types that are associated with the deductive approach to research. These are the experiment strategy, the survey strategy and the case study strategy. The experiment strategy is often considered the "gold standard" and is often utilized within natural sciences. However, due to both ethical and practical reasons it's often difficult or simply unrealistic to attempt to conduct experiments within the fields of management science and economics. The closest one might get is utilizing natural experiments when they arise. Unfortunately this is not a viable strategy for this study. On the other hand, the case study strategy is typically used when studying a phenomenon within its real life context. This is usually based on an empirical investigation likely using multiple sources of evidence. The case study strategy is most often used in explanatory and exploratory research. (Saunders, Lewis, & Adrian, 2009)

Lastly the survey method is characterized by the use of large amounts of data from a big population. The data is often standardized, being on the same form from different respondents. The strategy allows for the collection of quantitative data which can be analyzed using descriptive and inferential statistics. It tends to be used for exploratory and descriptive research. However it is strongly associated with the deductive approach, and is considered popular within business and management research (Saunders, Lewis, & Adrian, 2009). For this reason the survey strategy seems the most fitting for this study. It should be noted that it becomes important to ensure a representative sample is selected when using the survey method. This point will be discussed in more detail later.

4 Data

As previously discussed the data used in this study is sourced from the SNF and NHH database for accounting and business information. The data base contains standardized accounting information, mainly in the form of annual income statements from all firms registered in the Norwegian Entity Registry database (Brønnøysundregisteret) in the years 1992-2013. The data is already collected by a third party and therefore falls under "secondary source" category of Saunder et al. (2009). However, the data base represent an unprecedented wealth of information on Norwegian companies. Furthermore, there are few alternative data sources readily available that offers the required data for this study. Thus the SNF and NHH data base represent the best option.

In terms of standardization Mjøs et al. (2015) points out that there exist some incongruences across time. Many of these issues seem to stem from changes in how the data has been reported as a result of changes in Norwegian accounting regulations in 1998 and a move to IFRS in 2005. There has been done considerable work towards improving upon many of these issues. Never the less, Mjøs et al. (2015) warns that there might still exist some incongruences in the data set. I will discuss handling such problems more under the "outlier" section.

4.1 Empirical setting

For my sampling method I will follow a set of criteria for what firms will be included and excluded in the data sample. There are several reason for using a reduced sample instead of the entire data-set. The theoretical models used in this analysis to predict performance are based on certain assumptions. More often than not these will include competitive and profit maximizing behavior of the market actors. This gives grounds for excluding firms that do not tend to fulfill these assumptions. Furthermore, in this analysis I aim to test relationships that can be generalized to a larger portion of the population. Some of the selection criteria will therefore be aimed at "weeding out" firms that may not adhere to normal regulations or that might operate in very different ways than the rest of the population. Another goal is to reduce noise, as well as to make the sampling more comparable to previous work. In order to better facilitate comparison of findings I will use similar selection criteria to those that have been used be prior works (Bjørkli & Sandberg, 2012) (Brynhildsrud, 2013) (Bolle & Hundvin, 2015)

4.2 Selection criteria

Criterion 1: Time period 2000-2013

The data set includes information as far back as 1992. This range captures the time interval of the dot-com bubble around year 2000, and could potentially have allowed for the use of both recessionary events for econometric analysis. However, due to changes in Norwegian accounting practices around year 1998, comparison of data before and after this point become problematic (Mjøs, Berner, & Olving, 2015). For this reason I will limit myself to the period from 2000 until 2013, with the focus of this study will revolve around the recessionary event of 2007.

Criterion 2: Revenues above 10M NOK and wages and social costs above 3M NOK

A large number of companies are set up as tax shelters with no real operations (Knudsen & Lien, 2015). In order to avoid these firms with revenues lower than 10M NOK are removed from the sample. This cutoff is adjusted for inflation with 2007 as the basis year. Inflation data is collected from the Statistics Norway’s website (SSB, 2016). The index can be found in the appendix.

Criterion 4: Legal form = AS, ASA

The criterion is meant to remove organizations which typically exhibit non-profit maximizing behaviors. This paper

Criterion 5: Profit-maximizing industries

Certain industries will be more influenced by governmental subsidies or exhibit other non-competitive, non-profit maximizing characteristics. For example it is generally accepted that that both the Norwegian agricultural sector and cultural sector are largely dependent on subsidies. Profit maximization is also questionable in particular for the latter example. For this reason a select number of industries will be excluded from the sample.

4.3 Outliers

When performing regression analyses my aim is to identify relationships between variables. As will be discussed in more detail later this is done by creating a model with parameters that represent the best "fit" or estimate of this relationship. Put simply we wish to draw a line through the scatter plot of two (or more if we are using a multiple regression model) variables that most closely resembles the underlying trend in the data. This is done by minimizing the sum of the squared distances between this line and each observation point through what's known as the Ordinary Least Squares (OLS) method.

However, due to the fact that the distance are squared, observation points that are far away from the rest of the observations will quickly get a very large influence on where the regression line is drawn (Wooldridge, 2009). This can be problematic in cases where data has been mistyped. As an example Mjøs et al. (2015) points out that there has been found various cases where data has not been entered in the form of thousands (i.e. incorrectly writing "000" behind the numbers). These values will be three orders of magnitude too large and can easily influence the estimates in a negative way. Furthermore, special and non-reoccurring events may cause extreme observations that are not really representative. Thus the information these observations contain can be misleading in regards to what is expected in the future.

4.3.1 Standard deviation by year and industry

In order to avoid the misleading effect of such errors these observations should be removed. Unfortunately such error are not always easily identifiable. In their master thesis Bolle and Hundvin (2015) points out two potential ways of identifying outliers. One can create set separate limits for each variable based on experience and expertise in dealing with this particular type of data, or use statistical techniques designed for identifying outliers. Due to limited experience and expertise in this area I will use a statistical technique similar to those seen in previous master theses (Bjørkli & Sandberg, 2012) (Fjelltveit & Humling, 2012) (Brynhildsrud, 2013) (Bolle & Hundvin, 2015).

First standard deviations will be measured for each year within each industry for *ROA*, *EBTIDA margin* and *debt ratio*. Then observations that fall above and below 3 standard deviations will be removed. By limiting the removal to 3 standard deviation "tampering" with the data set is limited. Furthermore, by controlling for year and industry I reduce the probability of disproportionally affecting any particular time period or industry.

4.4 Limitations and representativeness

However, when implementing such methods caution is advised. It is difficult to know with certainty that the extreme values are in fact "mistakes" and not observations of a real phenomena. By selectively removing observations from the sample the study gain representability, but at the same time loose internal validity. Nevertheless, from the work of Mjøs et al. (2015) we know with high certainty that there exists reporting errors in the data material. Given extreme values, a relatively small number of such errors can have a strong and misleading influence on the coefficient estimates. It therefore seems like an acceptable risk to remove a small number of highly influence and high leverage observations in order to improve the quality of the analysis.

Even after the selection criteria as been applied and outliers removed, the remaining sample is still quite large. This is good in terms of the potential for finding statistically significant relationships. Nevertheless, the removal of observations could introduce certain biases in the following estimates. Limiting the standard deviation trimming to 3 standard deviation helps broaden the scope of firms included in the final sample. Still it is difficult to rule out that no important information was lost during this sampling.

Similarly the criteria to exclude firms with revenues below 10 mill NOK will remove a lot of small companies from the sample. This is important to remember when reviewing the results of the following analysis. By removing samples external validity is reduced, while internal validity is improved. This means that the estimates will be less representative of the entire population, but that it should be easier to get strong results for the firms that are within the sample. The relationships will be estimated based on data from the sampled firms and may not be representative for firms that fall outside of the selection criteria.

5 Econometric Interlude

5.1 Panel data

Regression analyses are often done on data sets containing cross-sectional data or time series data. Time series data are observations over time, like the historic stock price of a publicly traded company. Cross-sectional data are observations irrespective of time. Cross-sectional data studies tend to focus on relationships that are not exclusively time dependent, like education and wage. In this paper the data material used is classified as panel data. Panel data is a combination of cross-sectional data and time series data. Put simply a panel data set is a time series of cross-sections, were observations of a cross-section is sampled multiple times across time. This makes it possible to study both time dependent and time independent components of a phenomena. For example wage will tend to increase both with education and with time. However, education tend to change relatively little with time after a person start working. Using panel data regression techniques we can isolate the effect individual effects of education and time on wage.

5.2 Regression model

5.2.1 Pooled OLS

The simplest way of analyzing panel data would be to use pooled OLS regression. With this method each data point is treated as an individual and independent observation irrespective of the time series property of the data. In this sense pooled OLS is similar to that of the single cross-sectional analysis.

The challenges with using this method stems from the time-dependent nature of the data itself. As firms are sampled across time it seems reasonable to believe that there would exist serial correlation between observations of the same firm at different points in time.

The key difference that separates panel data from cross-sectional data is that cross-sectional units, which in this case are firms, are followed across time. An advantage of this feature is that it allows us to control for unobserved characteristics of the firms. Furthermore, because it allows us to observe changes in dependent and independent variables at different points in time, it gives us a better basis for measuring causal- , or at the very least predicative relationships. As the pooled OLS model does not take into account temporal data, it cannot be used to take advantage of these opportunities. To do so it is necessary to use models like the fixed effect estimator or the random effects estimator.

5.2.2 Fixed Effects Estimator

The fixed effects estimator enables the use of time variation in the panel data. Take the following unobserved effects model:

$$y_{it} = \beta_1 x_{it1} + \cdots + \beta_k x_{itk} + \alpha_i + u_{it}$$

Where $t = 1,2, \dots, T$

This panel data model is similar to a "normal" multiple regression model, but includes an unobserved effect α_i that is time-invariant. The unobserved effect varies across individuals (or firms), but not across time. This can be a problem if the unobserved effect is correlated with the explanatory variables. In fixed effects estimation the time-invariant unobserved effects are removed by performing a fixed effects transformation.

$$y_{it} - \bar{y}_i = \beta_1(x_{it1} - \bar{x}_{i1}) + \cdots + \beta_k(x_{itk} - \bar{x}_{itk}) + \alpha_i - a_i + (u_{it} - \overline{u_i})$$

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it1} + \cdots + \beta_k \ddot{x}_{itk} + \ddot{u}_{it}$$

Where $t = 1,2, \dots, T$ and $\ddot{y}_{it} = y_{it} - \bar{y}_i$

Thus the fixed effects estimator solves the problem of correlation between the unobserved effects and the explanatory variables by using time variation within each cross-sectional observation. Put differently it “evens out” the time-invariant differences between each firm and then uses information on how variables change across time.

5.2.3 Random Effects Estimator

The fixed effects is considered a good tool for estimating ceteris paribus effects (Wooldridge, 2009). However, it ignores any effect that is time-invariant. This can be problematic if key explanatory variables are constant over time. In such cases an alternative can be the random effects estimator. If the unobserved time-invariant effect is uncorrelated with the explanatory variables in all time periods it is not necessary to remove it.

$$Cov(x_{itj}, \alpha_i) = 0$$

Where $t = 1,2,\ldots,T; j = 1,2,\ldots,k$

By including the unobserved time-invariant effects the random effects estimator can utilize information between cross-sectional observations as well as within them. In order for this to be possible the assumption of no correlation between the unobserved effect and the explanatory variables must be true. Woolridge (2009) warns that this should be considered the exception rather than the rule. Regressors are often outcomes of choices processes and thus correlated with preferences and capabilities rather than being random.

5.2.4 Hausman test

The random effects estimator can be attractive as it incorporate more of the information in the data. In order to know whether the random effects estimator can be used the Hausman test can be applied.

It tests the statistically significant differences between the coefficients on time-varying explanatory variables of the fixed effects and random effects estimators. If the Hausman test rejects the null the key random effects assumption is false, and the fixed effects estimator must be used.

5.3 Model specification

The optimal debt ratio model attempts to estimate the optimal debt ratio in each individual year. This is done by estimating the coefficients for debt ratio and debt ratio squared, each multiplied by a dummy for each year and then adding control variables for firm level and industry level effects.

$$
\begin{aligned}
Y_t = \beta_0 + \beta_{1,1} DUM_{T=2001} + \beta_{2,1} Debt\ Ratio \cdot DUM_{T=2001} + \beta_{3,1} Debt\ Ratio^2 \\
\cdot DUM_{T=2001} + \beta_{1.2} DUM_{T=2002} + \beta_{2.2} Debt\ Ratio \cdot DUM_{T=2002} + \cdots \\
+ \beta_{3.13} Debt\ Ratio^2 \cdot DUM_{T=2013} + [firm\ level\ control\ variables] \\
+ [industry\ level\ control\ variables] + \varepsilon
\end{aligned}
$$

We can use vector notation to simplify the expression somewhat:

$$Y_{ROA} = \beta_0 + \begin{vmatrix}\beta_{1,1} & \beta_{1,2} & \cdots & \beta_{1,12} & \beta_{1,13}\end{vmatrix} \begin{vmatrix} DUM_{T=2001} \\ DUM_{T=2002} \\ \vdots \\ DUM_{T=2012} \\ DUM_{T=2013} \end{vmatrix}$$

$$+ \begin{vmatrix}\beta_{2,1} & \beta_{2,2} & \cdots & \beta_{2,12} & \beta_{2,13}\end{vmatrix} \begin{vmatrix} DUM_{T=2001} \\ DUM_{T=2002} \\ \vdots \\ DUM_{T=2012} \\ DUM_{T=2013} \end{vmatrix} Debt\ Ratio$$

$$+ \begin{vmatrix}\beta_{3,1} & \beta_{3,2} & \cdots & \beta_{3,12} & \beta_{3,13}\end{vmatrix} \begin{vmatrix} DUM_{T=2001} \\ DUM_{T=2002} \\ \vdots \\ DUM_{T=2012} \\ DUM_{T=2013} \end{vmatrix} Debt\ Ratio^2$$

$$+ [firm\ level\ control\ variables] + [industry\ level\ control\ variables] + \varepsilon$$

$$Y_{ROA} = \beta_0 + \widetilde{\beta_1}\widetilde{DUM}_{Year} + \widetilde{\beta_2}\widetilde{DUM}_{Year} Debt\ Ratio + \widetilde{\beta_2}\widetilde{DUM}_{Year} Debt\ Ratio^2$$

$$+\widetilde{CTRL}_{Firm} + \widetilde{CTRL}_{Industry} + \varepsilon$$

Where

$$\widetilde{\beta_j} = \begin{vmatrix}\beta_{j,1} & \beta_{j,2} & \cdots & \beta_{j,12} & \beta_{j,13}\end{vmatrix}$$

$$\widetilde{DUM}_{Year} = \begin{vmatrix} DUM_{T=2001} \\ DUM_{T=2002} \\ \vdots \\ DUM_{T=2012} \\ DUM_{T=2013} \end{vmatrix}$$

$$\widetilde{CTRL}_{Firm} = [firm\ level\ control\ variables]$$

$$\widetilde{CTRL}_{Industry} = [industry\ level\ control\ variables]$$

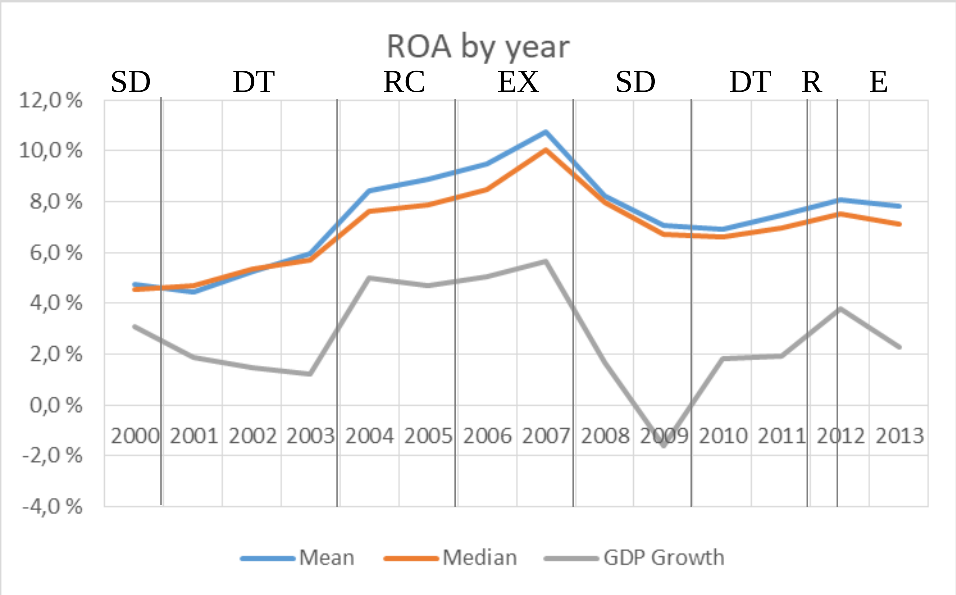
This is the general model that will be used to perform my analyses in the analysis section. When attempting to find evidence for the different hypotheses the model may be adapted in minor ways to suit these purposes. When this is the cause I will explicitly explain the alterations made.

6 Analysis, Discussion and Conclusion

In this section I will begin with presenting a general overview of the development of firms throughout the business cycle. Then I will look closer at each hypothesis and discuss the results of the related analyses. In the end I will summarize my findings in a final conclusion.

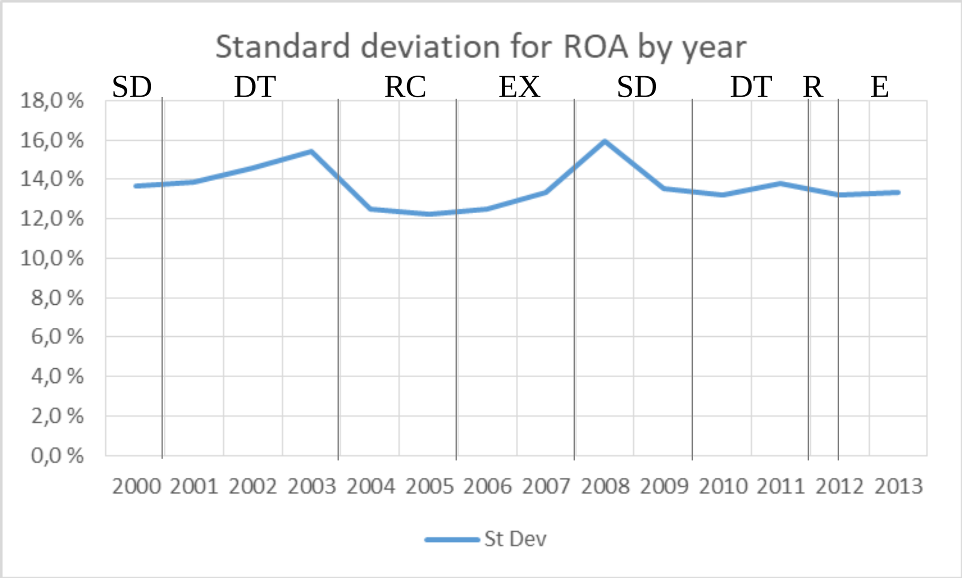
6.1 General overview

6.1.1 Return on Assets

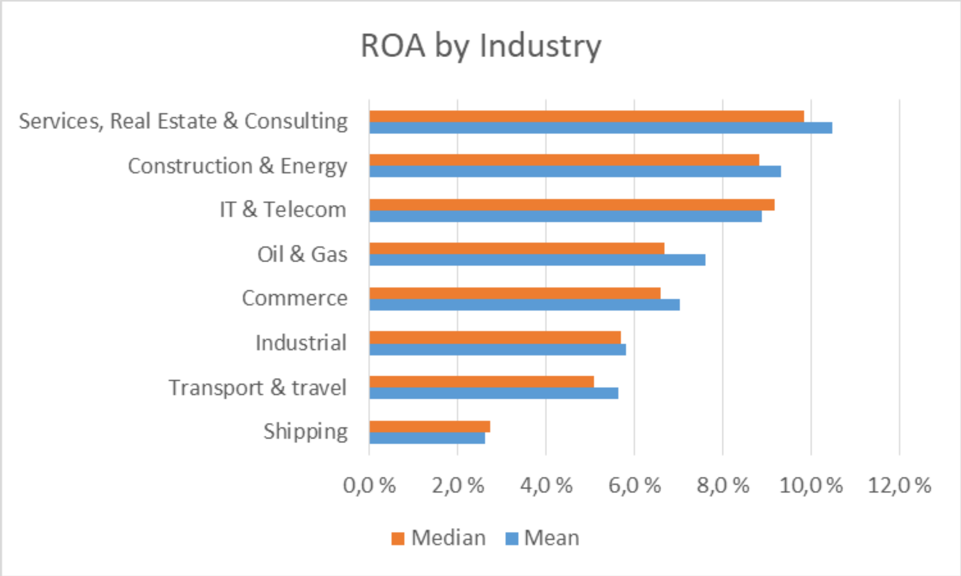


Graph 3: Mean and median Return on Assets for firms in the period 2000-2013, and GDP growth.
Source: Brønnøysund/SNF

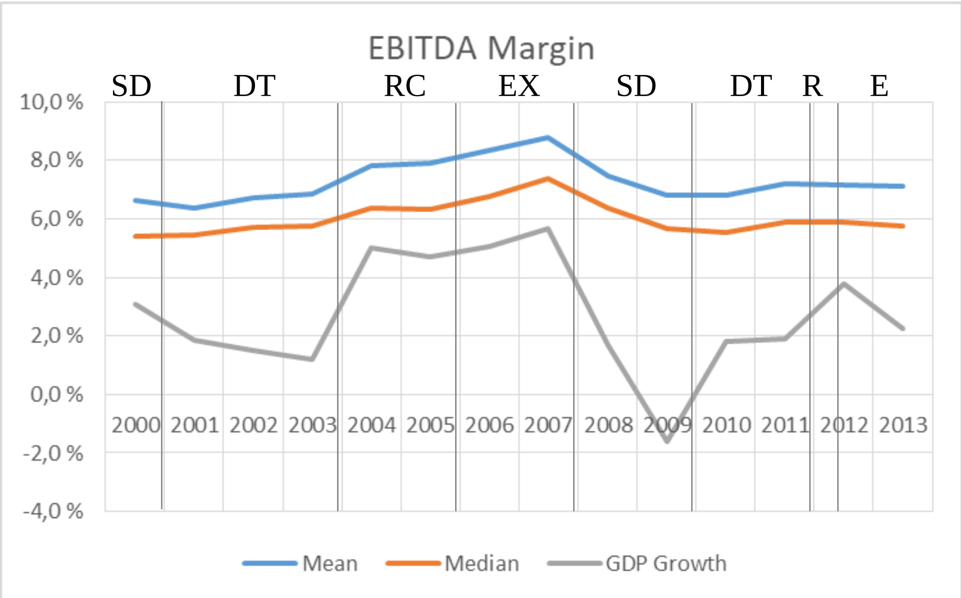
Graph 3 above shows the mean and median ROA plotted against the real GDP growth. The mean and median follow each other closely. However, the mean seem to grow faster during booms and fall faster during recessions. This could indicate that some firms in our sample which pull the average up by performing disproportionally good in booms. ROA seems to vary with the business cycle. It is substantially higher during the boom from 2004 to 2007, and drops markedly when the economy moves into recession. This holds true for both the period before and after the boom. The ROA standard deviation spikes at the end of the downturn in 2003 and displays a steady low during the boom in 2004 to 2007 before spiking again in the beginning of the slow down.



Segmenting by industry it can be seen that the ROA varies substantially between different parts of the economy. Services, Real Estate & Consulting is on the top, possibly driven by the Norwegian housing market. Shipping is ranking lowest which is to be expected given that the industry is dominated by large sunk costs and that the freight rates have been low (Clarksons, 2017). In fact due to its underlying microeconomic dynamics even an efficient shipping market will display longer periods of low activity borken by shorter periods of very high activity (Norman, 1979).

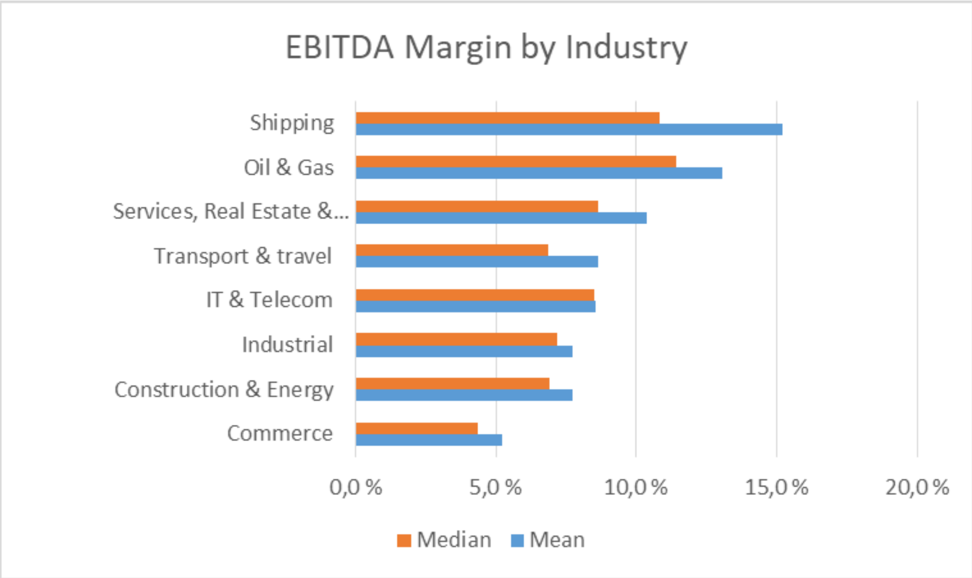


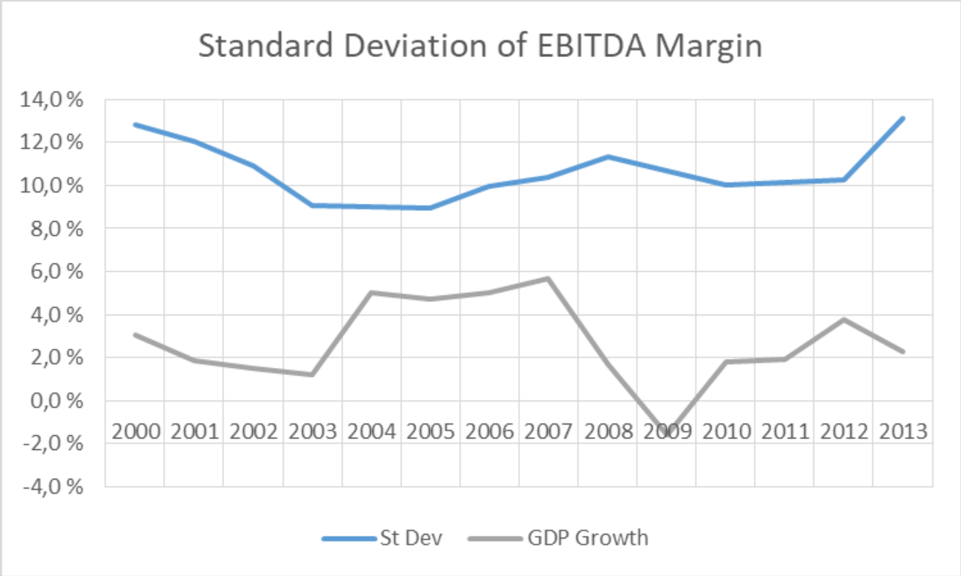
6.1.2 EBITDA Margin



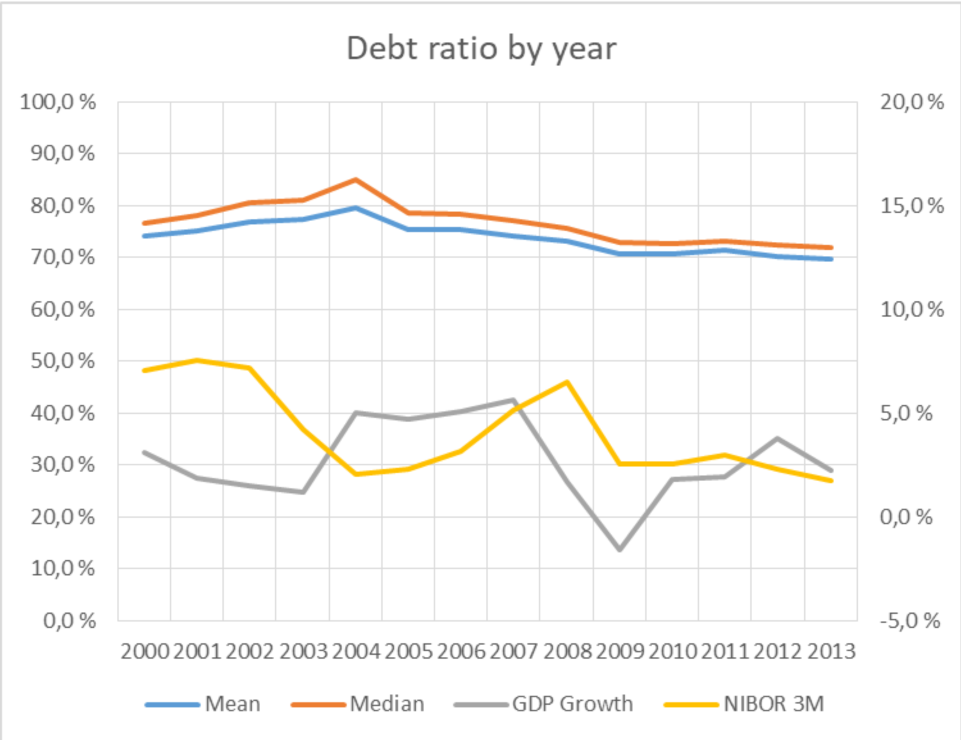
The EBITDA margin displays a similar to that of the ROA. It follows the macroeconomic activity althought it seems more stable than ROA. This could be explained by the EBITDA Margin being less sensitive to volume than the ROA. Firms are able to scale the variable parts of their costs during recessionary periods of low demand and maintain parts of their margin. This is especially true for firms with high variable costs. The returns however will follow the volume (unless margin can be substantially improved) and thus the Return on Assets will vary more during fluctuations in demand.

This fundamental difference can be seen in the industry break-down below. Shipping shows the highest EBITDA margin even though it is also the industry with lowest ROA. The high EBITDA margin is understandable given that EBITDA excludes capital costs and shipping is a capital-intensive industry. Interestingly, Oil & Gas and Shipping show the highest values for standard deviations of EBITDA margin. Capital costs are typically fixed and thus it seems sensible that firms within these capital-intensive industries have problems scaling their costs with large demand fluctuations.

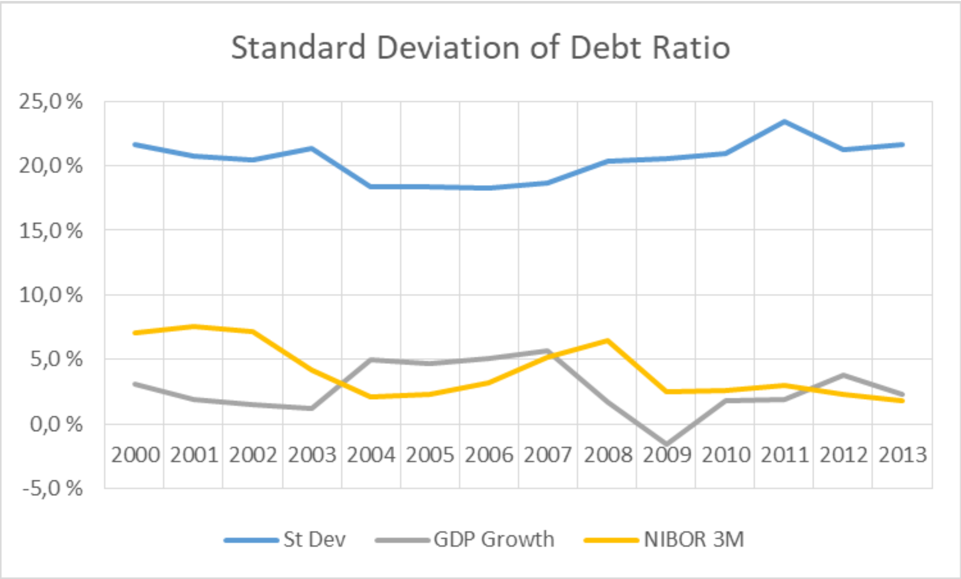




6.1.3 Debt



From the graph above it can be seen that the debt ratio increased steadily and spiked in 2004. This is congruent with the sudden increase in real GDP growth at the beginning of the recovery phase in 2004 to 2005. Additionally the interest rate dropped during in the same year making debt financing more attractive, and effectively shifting the optimal debt level higher. Directly after in 2005 the debt ratio drops suddenly even though there is no corresponding drop in real economic output, nor increase in interest rates. Part of the debt ratio drop could be explained by increases in book equity from the improved returns firms enjoyed during the demand increases. However, it also seems like many firms reduced their debt levels in 2005. After 2005 the debt ratio falls slowly as interest rates steadily increase and the economy starts moving into the slow down phase. There is no abrupt drop in mean and median debt levels here, possibly due to compensatory effect of interest rates dropping. However, from the standard deviation plot we can see that variance between firm capital structure increases.



6.2 Regression analysis

The regression analysis was performed using a Fixed Effects estimator on the specified regression model. As discussed in the econometric section the Random Effects estimator would be preferred because it can utilize the variance both within and between cross-sections. Unfortunately a Hausman tests soundly rejects the null hypothesis of no systematic difference. Therefore the time constant firm specific effect must be assumed to be correlated with the explanatory variables. This leaves the FE estimator as the next best option. The coefficients of determination (R^2) are reported at the bottom of each regression table. The R^2 metric is dependent on the estimator. For the FE estimator the within R-squared is used because the FE only utilizes variation within cross-sections.

The models were first estimated without control variables and then with so that any potential difference could be observed. As can be seen from the R-squared the proportion of explained variance increase substantially with the inclusion of the control variables, moving from 14,3% to 20,2%. This is good and suggests that the model with the control variables should be the preferred model.

The models find statistically significant relationships both with and without control variables. The coefficients change somewhat but the general tendencies in the model remain. Estimates are significant with a few exceptions. Particularly, for the controlled model the estimates for both debt ratio and debt ratio squared are not statistically significant in 2007 and 2009. This means that the estimates in these years cannot be used. For the remaining years estimates show strong statistical significance for debt ratio related coefficients estimates.

The dummy variables makes it possible to measure the effect of debt ratio at each point in time. The squared debt ratio term allows the model to measure non-linear relationships. This is key point because the concept of an optimal debt ratio automatically assumes that the debt ratio effect on performance is non-linear in nature. Coefficients of control variables are not presented in the regression tables of this section. This mainly due to space restrictions and the scope of this paper. However, control variable coefficients are included in the appendix. The number of observations are substantially smaller for

Regression results for ROA

Variables	Fixed Effects With Controls Coefficients	Fixed Effects With Controls Standard Error	Fixed Effects without Controls Coefficients	Fixed Effects without Controls Standard Error
$Constant$	-0,1872***	0,0455	0,1470***	0,0061
$Debt\ Ratio$	0,2538***	0,0234	0,0503***	0,0148
$Debt\ Ratio^2$	-0,3325***	0,0157	-0,1913***	0,0093
$DUM_{T=2001}$			-0,0980***	0,0085
$DUM_{T=2002}$	-0,0356***	0,0108	-0,1199***	0,0086
$DUM_{T=2003}$	0,0120	0,0097	-0,0575***	0,0074
$DUM_{T=2004}$	0,0398***	0,0110	-0,0439***	0,0085
$DUM_{T=2005}$	0,0442***	0,0120	-0,0197**	0,0095
$DUM_{T=2006}$	0,0362***	0,0117	-0,0356***	0,0092
$DUM_{T=2007}$	0,0337***	0,0118	-0,0519***	0,0088
$DUM_{T=2008}$	-0,0336***	0,0112	-0,0675***	0,0081
$DUM_{T=2009}$	-0,0293***	0,0110	-0,0976***	0,0080
$DUM_{T=2010}$	-0,0036	0,0108	-0,0856***	0,0080
$DUM_{T=2011}$	0,0481***	0,0101	0,0133*	0,0069
$DUM_{T=2012}$	0,0076	0,0113	-0,0819***	0,0083
$DUM_{T=2013}$	-0,0134	0,0126	-0,0757***	0,0085
$DUM_{T=2001} \cdot Debt\ Ratio$			0,2532***	0,0218
$DUM_{T=2002} \cdot Debt\ Ratio$	0,1163***	0,0285	0,3293***	0,0216
$DUM_{T=2003} \cdot Debt\ Ratio$	-0,0573**	0,0245	0,1293***	0,0167
$DUM_{T=2004} \cdot Debt\ Ratio$	-0,1368***	0,0280	0,1050***	0,0203
$DUM_{T=2005} \cdot Debt\ Ratio$	-0,0919***	0,0324	0,1374***	0,0249
$DUM_{T=2006} \cdot Debt\ Ratio$	-0,0687**	0,0312	0,1843***	0,0238
$DUM_{T=2007} \cdot Debt\ Ratio$	-0,0326	0,0319	0,2642***	0,0231
$DUM_{T=2008} \cdot Debt\ Ratio$	0,0921***	0,0294	0,2485***	0,0205
$DUM_{T=2009} \cdot Debt\ Ratio$	-0,0213	0,0292	0,2115***	0,0207
$DUM_{T=2010} \cdot Debt\ Ratio$	-0,1390***	0,0283	0,1460***	0,0207
$DUM_{T=2011} \cdot Debt\ Ratio$	-0,3205***	0,0250	-0,1714***	0,0159
$DUM_{T=2012} \cdot Debt\ Ratio$	-0,1923***	0,0293	0,1130***	0,0215
$DUM_{T=2013} \cdot Debt\ Ratio$	-0,1752***	0,0339	0,0556**	0,0227
$DUM_{T=2001} \cdot Debt\ Ratio^2$			-0,1607***	0,0142
$DUM_{T=2002} \cdot Debt\ Ratio^2$	-0,0746***	0,0190	-0,2075***	0,0139
$DUM_{T=2003} \cdot Debt\ Ratio^2$	0,0632***	0,0161	-0,0533***	0,0100
$DUM_{T=2004} \cdot Debt\ Ratio^2$	0,1466***	0,0184	-0,0094	0,0126
$DUM_{T=2005} \cdot Debt\ Ratio^2$	0,0568***	0,0221	-0,0984***	0,0167
$DUM_{T=2006} \cdot Debt\ Ratio^2$	0,0426**	0,0211	-0,1268***	0,0158
$DUM_{T=2007} \cdot Debt\ Ratio^2$	0,0061	0,0220	-0,1877***	0,0153
$DUM_{T=2008} \cdot Debt\ Ratio^2$	-0,0936***	0,0199	-0,1897***	0,0132
$DUM_{T=2009} \cdot Debt\ Ratio^2$	0,0313	0,0199	-0,1212***	0,0137
$DUM_{T=2010} \cdot Debt\ Ratio^2$	0,1238***	0,0192	-0,0668***	0,0137
$DUM_{T=2011} \cdot Debt\ Ratio^2$	0,2672***	0,0165	0,1689***	0,0097
$DUM_{T=2012} \cdot Debt\ Ratio^2$	0,1766***	0,0200	-0,0244*	0,0143

$DUM_{T=2013} \cdot Debt\ Ratio^2$	0,1734***	0,0238	0,0265*	0,0154
R2	0,202		0,143	
Observations	137290		211665	

Control variables have been excluded from the table due to space restrictions. An overview of all coefficients can be found in appendix 2.
* p < 0.10, ** p < 0.05, *** p < 0.01

6.3 The existence and Dynamics of the Optimal Debt Ratio

Hypothesis 1: For each year of the business cycle there exists an optimal debt ratio that maximizes ROA

Hypothesis 2: For each year of the business cycle there exists an optimal debt ratio that maximizes EBITDA Margin

The regression results show strong evidence for a non-linear relationship between the ROA and the Debt Ratio with the exception of years 2007 and 2009. In order to identify whether this non-linear relationship would facilitate an optimal debt ratio the combined effect of the debt ratio on ROA must be tested for concavity. A concave relationship will be characterized by a positive coefficient for Debt Ratio and negative coefficient for Debt Ratio squared. In cases where the relationship is concave the maximum point can be found by differentiating the expression and setting it equal to zero.

$$\beta_1 Debt\ Ratio - \beta_2 Debt\ Ratio^2$$

$$\frac{d}{dDebt\ Ratio}\beta_1 Debt\ Ratio - \beta_2 Debt\ Ratio^2 = 0$$

$$\beta_1 - 2\beta_2 Debt\ Ratio^* = 0$$

$$Debt\ Ratio^* = \frac{\beta_1}{2\beta_2}$$

The results of this algebraic refinement can be seen in the table below. With the exception of 2011, all years with statistically significant estimates show evidence of concave relationship between the ROA and the Debt Ratio and the existence of an optimal debt ratio in each of the remaining years.

6.4 Dynamics of the Optimal Debt Ratio

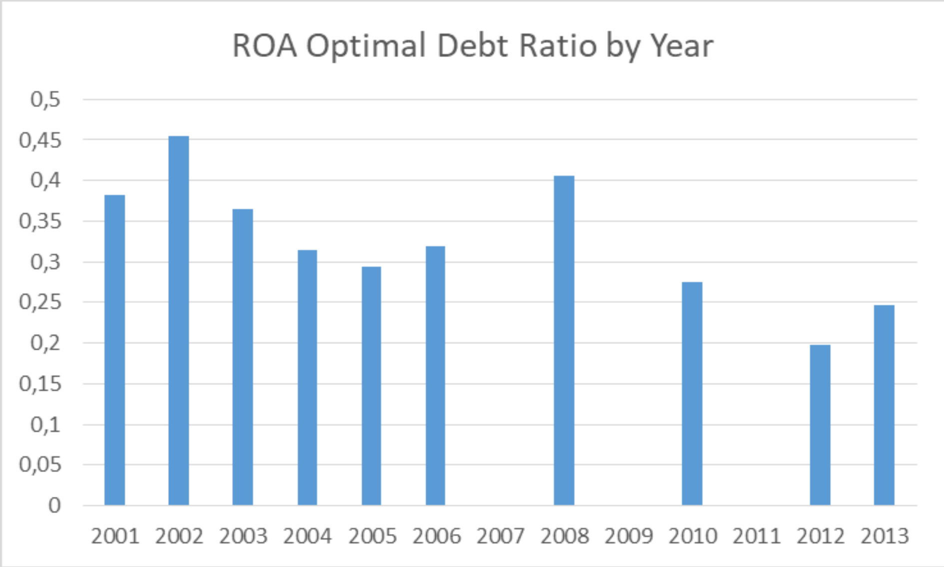
Hypothesis 3: The optimal debt ratio for the ROA shifts towards less debt at the beginning of the recession

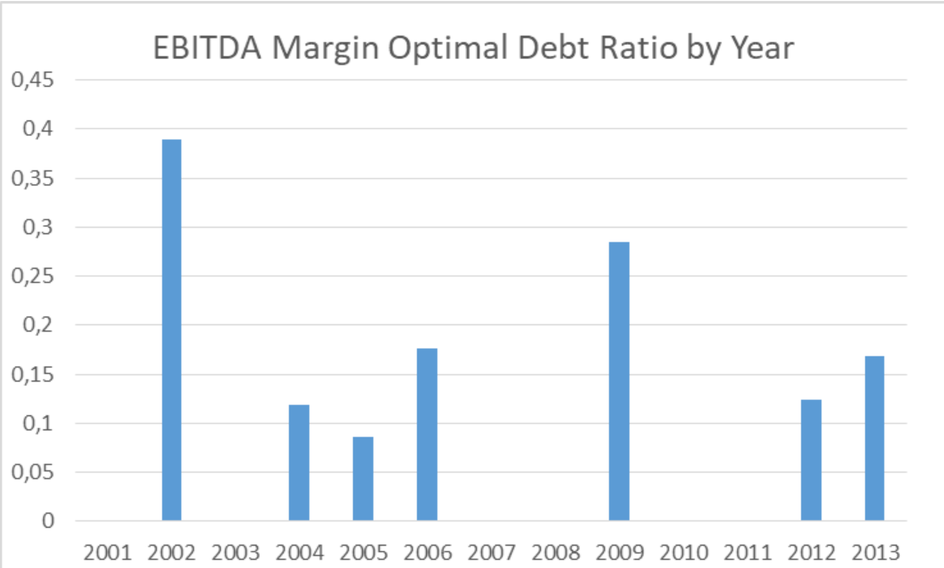
Hypothesis 4: The optimal debt ratio for the EBITDA Margin shifts towards less debt at the beginning of the recession

Hypothesis 5: The optimal debt ratio for the ROA shifts towards more debt at the beginning of the boom.

Hypothesis 6: The optimal debt ratio for the EBITDA Margin shifts towards more debt at the beginning of the boom

In 2011 the relationship is initially negative and exponentially decreasing meaning no optimal debt ration can be found. In fact the mathematically optimal solution in that case would be a fully equity-financed capital structure. This strange relationship could be an artifact of unrepresentative extreme observations that were not caught by the previous standard deviations trimming. Standard deviation of debt ratio shows a small spike in 2011, reaching its highest level of variance in the time period of this study. However this increase in standard deviation is still quite small. There are no spikes in interest rate which could potentially explain the estimate. The output gap is at its lowest in this part of the business cycle. However, the negative differences was even larger in 2003. It is possible that firm's with a large equity ratio is able to enjoy some unobserved benefit in this particular year. However, for the purposes of this paper I will treat the result of 2011 as an anomaly and exclude it from further analyses. The EBITDA Margin seems to follow a similar pattern. Although far fewer significant results were found. Optimal debt ratios were calculated for the significant estimates and presented in the graph below. With I conclude that there exist a optimal debt level for ROA and EBITDA Margin. As can be seen from the graphs this optimal ratio changes with time and follows a similar pattern of the business cycle.


ROA Optimal Debt Ratio by Year
0,5
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013


EBITDA Margin Optimal Debt Ratio by Year
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Regression results for EBITDA Margin

	Fixed Effects With Controls		Fixed Effects without Controls	
Variables	Coefficients	Standard Error	Coefficients	Standard Error
Constant	0,0304	0,0299	0,1470***	0,0061
Debt Ratio	0,0979***	0,0154	0,0371***	0,0107
$Debt\ Ratio^2$	-0,1170***	0,0103	-0,0666***	0,0067
$DUM_{T=2001}$			-0,0404***	0,0061
$DUM_{T=2002}$	0,0070	0,0071	-0,0318***	0,0062
$DUM_{T=2003}$	0,0442***	0,0063	0,0241***	0,0053
$DUM_{T=2004}$	0,0298***	0,0072	-0,0015	0,0061
$DUM_{T=2005}$	0,0339***	0,0079	0,0170**	0,0068
$DUM_{T=2006}$	0,0304***	0,0077	0,0086	0,0066
$DUM_{T=2007}$	0,0183**	0,0077	-0,0161**	0,0064
$DUM_{T=2008}$	-0,0046	0,0073	-0,0270***	0,0059
$DUM_{T=2009}$	0,0015	0,0072	-0,0266***	0,0058
$DUM_{T=2010}$	0,0115	0,0071	-0,0220***	0,0058
$DUM_{T=2011}$	0,0176***	0,0066	0,0123**	0,0050
$DUM_{T=2012}$	0,0041	0,0074	-0,0259***	0,0060
$DUM_{T=2013}$	-0,0060	0,0083	-0,0322***	0,0061
$DUM_{T=2001} \cdot Debt\ Ratio$			0,1192***	0,0158
$DUM_{T=2002} \cdot Debt\ Ratio$	-0,0107	0,0188	0,0897***	0,0156
$DUM_{T=2003} \cdot Debt\ Ratio$	-0,1377***	0,0161	-0,0727***	0,0120
$DUM_{T=2004} \cdot Debt\ Ratio$	-0,0872***	0,0184	0,0149	0,0146
$DUM_{T=2005} \cdot Debt\ Ratio$	-0,0861***	0,0213	0,0032	0,0180
$DUM_{T=2006} \cdot Debt\ Ratio$	-0,0690***	0,0205	0,0322*	0,0172
$DUM_{T=2007} \cdot Debt\ Ratio$	-0,0221	0,0210	0,1047***	0,0167
$DUM_{T=2008} \cdot Debt\ Ratio$	-0,0035	0,0193	0,0975***	0,0148
$DUM_{T=2009} \cdot Debt\ Ratio$	-0,0532***	0,0192	0,0507***	0,0150
$DUM_{T=2010} \cdot Debt\ Ratio$	-0,0994***	0,0186	0,0237	0,0150
$DUM_{T=2011} \cdot Debt\ Ratio$	-0,1319***	0,0165	-0,0859***	0,0115
$DUM_{T=2012} \cdot Debt\ Ratio$	-0,0853***	0,0193	0,0293*	0,0155
$DUM_{T=2013} \cdot Debt\ Ratio$	-0,0832***	0,0223	0,0277*	0,0164
$DUM_{T=2001} \cdot Debt\ Ratio^2$	0	0	-0,0869***	0,0103
$DUM_{T=2002} \cdot Debt\ Ratio^2$	0,0053	0,0125	-0,0628***	0,0100
$DUM_{T=2003} \cdot Debt\ Ratio^2$	0,1017***	0,0106	0,0521***	0,0072
$DUM_{T=2004} \cdot Debt\ Ratio^2$	0,0721***	0,0121	-0,0008	0,0091
$DUM_{T=2005} \cdot Debt\ Ratio^2$	0,0481***	0,0145	-0,0240**	0,0121
$DUM_{T=2006} \cdot Debt\ Ratio^2$	0,0350**	0,0139	-0,0441***	0,0114
$DUM_{T=2007} \cdot Debt\ Ratio^2$	-0,0005	0,0144	-0,0897***	0,0111
$DUM_{T=2008} \cdot Debt\ Ratio^2$	-0,0094	0,0131	-0,0840***	0,0095
$DUM_{T=2009} \cdot Debt\ Ratio^2$	0,0385***	0,0131	-0,0421***	0,0099
$DUM_{T=2010} \cdot Debt\ Ratio^2$	0,0715***	0,0126	-0,0202**	0,0099
$DUM_{T=2011} \cdot Debt\ Ratio^2$	0,1020***	0,0108	0,0619***	0,0070

$DUM_{T=2012} \cdot Debt\ Ratio^2$	0,0667***	0,0132	-0,0200*	0,0103
$DUM_{T=2013} \cdot Debt\ Ratio^2$	0,0733***	0,0156	-0,0135	0,0111
R2	0,131		0,04	
Observations	137290		211665	

Control variables have been excluded from the table due to space restrictions. An overview of all coefficients can be found in appendix 3.
* p < 0.10, ** p < 0.05, *** p < 0.01

6.5 The effect size on the optimal debt ratio

Hypothesis 7: The optimal debt ratio for the EBITDA Margin shifts towards more debt at he beginning of the boom

Hypothesis 8: The optimal debt ratio for the EBITDA Margin shifts towards more debt at the beginning of the boom

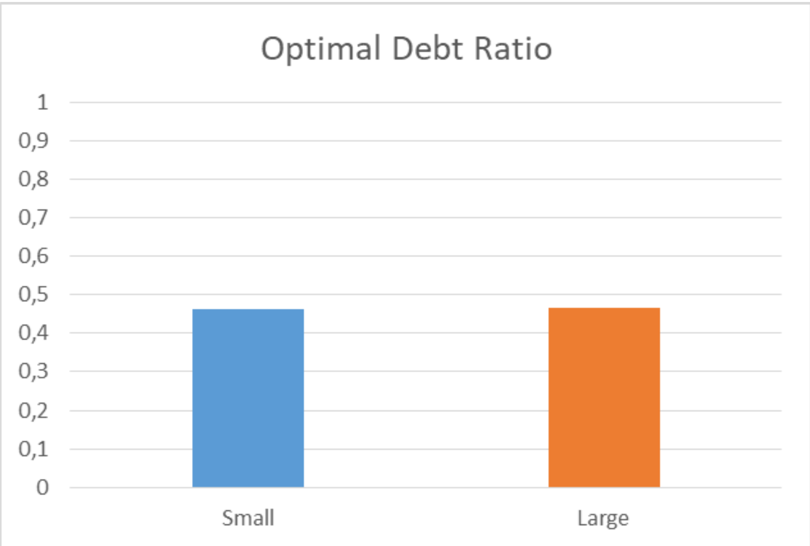
When testing for the effect of firms being large or small, all observations have been split into two categories; large and small. The split level is set at the median of total assets within each year and industry. The decision to adjust for industries as comes with advantages and drawbacks. On the one hand, some potential impacts of size such as inertia, complexity, managerial challenges, economies of scale, etc. are arguably related to the absolute size rather than relative size of the firm. Hence in industries dominated by firms of large or small absolute size the potential negative impacts of size may not be accurately modelled when using a metric for relative size within industries.

On the other hand, other potential effects of size such as market power should be more closely related the relative size of firms. Furthermore, given a competitive market a firm's ability to generate above normal profits should be based on its ability to outcompete other firms. For this reason I will adjust the size dummy according to industries.

The effect of a firm being large or small on the optimal debt ratio can be tested with relative ease using the Pooled OLS Estimator. As discussed under the econometric section, the

Pooled OLS ignores the unique properties of panel data and utilize the data set as if it was one big cross-section.

This helps us identify an overall relationship between size category and debt level, irrespective of time. As can be viewed from the figure below the Pooled OLS estimator finds statistical evidence for an optimal debt level. By adding a dummy for large size we are able to isolate the effect of size on the estimates. Small size is used as the base case and the effect of large size is added “on top”. Testing the relationship in this manner yields separate estimates and standard errors for the differences in coefficient estimates that the size categorization provides. The standard errors allows us to see if the differences are statistically significant or not. In the Pooled OLS results the differences are strongly significant.



Variable	Small		Large	
	Coefficient	St Error	Coefficient	St Error
Debt Ratio	0,1714***	0,0054	0,04127***	0,010
Debt Ratio^2	-0,1848***	0,0029	-0,0437***	0,007
Calculated variable				
Optimal Debt Ratio	0,4639		0,4654	

However, when calculating the optimal debt level for small and large firms separately, we see that the optimal debt ratio does not differ much between small and large firms for the entire time period as a whole. This makes it interesting to test the differences in each year. In order to do this we can apply the same method of size categorizing to the FE model used in the analyses above. Again, when doing this we get the base case with coefficient estimated for small category firms and the addition of how much these estimates differ when the large size dummy is activated. In effect, by doing this we get the benefits of being able to see if the differences for each year and if these differences are statistically significant for each year.

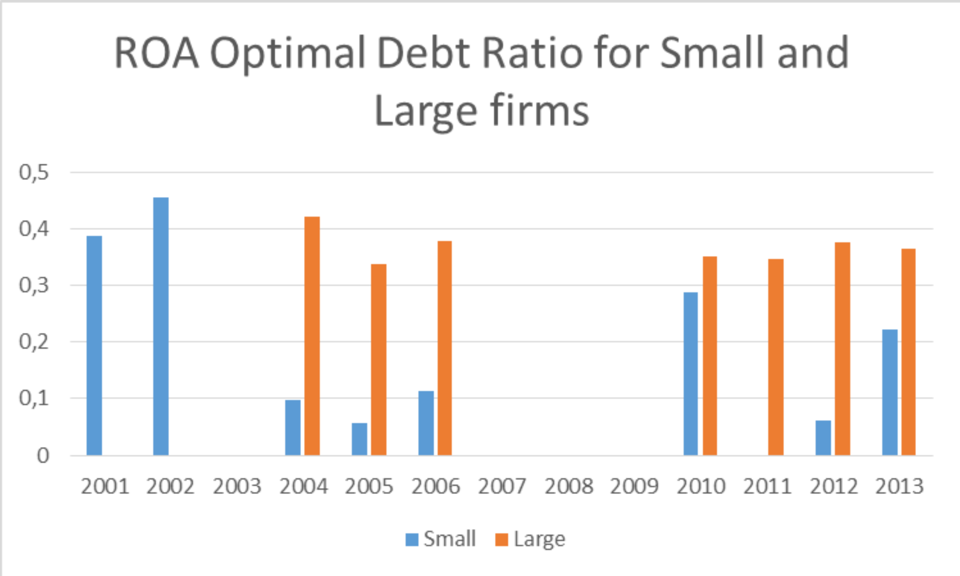
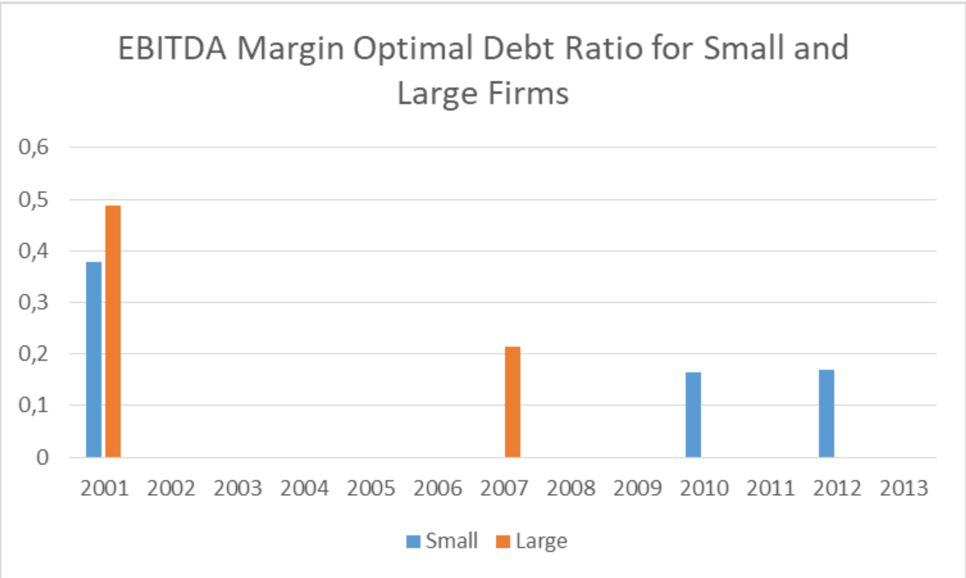


Figure 8: Results from the RE estimator model measuring differences in Optimal debt rato between small and large firms

There are some drawbacks with this method. Perhaps most notable, the method includes a lot of extra parameters to the model. This increases the degrees of freedom that are lost substantially, making it more challenging to prove statistically significant relationships. However, as can be seen illustrated in the graph we do find some statistically significant difference for many of the years. The plot shows the optimal debt ratios for small and large firms based on the estimated coefficients. Only debt ratios with statistically significant estimates are included. On other words the difference between the debt ratios of small and large firms for each year are also statistically significant.

For the years where significant estimates have been found for both size categories, there seem to be a clear tendency for small firms to have a smaller optimal debt ratio than large firms. In the years 2001 and 2002 the optimal debt ratio for small firms seems to be substantially higher compared to the other years. However, without reliable estimates for large firms in these years it is difficult to discuss the relative difference in these years. It should also be noted that significant estimates are missing around the time periods when the output gap is furthest away from the trend. This could mean that the volatility of the underlying relationship increase during periods of exceptionally favorable or unfavorable economic conditions. If this is the case then a possible explanation would be that other factors than capital structure become more important for ROA in these periods. Another potential explanation could be that that debt ratio is particularly important during times of economic change, when the growth rate is exceptionally high or low. It also might seem like the difference optimal debt ratio between large and small firms increase when GDP growth rate exceeds the trend and reduce when the GDP growth rate returns to trend levels, although there is no strong evidence to support this.

The Pooled OLS model was not able to find a statistically significant relationship between EBITDA Margin and the debt ratio squared. For this reason size category differences in EBITDA margin optimal debt ratio was not identified for the time period as a whole. When testing for optimal debt ratios in each individual year, estimates of statistical significance was not found with the exception of the base year 2001 as well as 2007 for large firms and 2010 and 2012 for small firms.



This lack of statistical evidence makes it difficult to discuss how the optimal debt ratio for EBITDA margin develop throughout the cycle for small and large firms. However, the tendency for optimal debt ratios to be smaller for small firms also seem to hold true for EBITDA margin in the base year of 2001. The optimal debt ratios for small firms in 2010 and 2012 are smaller than the equivalent ratio for large firms in 2007. However, as seen in the data for ROA the optimal ratio can vary between different parts of the business cycle.

For this reason I only consider 2001 a viable indication of the difference in optimal debt ratios for EBITDA margin.

As a general conclusion to this subsection I will say that there exists evidence for the possibility of adapting to the business cycle. If the relationship indicated by the analyses are indeed causal then a firm that optimized the debt ratio accordingly should have been able to secure a higher ROA than if the firm had not done so.

6.6 The effect of strategically adapting capital structure to the business cycle

Hypothesis 9:

Hypothesis 9: Firms that reduce their debt levels at the onset of the recession shows better performance throughout the entire cycle relative to their competitors.

As discussed throughout the theory section shifting capital structure to account for the business cycle should be associated with improved firm performance. The idea is that different levels of debt will be optimal for different phases of the business cycle. In the previous parts of the analysis section we have seen evidence for an optimal debt level and that change throughout the cycle, supporting the idea.

In the last parts of the theory section I hypothesized that firms which possess the dynamical capability to adapt to the business cycle should have a competitive advantage that gives them superior performance in general. In order to test for this it is first necessary to identify firms which adapts their capital structure to the business cycle. In any given year there should be a large number of firms that increases or decreases their capital ratio. In fact unless the firm rebalances its capital structure perfectly the addition of net income to equity should mean that we would expect at least minor changes in debt ratios for all firms. In order to separate minor fluctuations from more substantial changes in the debt ratio I will use a limit. Firms that change their debt ratio by 10 percentage points or more are assumed to have made a managerial decision to change the capital structure. I have chosen to set the limit at 10 because 15 percentage points excludes a substantial share of firms that could be optimizing their capital structure, while 5 percentage points seem to negatively influence the statistical significance of the results.

Because it is necessary to identify firms that actively adapts to the cycle I choose a time period where it seems most beneficial to make capital structure changes. Increasing the debt ratio would be most beneficial right before the boom. This means that 2003, 2004 and 2005 were the years where it would have made the most sense to increase debt ratio. Conversely, decreasing the leverage should be most beneficial right before a recession, which would be 2007, 2008 and 2009 before and at the beginning of the Great Recession.

In each of the years, firms that decreased or increased capital ratios respectively beyond 10 percentage points were identified and given a dummy variable for all years. This dummy variable was then used in regression as an explanatory variable for ROA and EBITDA Margin together with the control variables. The coefficient estimate of the dummy should then capture any potential differences in performance of these firms compared to the rest of the market.

I first use a FE estimator with the full set of control variables to test if reducing debt ratio by 10 percentage points leads to firms enjoying improved performance in the 4 years following. During the slowdown phase of 2007 to 2009, I find no statistical relationship between the debt ratio reduction and ROA for 2007 and 2008. However, firms that reduced debt ratio beyond 10 percentage points in 2009 showed statistically significant increase in performance in the following 4 years compared to firms that didn't. Running the same test for EBITDA Margin I find a similar positive and statistically significant relationship for 2008. As can be seen from the table below the effect on ROA seems to be somewhat higher than for EBITDA. However both coefficients has positive term. This is congruent with what was predicted by theory.

Regression results using a Fixed Effects estimator

	ROA		EBITDA Margin	
Variables	Coefficients	Standard Error	Coefficients	Standard Error
$Debt\ Ratio\ Adj\ 2009$	0,0701***	0,0170		
$Debt\ Ratio\ Adj\ 2008$			0,0324**	0,0159
$DUM_{T=2010}$			-0,0063***	0,0019
$DUM_{T=2011}$	-0,0077***	0,0026	-0,0077***	0,0029

$DUM_{T=2012}$	-0,0150***	0,0029	-0,0100***	0,0027
$DUM_{T=2013}$	-0,0261***	0,0039	-0,0100***	0,0027
$DUM_{T=2011} \cdot Debt\ Ratio\ Adj\ 2009$	-0,0102***	0,0023		
$DUM_{T=2012} \cdot Debt\ Ratio\ Adj\ 2009$	-0,0088***	0,0028		
$DUM_{T=2013} \cdot Debt\ Ratio\ Adj\ 2009$	-0,0117***	0,0033		
$DUM_{T=2011} \cdot Debt\ Ratio\ Adj\ 2008$			-0,0037*	0,0021
$DUM_{T=2012} \cdot Debt\ Ratio\ Adj\ 2008$			-0,0063***	0,0022
$DUM_{T=2013} \cdot Debt\ Ratio\ Adj\ 2008$			-0,0040	0,0026
Growth in Sales	0,0156***	0,0009	0,0112***	0,0006
Delta Equity	0,0001***	0,0000	0,0000***	0,0000
Firm Size	0,0749***	0,0025	0,0485***	0,0015
Firm Age	0,0119	0,0085	0,0046	0,0047
ROA_{t-1}	-0,1764***	0,0074	-0,0288***	0,0043
$EBITDA\ Margin_{t-1}$	0,1233***	0,0115	-0,0024	0,0065
$Liquidity\ Ratio_{t-1}$	-0,0101***	0,0009	-0,0052***	0,0005
$Receivables\ to\ Assets_{t-1}$	0,0685***	0,0070	0,0087**	0,0041
$Cash\ to\ Assets_{t-1}$	0,0856***	0,0075	0,0201***	0,0045
$Interests\ Coverage_{t-1}$	-0,0000	0,0000	-0,0000	0,0000
$Log\ Compensation_{t-1}$	0,0010	0,0030	-0,0019	0,0017
Industry Growth in Sales	0,0494*	0,0282	-0,0142	0,0158
Industry Firm Size	0,0141	0,0094	-0,0299***	0,0081
Industry Firm Age	0,0169*	0,0089	0,0189***	0,0058
Industry ROA_{t-1}	-0,0094	0,0343	0,0067	0,0244
$Industry\ EBITDA\ Margin_{t-1}$	-0,1119	0,0826	-0,0715*	0,0386
$Industry\ Liquidity\ Ratio_{t-1}$	0,0215	0,0156	0,0122	0,0100
$Industry\ Receivables\ to\ Assets_{t-1}$	-0,2035***	0,0606	0,0041	0,0181
$Industry\ Cash\ to\ Assets_{t-1}$	-0,2817***	0,1014	0,1372***	0,0356
$Industry\ Interests\ Coverage_{t-1}$	0,0002	0,0002	0,0001	0,0001
$Industry\ Log\ Compensation_{t-1}$	0,0004	0,0229	-0,0057	0,0093
Constant	-0,8627***	0,1724	-0,1599	0,0995
R2	0,076		0,060	
Observations	40915		42076	

* p < 0.10, ** p < 0.05, *** p < 0.01

In order to test the effect of the dummies throughout the business cycle the model must be expanded for the full sample. Ideally additional year dummies would be included like in the table above so that any variation in effect throughout the cycle could be identified. Unfortunately it was not possible to get significant results using such a model. Instead a FE estimator model without year dummies was used to test the relationship. The results can be seen in the table below. The results are strong significant. The coefficients are slightly smaller than when testing for the 4 years directly after. This is expected as the effect of the reduced debt ratio should primarily be positive during the following boom and not through the entire sample. This also makes it difficult to conclude whether these firms show a general level of increased performance or whether the analysis simply picks up an effect limited to one boom. Without dummies for each year this question will be hard to answer. To conclude I find that the data indicates of a superior profit level for firms that reduced their debt ratio at the beginning of the recession. However, I cannot prove that this superior profit level stems from dynamic capabilities. Nor am I able to prove that the increased profit levels of these firms stem from a general capability to strategically adapt to the business cycle, and not just an artifact of luck.

Regression results using a Fixed Effects estimator

	ROA		EBITDA Margin	
Variables	Coefficients	Standard Error	Coefficients	Standard Error
Debt Ratio Adj 2009	0,0189***	0,0034		
Debt Ratio Adj 2008			0,0086***	0,0031
Growth in Sales	0,0206***	0,0005	0,0131***	0,0003
Delta Equity	0,0000***	0,0000	0,0000***	0,0000
Firm Size	0,0295***	0,0009	0,0265***	0,0005
Firm Age	-0,0092***	0,0017	-0,0068***	0,0011
ROA_{t-1}	0,0773***	0,0033	-0,0185***	0,0020
$EBITDA\ Margin_{t-1}$	0,0796***	0,0047	0,1957***	0,0029
$Liquidity\ Ratio_{t-1}$	-0,0110***	0,0004	-0,0052***	0,0002
$Receivables\ to\ Assets_{t-1}$	0,0791***	0,0029	-0,0037**	0,0018
$Cash\ to\ Assets_{t-1}$	0,1050***	0,0033	0,0200***	0,0020
$Interests\ Coverage_{t-1}$	0,0000***	0,0000	0,0000**	0,0000
$Log\ Compensation_{t-1}$	-0,0008	0,0013	0,0018**	0,0008
Industry Growth in Sales	0,0451***	0,0041	0,0166***	0,0025
Industry Firm Size	-0,0293***	0,0036	-0,0248***	0,0022
Industry Firm Age	-0,0057	0,0047	0,0013	0,0029
Industry ROA_{t-1}	0,1718***	0,0155	0,0919***	0,0096
$Industry\ EBITDA\ Margin_{t-1}$	0,0211	0,0208	-0,0379***	0,0129
$Industry\ Liquidity\ Ratio_{t-1}$	-0,0002	0,0037	0,0024	0,0023
$Industry\ Receivables\ to\ Assets_{t-1}$	0,1082***	0,0113	0,0099	0,0070
$Industry\ Cash\ to\ Assets_{t-1}$	-0,0510**	0,0200	-0,0196	0,0124
$Industry\ Interests\ Coverage_{t-1}$	0,0000	0,0000	0,0000	0,0000
$Industry\ Log\ Compensation_{t-1}$	-0,0471***	0,0037	-0,0439***	0,0023
Constant	0,3064***	0,0301	0,3039***	0,0187
R2	0,073		0,102	
Observations	137290		137290	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6.7 Conclusion

The main research question of this paper has been:

Can superior firm performance be gained by strategically adapting the capital structure to business cycle fluctuations?

The result show that there exists an optimal debt ratio for ROA and EBITDA margin. Furthermore for both ROA and EBITDA this optimal level of debt vary from year to year and seem to follow the phases of the business cycle. This lays the foundation for firm capable of easily changing their capital structure to exploit these changes. For instance the optimal debt level for ROA was higher in 2002 than in 2005. If there exists a causal relationship between these variables then firms might be able to gain increased performance by strategically increasing their debt ratio in periods when the optimum is high and conversely reducing it in periods when the optimum is lower.

The theory covered in this paper suggest that such a causal relationship should indeed exist. Furthermore when testing for difference in performance between firms that reduced the debt ratio at the onset of the great recession, evidence was found for improved profit levels during the following 4 years compared to the rest of the market. This finding further suggests that there exist a causal link between strategically optimizing the capital structure and achieving greater than average profits.

Whether these benefits extend for longer periods of time is hard to establish. For instance, it proved difficult to prove that the ability of the firm to strategically adapt stems from superior dynamic capabilities that will cause the firm to have superior profit in the long term or whether the analysis simply picks up an effect limited to one boom. Without dummies for each year this question will be hard to answer.

Furthermore the analysis in this paper revolves around a limited period of time. The analysis would benefit from data of multiple business cycles over a longer period of time. This could potentially allow for more general relationships to be found. Speaking from a strictly empirical point of view, we do not know whether the effects found in this study are isolated to this particular recession and period or if they are representative for future recessions. In order to answer these questions, further research is needed.

1. References

Adams, J. S. (1963). Toward an understanding of inequity. *Journal of Abnormal and Social Psychology, 67*, 422-436.

Andersen, M., & Frengstad, B. C. (2008). *The predictive power of the term structure in Norway*. Retrieved from NHH Brage - Open institutional repository: https://brage.bibsys.no/xmlui/handle/11250/168075

Backman, D. (2014, December 12). *Business cycle length and the probability of a recession*. Retrieved from Deloite University Press: https://dupress.deloitte.com/dup-us-en/economy/behind-the-numbers/business-cycle-length.html

Barney, J. B. (1986). Strategic factor markets: Expectations, luck and business strategy. *Management Science*, 1231-1241.

Barney, J. B. (1986). Strategic Factor Markets: Expectations, Luck and Business Strategy. *Management Science, Vol 32, Issue 10*, 1231-1241.

Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 99-120.

Benedictow, A., & Johansen, P. (2005). Prognoser for internasjonal økonomi - Står vi foran en amerikansk konunkturavmatning? *Økonomiske analyser 2/2005*, 13-20.

Bernanke, B., Gertler, M., & Gilchrist, S. (1996). The Financial Accelerator and the Flight to Quality. *The Review of Economics and Statistics, Vol 78*, 1-15.

Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2013). *Economics of Strategy, 6th Ed.* New York: John Wiley & Sons, Inc.

Bjørkli, R., & Sandberg, M. R. (2012). Recessions and the short-term stability of the relative economic performance between firms. *Master thesis, Norwegian School of Economics*.

Bloom, N., Bond, S., & Van Reenen, J. (2007). Uncertainty and Investment Dynamics. *Review of Economic Studies, Vol 74*, 391-415.

Bolle, C. M., & Hundvin, D. K. (2015). Corporate performance in recessions: The effects of capital structure and growth. *Master thesis, Norwegian School of Economics*.

Brealey, R. A., Myers, S. C., & Allen, F. (2014). *Principles of Corporate Finance (11th Edition).* New York: McGraw-Hill/Irwin.

Brynhildsrud, L. M. (2013). High-growth firms and the business cycle: A study on how the fastest growing Norwegian firms are affected by the different phases of the business cycle. *Master thesis, Norwegian School of Economics*.

Bykowsky, M. M., Kwasnica, A. M., Sharkey, & W, W. (2016, December 18). *Buyer Size and Bargaining Power: An Experimental Analysis.* Retrieved from Pen State University web site: http://www.personal.psu.edu/amk17/BuyerSize.pdf

Canova, F. (1998). Detrending and business cycle facts. *Journal of Monetary Economics*, 475-512.

Caves, R. E., & Porter, M. (1977). From entry barriers to mobility barriers: Conjectural decisions and contrived deterrence to new competition. *Quarterly Journal of Economics, 91*, 241-262.

Clark, A. (2009, September 04). *How the collapse of Lehman Brothers pushed capitalism to the brink*. Retrieved from The Guardian: https://www.theguardian.com/business/2009/sep/04/lehman-brothers-aftershocks-28-days

Clarksons. (2017, 01 15). *Shipping and Trade*. Retrieved from Clarksons.com: http://www.clarksons.com/services/research/shipping-and-trade/

Crook, T. R., Ketchen, D. J., Combs, J. G., & Todd, S. (2008). Strategic resources and performance: a meta-analysis. *Strategic Management Journal 29(11)*, 1141-1154.

D'Aveni, R. A., Dagnino, G. B., & Smith, K. G. (2010). The Age of Temporary Advantage. *Strategic Management Journal, Vol 31*, 1371-1385.

Davidsson, P., Steffens, P., & Fitzsimmons, J. (2009). Growing profitable or growing from profit: Putting the horse in front of the cart? *Journal of Business Venturing, Vol 24, Issue 24*, 388-406.

Delmar, F., Davidsson, P., & Fartner, W. (2003). Arriving at the High-Growth Firm. *Journal of Business Venturing 18(2)*, 1-52.

Dierickx, I., & Cool, K. (1989). Asset Stock Accumulation and Sutainability of Competitive Advantage. *Management Science, Vol 35, No 12*, 1504-1511.

Dyer, J. H., & Singh, H. (1998). The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *Academy of Management Review, Vol 23, No 4*, 660-679.

Eisenhardt, K., & Martin, J. (2000). Dynamic Capabilities: What are they? *Strategic Management Journal*, 1105-1121.

Estrella, A., & Mishkin, F. S. (1998). Predicting U.S. Recessions: Financial Variables as Leading Indicators. *The Review of Economics and Statistics*, 45-61.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance, Vol 25*, 383-417.

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance, Vol 47, No 2*, 427-465.

Fitzsimmons, J. R., Steffens, P. R., & Douglas, E. J. (2005). Growth and Profitability in Small and Medium Sized Australian Firms. *AGSE Entrepreneurship*.

Fjelltveit, A. M., & Humling, I. (2012). Hvor stabilt er prestasjonsnivået til norske bedrifter under nedgangstider? - En empirisk studie av effekten til nedgangstiden på 2000-tallet. *Master thesis, Norwegian School of Economics*.

Fort, T. C., Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2013). How Firms Respond to Business Cycles: The Role of Firm Age and Firm Size. *NBER Working Paper No. 19134*, 1-77.

Gardner, J. C., & Trzcinka, C. A. (1992). All-Equity Firms and The Balancing Theory of Capital Structure. *Journal of Financial Research, Vol 15, Issue 1*, 77-90.

Geroski, P. A., & Gregg, P. (1993). Coping with the Recession. *National Institute Economic Review, No 146*, 64-75.

Ghemawat, P. (2009). The Risk of Not Investing in a Recession. *MIT Sloan Management Review*, 30-38.

Goldsmith, R. W. (1982). *The National Balance Sheet of the United States.* University of Chicago Press.

Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning.* http://www.deeplearningbook.org: MIT Press.

Grytten, O., & Hunnes, A. (2010, 05). *A chronology of Financial Crises for Norway (Discussion Paper).* Retrieved from NHH Brage Web site: https://brage.bibsys.no/xmlui/handle/11250/163220

Gulati, R., Nohria, N., & Wohlgezogen, F. (2010). Roaring Out of Recession. *Harvard Business Review*, 62-29.

Hannan, M. T., & Freeman, J. (1984). Structural Intertia and Organizational Change. *American Sociological Review, Vol 49, No 2*, 149-164.

Hardesty, L. (2017, April 14). *Explained: Neural neworks*. Retrieved from MIT News: https://news.mit.edu/2017/explained-neural-networks-deep-learning-0414

Henriksen, N. B., & Kvaslerud, P. M. (2012). Konkursprediksjon gjennom ulike konjunkturfaser. *NHH Master thesis*.

Hodrick, R. J., & Prescott, E. C. (1997). Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Mone, Credit and Banking, Vol 29*, 1-16.

Huseman, R. C., Hatfield, J. D., & Miles, E. W. (1987). A New Perspective on Equity Theory: The Equity Sensitivity Construct. *Academy of Management Review, Vol 12, No 2*, 222-234.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics*, 319-338.

Johansen, P. R., & Eika, T. (2000). Drivkrefter bak konjunkturforløpet på 1990-tallet. *SSB Økonomiske analyser 6*, 31-44.

Joseph, A., Larrain, M., & Singh, E. (2011). Predictive Ability of the Interest Rate Spread Using Naural Networks. *Procedia Computer Science 6*, 207-212.

Kindleberger, C. P., & Aliber, R. Z. (2005). *Manias, Panics and Crashes - A History of Financial Crises.* John Wiley & Sons, Inc.

Knudsen, E. (2015). Shadows of Trouble: Pre-Recession Characteristics and The Likelihood of Decline During Recession. *PHD Thesis, Norwegian School of Economics*.

Knudsen, E. S., & Lien, L. B. (2014). Investments in Recessions. *Finance and Strategy (31)*, 3-36.

Kurshev, A., & Strebulaev, I. A. (2015). Firm Size and Capital Structure. *Quarterly Journal of Finance, Vol 5*, 1-46.

Le, Q. V., & Schuster, M. (2016, September 27). *A Neural Network for Machine Translation, at ProductionScale*. Retrieved from Google Research Blog: https://research.googleblog.com/2016/09/a-neural-network-for-machine.html

Lien, L. (2015, October 13). Origins of Competitive Advantage (Lecture Presentation). Bergen, Hordaland, Norway.

Lien, L. B., & Knudsen, E. S. (2012). Norske bedrifter gjennom krisen: en oversikt. *Magma, 0612*, 40-51.

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance, Vol 7, No 1*, 77-91.

Markowitz, H. (1959). *Portfolio Selection, Efficient Diversification of Investments.* New York: John Wiley & Sons, Inc.

McGahan, A. M., & Porter, M. E. (1997). How Much Does Industry Matter, Really? *Strategic Management Journal, Vol 18*, 15-30.

Miller, M., & Modigliani, F. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review, Vol 48*, 261-297.

Miller, M., & Modigliani, F. (1961). Dividend Policy, Growth, and the Valuation of Shares. *The Journal of Business, Vol 34*, 411-438.

Mitchell, W. C. (1927). *Business Cycles: The Problem and Its Setting.* http://papers.nber.org/books/mitc27-1: NBER.

Mjøs, A., Berner, E., & Olving, M. (2015). *Regnskapsboka - Dokumentasjon og kvalitetsikring av SNFs og NHHs database med regnskaps- og foretaksinformasjon for norske selskaper (Arbeidsnotat nr. 14/15).* Bergen: Samfunns- og næringslivsforskning AS.

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Association*, 261-297.

Myers, S. C. (1977). Determinants of Corporate Borrowing. *Journal of Financial Economics (5)*, 147-175.

Myers, S. C. (2001). Capital Structure. *The Journal of Economic Perspectives, Vol 15, No. 2*, 81-102.

Navarro, P. (2004). Principles of the Master Cyclist. *MIT Sloan Management Review*, 20-24.

Navarro, P. (2009). Recession-Proofing Your Organization. *MIT Sloan Management Review*, 44-51.

Norman, V. D. (1979). Organization of the Tanker Market. *International Conference "Supply and Demand of water transport"* (pp. p181-190). Stockholm: Economics Research Institute, Stockholm School of Economics (ISBN: 91-7258-129-8).

Nyman, R., & Ormerod, P. (2016). Predicting Economic Recessions Using Machine Learning Algorithms. *Cornell University Library (Working Paper)*, 1-14.

Pergler, M., & Rasmussen, A. (2014, May). *Making better decisions about the risks of capital projects*. Retrieved from McKinsey&Company: http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/making-better-decisions-about-the-risks-of-capital-projects

Peteraf, M. A. (1993). The Cornerstones of Competitive Advantage: A Resource-Based View. *Strategic Management Journal*, 179-191.

Plosser, C., & Rouwenhorst, K. (1994). International Term Structures and Real Economic Growth. *Journal of Monetary Economics, Vol 33*, 133-155.

Porter, M. (1980). *Competitive strategy.* New York: Free Press.

Porter, M. (1985). *Competitive strategy.* New York: Free Press.

Powell, T. C. (1996). How Much Does Industry Matter? An Alternative Empirical Test. *Strategic Management Journal, Vol 17*, 323-334.

Qi, M. (2001). Predicting US recessions with leading indicators via neural network models. *International Journal of Forecasting, Vol 17*, 383-401.

Rajan, R. G., & Zingales, L. (1995). What Do We Know about Capital Structure? Some Evidence from International Data. *The Journal of FInance, Vol 50, No 5*, 1421-1460.

Rigby, D., & Rogers, P. (2000). Winning in turbulence -- strategies for success in turbulent times. *European Business Journal, 12(2)*, 76-86.

Saunders, M., Lewis, P., & Adrian, T. (2009). *Research methods for business students 5th ed.* Harlow, England: Pearson Eductaion Limited.

Schmalensee, R. (1985). Do Markets Differ Much? *American Economic Journal, Vol 75, No 3*, 341-351.

Schumpeter, J. (1939). *Business Cycles - A Theoretical, Historical and Satistical Analysis of the Capitalist Process.* New York: McGraw-Hill Book Company.

Sedlak, M. (2016, October 29). *A quick deep learning tutorial*. Retrieved from IBM Watson: https://www.ibm.com/blogs/watson/2016/10/quick-deep-learning-tutorial/

Senderovitz, M., Klyver, K., Steffens, P. R., & Davidsson, P. (2010). The growth-profitability relationship : strategic orientations as. *Proceedings of the 7th AGSE International Entrepreneurship* (pp. 479-491). Queensland: University of the Sunshine Coast.

Shaaf, M. (2000). Predicting Recessions Using the Yield Curve: An Artificial Intelligence and Econometric Comparison. *Eastern Economic Journal, Spring 26*, 171-190.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance, Vol 19, No 3*, 425-442.

SSB. (2016, July 21). *Consumer Price Index*. Retrieved from Statistisk Sentral Byrå: https://ssb.no/en/priser-og-prisindekser/statistikker/kpi/maaned/2016-07-11?fane=tabell#content

SSB. (2016, 12 15). *Mitt SSB: Statistikkbanken*. Retrieved from Statistics Norway website: https://www.ssb.no/statistikkbanken/selectvarval/Define.asp?subjectcode=&ProductId=&MainTable=NRMakroHov&nvl=&PLanguage=0&nyTmpVar=true&CMSSubjectArea=nasjonalregnskap-og-konjunkturer&KortNavnWeb=knr&StatVariant=&checked=true

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal, Vol. 18*, 509-533.

Tobin, J. (1958). Liquidity Preference as Behavior Towards Risk. *The Review of Economic Studies, XXV*, 65-86.

Wheelock, D., & Wohar, M. E. (2009). Can the Term Spread Predict Output Growth and Recession? A survey of the Literature. *Federal Reserve Bank of St. Luis Review, Part1*, 419-440.

Wiggins, R. R., & Ruefli, T. W. (2002). Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance. *Organization Science, Vol 13*, 82-105.

Wiggins, R. R., & Ruefli, T. W. (2005). Schumpeter's Ghost: Is Hypercompetition Making the Best of Times Shorter? *Strategic Management Journal, Vol 26*, 887-911.

Winter, S. G. (2003). Understanding Dynamic Capabilities. *Strategic Management Journal, 24*, 991-995.

Wooldridge, J. M. (2009). *Introductory Econometrics - A modern Approach 4e.* Mason: South-Western Cengage Learning.

Worstall, T. (2012, March 4). *The Story of Henry Ford's $5 a Day Wages: It's Not What You Think*. Retrieved from Forbes.com: https://www.forbes.com/sites/timworstall/2012/03/04/the-story-of-henry-fords-5-a-day-wages-its-not-what-you-think/#18c65a6c766d

Zollo, M., & Winter, S. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science, Vol 13, No 3*, 339-351.

7 Appendix

7.1 Tables

Year	Phase
2000	Slowdown
2001	Downturn
2002	Downturn
2003	Downturn
2004	Recovery
2005	Recovery
2006	Expansion
2007	Expansion
2008	Slowdown
2009	Slowdown
2010	Downturn
2011	Downturn
2012	Expansion
2013	Expansion
2014	Slowdown
2015	Downturn

Appendix 1: Phases of the Business Cycle

Year	Inflation Index
2000	0,890
2001	0,917
2002	0,928
2003	0,951
2004	0,955
2005	0,970
2006	0,992
2007	1,000
2008	1,038
2009	1,060
2010	1,086
2011	1,099
2012	1,108
2013	1,132

Appendix 2:Inflation index, sources from SSB

Regression results for ROA

	Fixed Effects With Controls		Fixed Effects without Controls	
Variables	Coefficients	Standard Error	Coefficients	Standard Error
$Constant$	-0,1872***	0,0455	0,1470***	0,0061
$Debt\ Ratio$	0,2538***	0,0234	0,0503***	0,0148
$Debt\ Ratio^2$	-0,3325***	0,0157	-0,1913***	0,0093
$DUM_{T=2001}$			-0,0980***	0,0085
$DUM_{T=2002}$	-0,0356***	0,0108	-0,1199***	0,0086
$DUM_{T=2003}$	0,0120	0,0097	-0,0575***	0,0074
$DUM_{T=2004}$	0,0398***	0,0110	-0,0439***	0,0085
$DUM_{T=2005}$	0,0442***	0,0120	-0,0197**	0,0095
$DUM_{T=2006}$	0,0362***	0,0117	-0,0356***	0,0092
$DUM_{T=2007}$	0,0337***	0,0118	-0,0519***	0,0088
$DUM_{T=2008}$	-0,0336***	0,0112	-0,0675***	0,0081
$DUM_{T=2009}$	-0,0293***	0,0110	-0,0976***	0,0080
$DUM_{T=2010}$	-0,0036	0,0108	-0,0856***	0,0080
$DUM_{T=2011}$	0,0481***	0,0101	0,0133*	0,0069
$DUM_{T=2012}$	0,0076	0,0113	-0,0819***	0,0083
$DUM_{T=2013}$	-0,0134	0,0126	-0,0757***	0,0085
$DUM_{T=2001} \cdot Debt\ Ratio$			0,2532***	0,0218
$DUM_{T=2002} \cdot Debt\ Ratio$	0,1163***	0,0285	0,3293***	0,0216
$DUM_{T=2003} \cdot Debt\ Ratio$	-0,0573**	0,0245	0,1293***	0,0167
$DUM_{T=2004} \cdot Debt\ Ratio$	-0,1368***	0,0280	0,1050***	0,0203
$DUM_{T=2005} \cdot Debt\ Ratio$	-0,0919***	0,0324	0,1374***	0,0249
$DUM_{T=2006} \cdot Debt\ Ratio$	-0,0687**	0,0312	0,1843***	0,0238
$DUM_{T=2007} \cdot Debt\ Ratio$	-0,0326	0,0319	0,2642***	0,0231
$DUM_{T=2008} \cdot Debt\ Ratio$	0,0921***	0,0294	0,2485***	0,0205
$DUM_{T=2009} \cdot Debt\ Ratio$	-0,0213	0,0292	0,2115***	0,0207
$DUM_{T=2010} \cdot Debt\ Ratio$	-0,1390***	0,0283	0,1460***	0,0207
$DUM_{T=2011} \cdot Debt\ Ratio$	-0,3205***	0,0250	-0,1714***	0,0159
$DUM_{T=2012} \cdot Debt\ Ratio$	-0,1923***	0,0293	0,1130***	0,0215
$DUM_{T=2013} \cdot Debt\ Ratio$	-0,1752***	0,0339	0,0556**	0,0227
$DUM_{T=2001} \cdot Debt\ Ratio^2$			-0,1607***	0,0142
$DUM_{T=2002} \cdot Debt\ Ratio^2$	-0,0746***	0,0190	-0,2075***	0,0139
$DUM_{T=2003} \cdot Debt\ Ratio^2$	0,0632***	0,0161	-0,0533***	0,0100
$DUM_{T=2004} \cdot Debt\ Ratio^2$	0,1466***	0,0184	-0,0094	0,0126
$DUM_{T=2005} \cdot Debt\ Ratio^2$	0,0568***	0,0221	-0,0984***	0,0167
$DUM_{T=2006} \cdot Debt\ Ratio^2$	0,0426**	0,0211	-0,1268***	0,0158
$DUM_{T=2007} \cdot Debt\ Ratio^2$	0,0061	0,0220	-0,1877***	0,0153
$DUM_{T=2008} \cdot Debt\ Ratio^2$	-0,0936***	0,0199	-0,1897***	0,0132
$DUM_{T=2009} \cdot Debt\ Ratio^2$	0,0313	0,0199	-0,1212***	0,0137
$DUM_{T=2010} \cdot Debt\ Ratio^2$	0,1238***	0,0192	-0,0668***	0,0137

$DUM_{T=2011} \cdot Debt\ Ratio^2$	0,2672***	0,0165	0,1689***	0,0097
$DUM_{T=2012} \cdot Debt\ Ratio^2$	0,1766***	0,0200	-0,0244*	0,0143
$DUM_{T=2013} \cdot Debt\ Ratio^2$	0,1734***	0,0238	0,0265*	0,0154
Growth in Sales	0,0203***	0,0004		
Delta Equity	0,0000***	0,0000		
Firm Size	0,0329***	0,0008		
Firm Age	-0,0052***	0,0018		
ROA_{t-1}	0,0062**	0,0031		
$EBITDA\ Margin_{t-1}$	0,0933***	0,0044		
$Liquidity\ Ratio_{t-1}$	-0,0151***	0,0004		
$Receivables\ to\ Assets_{t-1}$	0,0814***	0,0027		
$Cash\ to\ Assets_{t-1}$	0,1029***	0,0030		
$Interests\ Coverage_{t-1}$	0,0000***	0,0000		
$Log\ Compensation_{t-1}$	0,0028**	0,0012		
Industry Growth in Sales	-0,0031	0,0049		
Industry Firm Size	-0,0166***	0,0035		
Industry Firm Age	0,0230***	0,0047		
Industry ROA_{t-1}	0,1180***	0,0183		
Industry $EBITDA\ Margin_{t-1}$	-0,0490**	0,0200		
Industry $Liquidity\ Ratio_{t-1}$	-0,0216***	0,0037		
Industry $Receivables\ to\ Assets_{t-1}$	0,0245**	0,0112		
Industry $Cash\ to\ Assets_{t-1}$	-0,0205	0,0197		
Industry $Interests\ Coverage_{t-1}$	0,0002**	0,0000		
Industry $Log\ Compensation_{t-1}$	0,0041	0,0055		
R2	0,202		0,143	
Observations	137290		211665	

Standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Appendix 3: ROA Debt Ratio regression

Regression results for EBITDA Margin

	Fixed Effects With Controls		Fixed Effects without Controls	
Variables	Coefficients	Standard Error	Coefficients	Standard Error
$Constant$	0,0304	0,0299	0,1470***	0,0061
$Debt\ Ratio$	0,0979***	0,0154	0,0371***	0,0107
$Debt\ Ratio^2$	-0,1170***	0,0103	-0,0666***	0,0067
$DUM_{T=2001}$			-0,0404***	0,0061
$DUM_{T=2002}$	0,0070	0,0071	-0,0318***	0,0062
$DUM_{T=2003}$	0,0442***	0,0063	0,0241***	0,0053
$DUM_{T=2004}$	0,0298***	0,0072	-0,0015	0,0061
$DUM_{T=2005}$	0,0339***	0,0079	0,0170**	0,0068
$DUM_{T=2006}$	0,0304***	0,0077	0,0086	0,0066
$DUM_{T=2007}$	0,0183**	0,0077	-0,0161**	0,0064
$DUM_{T=2008}$	-0,0046	0,0073	-0,0270***	0,0059
$DUM_{T=2009}$	0,0015	0,0072	-0,0266***	0,0058
$DUM_{T=2010}$	0,0115	0,0071	-0,0220***	0,0058
$DUM_{T=2011}$	0,0176***	0,0066	0,0123**	0,0050
$DUM_{T=2012}$	0,0041	0,0074	-0,0259***	0,0060
$DUM_{T=2013}$	-0,0060	0,0083	-0,0322***	0,0061
$DUM_{T=2001} \cdot Debt\ Ratio$			0,1192***	0,0158
$DUM_{T=2002} \cdot Debt\ Ratio$	-0,0107	0,0188	0,0897***	0,0156
$DUM_{T=2003} \cdot Debt\ Ratio$	-0,1377***	0,0161	-0,0727***	0,0120
$DUM_{T=2004} \cdot Debt\ Ratio$	-0,0872***	0,0184	0,0149	0,0146
$DUM_{T=2005} \cdot Debt\ Ratio$	-0,0861***	0,0213	0,0032	0,0180
$DUM_{T=2006} \cdot Debt\ Ratio$	-0,0690***	0,0205	0,0322*	0,0172
$DUM_{T=2007} \cdot Debt\ Ratio$	-0,0221	0,0210	0,1047***	0,0167
$DUM_{T=2008} \cdot Debt\ Ratio$	-0,0035	0,0193	0,0975***	0,0148
$DUM_{T=2009} \cdot Debt\ Ratio$	-0,0532***	0,0192	0,0507***	0,0150
$DUM_{T=2010} \cdot Debt\ Ratio$	-0,0994***	0,0186	0,0237	0,0150
$DUM_{T=2011} \cdot Debt\ Ratio$	-0,1319***	0,0165	-0,0859***	0,0115
$DUM_{T=2012} \cdot Debt\ Ratio$	-0,0853***	0,0193	0,0293*	0,0155
$DUM_{T=2013} \cdot Debt\ Ratio$	-0,0832***	0,0223	0,0277*	0,0164
$DUM_{T=2001} \cdot Debt\ Ratio^2$	0	0	-0,0869***	0,0103
$DUM_{T=2002} \cdot Debt\ Ratio^2$	0,0053	0,0125	-0,0628***	0,0100
$DUM_{T=2003} \cdot Debt\ Ratio^2$	0,1017***	0,0106	0,0521***	0,0072
$DUM_{T=2004} \cdot Debt\ Ratio^2$	0,0721***	0,0121	-0,0008	0,0091
$DUM_{T=2005} \cdot Debt\ Ratio^2$	0,0481***	0,0145	-0,0240**	0,0121
$DUM_{T=2006} \cdot Debt\ Ratio^2$	0,0350**	0,0139	-0,0441***	0,0114
$DUM_{T=2007} \cdot Debt\ Ratio^2$	-0,0005	0,0144	-0,0897***	0,0111
$DUM_{T=2008} \cdot Debt\ Ratio^2$	-0,0094	0,0131	-0,0840***	0,0095
$DUM_{T=2009} \cdot Debt\ Ratio^2$	0,0385***	0,0131	-0,0421***	0,0099
$DUM_{T=2010} \cdot Debt\ Ratio^2$	0,0715***	0,0126	-0,0202**	0,0099

$DUM_{T=2011} \cdot Debt\ Ratio^2$	0,1020***	0,0108	0,0619***	0,0070
$DUM_{T=2012} \cdot Debt\ Ratio^2$	0,0667***	0,0132	-0,0200*	0,0103
$DUM_{T=2013} \cdot Debt\ Ratio^2$	0,0733***	0,0156	-0,0135	0,0111
Growth in Sales	0,0130***	0,0003		
Delta Equity	0,0000***	0,0000		
Firm Size	0,0285***	0,0005		
Firm Age	-0,0031**	0,0012		
ROA_{t-1}	-0,0380***	0,0020		
$EBITDA\ Margin_{t-1}$	0,1962***	0,0029		
$Liquidity\ Ratio_{t-1}$	-0,0065***	0,0002		
$Receivables\ to\ Assets_{t-1}$	-0,0031*	0,0018		
$Cash\ to\ Assets_{t-1}$	0,0186***	0,0020		
$Interests\ Coverage_{t-1}$	0,0000***	0,0000		
$Log\ Compensation_{t-1}$	0,0033***	0,0008		
Industry Growth in Sales	-0,0026	0,0032		
Industry Firm Size	-0,0188***	0,0023		
Industry Firm Age	0,0174***	0,0031		
Industry ROA_{t-1}	0,0753***	0,0120		
$Industry\ EBITDA\ Margin_{t-1}$	-0,0760***	0,0131		
$Industry\ Liquidity\ Ratio_{t-1}$	-0,0068***	0,0024		
$Industry\ Receivables\ to\ Assets_{t-1}$	-0,0250***	0,0074		
$Industry\ Cash\ to\ Assets_{t-1}$	-0,0063	0,0130		
$Industry\ Interests\ Coverage_{t-1}$	0,0002***	0,0000		
$Industry\ Log\ Compensation_{t-1}$	-0,0171***	0,0036		
R2	0,131		0,04	
Observations	137290		211665	

Standard errors in parentheses

* p < 0.10, ** p < 0.05, *** p < 0.01

Appendix 4:Regression results for estimating EBITDA Margin Optimal Debt Ratio

ROA

Industry	Statistic	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Oil & Gas	Mean	6,5 %	8,0 %	8,6 %	7,4 %	9,1 %	7,5 %	10,0 %	7,9 %	9,4 %	5,6 %	8,9 %	4,6 %	8,7 %	3,1 %
	Median	5,9 %	7,4 %	6,8 %	7,5 %	8,5 %	5,8 %	8,9 %	6,1 %	7,3 %	4,7 %	7,0 %	4,2 %	6,2 %	5,7 %
	St Dev	14,5 %	12,2 %	14,1 %	13,3 %	12,4 %	12,0 %	13,3 %	15,1 %	14,9 %	14,1 %	14,7 %	17,1 %	14,6 %	15,5 %
	Frequency	55	66	70	67	80	71	78	95	89	86	71	76	56	57
Industrial	Mean	3,6 %	3,5 %	3,6 %	3,8 %	7,0 %	7,3 %	7,9 %	9,4 %	6,9 %	5,2 %	5,2 %	5,6 %	6,3 %	5,5 %
	Median	3,9 %	3,7 %	4,0 %	4,4 %	6,3 %	6,8 %	7,3 %	8,7 %	6,6 %	5,4 %	5,3 %	5,8 %	6,4 %	5,1 %
	St Dev	11,0 %	11,7 %	14,2 %	18,5 %	10,7 %	10,3 %	11,0 %	12,0 %	13,5 %	12,4 %	11,6 %	11,7 %	11,8 %	11,9 %
	Frequency	3155	3271	3218	3011	3152	3280	3396	3633	3313	3288	3100	3186	2269	2157
Construction & Energy	Mean	7,0 %	6,5 %	7,2 %	8,6 %	10,7 %	10,2 %	11,2 %	13,1 %	12,0 %	8,3 %	6,8 %	7,8 %	8,9 %	9,2 %
	Median	6,7 %	6,6 %	7,3 %	8,2 %	10,1 %	9,5 %	10,4 %	12,3 %	11,8 %	8,0 %	6,7 %	7,3 %	8,6 %	8,8 %
	St Dev	10,3 %	11,0 %	12,2 %	10,7 %	10,8 %	10,7 %	11,1 %	11,5 %	12,8 %	11,7 %	11,5 %	11,2 %	11,3 %	10,8 %
	Frequency	1911	2016	2139	2038	2334	2551	2857	3394	3230	3130	3018	3238	2253	2277
Commerce	Mean	3,9 %	4,3 %	5,8 %	5,9 %	7,8 %	8,2 %	8,7 %	10,0 %	7,1 %	7,0 %	7,2 %	7,1 %	7,5 %	6,8 %
	Median	4,1 %	4,3 %	5,5 %	5,3 %	7,3 %	7,2 %	7,8 %	9,3 %	6,7 %	6,7 %	7,0 %	7,0 %	7,2 %	6,3 %
	St Dev	13,7 %	11,9 %	12,8 %	11,7 %	11,5 %	12,5 %	11,5 %	12,5 %	13,9 %	12,4 %	11,8 %	13,3 %	12,7 %	12,5 %
	Frequency	4937	4978	5075	4805	5201	5557	5771	6388	6130	6223	6054	6479	4592	4683
Shipping	Mean	4,3 %	1,8 %	3,7 %	1,2 %	3,2 %	5,1 %	6,0 %	5,3 %	-2,9 %	-2,0 %	3,1 %	1,1 %	1,8 %	3,2 %
	Median	1,8 %	2,1 %	2,7 %	2,5 %	2,4 %	3,2 %	4,6 %	4,2 %	2,7 %	3,2 %	2,5 %	1,9 %	2,2 %	2,0 %
	St Dev	14,0 %	13,1 %	12,6 %	17,6 %	13,3 %	13,1 %	17,3 %	17,1 %	63,2 %	26,2 %	10,9 %	14,4 %	15,6 %	10,0 %
	Frequency	144	143	146	94	102	132	199	203	139	171	163	199	135	159
Transport & Travel	Mean	3,8 %	4,3 %	4,9 %	4,9 %	6,5 %	6,8 %	6,6 %	7,7 %	6,4 %	4,4 %	4,6 %	5,3 %	6,3 %	5,7 %
	Median	3,4 %	4,0 %	4,6 %	5,0 %	5,1 %	5,7 %	5,8 %	7,1 %	5,6 %	4,3 %	4,6 %	4,8 %	5,6 %	5,3 %
	St Dev	10,7 %	12,4 %	12,2 %	12,3 %	10,9 %	11,6 %	12,3 %	13,1 %	13,1 %	12,5 %	12,2 %	10,5 %	10,2 %	10,7 %
	Frequency	664	716	725	628	672	762	825	955	901	932	885	913	664	717
Real Estate	Mean	8,4 %	7,0 %	6,6 %	7,0 %	10,6 %	12,8 %	13,4 %	13,1 %	11,7 %	9,6 %	10,2 %	11,0 %	11,0 %	10,5 %
	Median	7,3 %	7,2 %	6,3 %	7,9 %	9,9 %	11,4 %	12,0 %	12,8 %	11,4 %	9,2 %	9,2 %	10,2 %	10,2 %	9,7 %
	St Dev	15,9 %	17,1 %	16,9 %	22,4 %	18,2 %	14,1 %	14,9 %	16,6 %	16,6 %	16,0 %	16,3 %	16,9 %	14,6 %	15,6 %
	Frequency	1380	1463	1502	1333	1462	1652	1963	2315	2311	2414	2408	2694	2073	2124
IT & Telecom	Mean	0,1 %	-2,8 %	1,0 %	7,8 %	10,7 %	11,6 %	11,3 %	12,8 %	11,9 %	9,3 %	10,5 %	11,3 %	9,6 %	12,2 %
	Median	2,4 %	3,6 %	4,1 %	8,5 %	10,1 %	9,9 %	10,2 %	11,7 %	11,5 %	8,7 %	9,5 %	10,9 %	9,5 %	11,8 %
	St Dev	27,0 %	30,5 %	26,8 %	19,9 %	17,8 %	16,8 %	18,1 %	17,8 %	17,9 %	16,5 %	15,8 %	16,3 %	18,9 %	17,2 %
	Frequency	439	486	494	464	518	531	574	679	688	713	687	701	533	556

Appendix 5: Mean, median, standard deviation and frequency statistics for Return on Assets by Industry and year

EBITDA Margin

Industry	Statistic	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Oil & Gas	Mean	18,5 %	17,3 %	18,6 %	19,3 %	17,5 %	21,8 %	19,8 %	10,4 %	17,9 %	5,3 %	11,9 %	11,1 %	7,4 %	-19,4 %
	Median	10,5 %	12,2 %	12,2 %	11,3 %	12,0 %	12,2 %	14,3 %	11,5 %	12,4 %	9,6 %	11,7 %	7,5 %	9,7 %	9,6 %
	St Dev	33,4 %	29,8 %	21,4 %	22,8 %	20,8 %	25,1 %	28,0 %	34,5 %	27,5 %	51,1 %	41,8 %	26,7 %	54,4 %	131,5 %
	Frequency	55	66	70	67	80	71	78	95	89	86	71	76	56	57
Industrial	Mean	7,3 %	7,0 %	7,1 %	7,3 %	8,5 %	8,4 %	8,7 %	9,4 %	8,2 %	6,8 %	7,2 %	7,3 %	7,4 %	7,2 %
	Median	6,7 %	6,8 %	6,7 %	6,9 %	7,6 %	7,6 %	8,0 %	8,6 %	7,6 %	6,5 %	6,8 %	6,9 %	7,1 %	6,5 %
	St Dev	8,7 %	10,5 %	9,7 %	9,5 %	8,7 %	7,9 %	8,5 %	9,9 %	9,8 %	10,1 %	9,6 %	9,3 %	10,1 %	9,6 %
	Frequency	3155	3271	3218	3011	3152	3280	3396	3633	3313	3288	3100	3186	2269	2157
Construction & Energy	Mean	6,9 %	6,7 %	7,2 %	7,6 %	8,4 %	7,8 %	8,5 %	9,3 %	8,9 %	7,4 %	6,6 %	7,1 %	7,2 %	7,7 %
	Median	6,2 %	6,2 %	6,4 %	6,7 %	7,4 %	6,8 %	7,5 %	8,5 %	8,2 %	6,6 %	5,9 %	6,2 %	6,5 %	6,9 %
	St Dev	6,6 %	7,0 %	7,5 %	6,9 %	7,0 %	6,7 %	7,0 %	7,1 %	7,5 %	7,5 %	7,3 %	7,6 %	6,9 %	7,7 %
	Frequency	1911	2016	2139	2038	2334	2551	2857	3394	3230	3130	3018	3238	2253	2277
Commerce	Mean	4,2 %	4,4 %	5,0 %	4,9 %	5,6 %	5,7 %	5,7 %	6,3 %	5,3 %	5,0 %	5,1 %	5,2 %	5,3 %	4,9 %
	Median	3,6 %	3,8 %	4,3 %	4,1 %	4,7 %	4,6 %	4,8 %	5,3 %	4,4 %	4,2 %	4,3 %	4,3 %	4,3 %	3,9 %
	St Dev	6,5 %	6,3 %	6,1 %	5,9 %	5,9 %	7,1 %	5,8 %	6,6 %	6,8 %	6,5 %	6,2 %	6,5 %	6,5 %	6,5 %
	Frequency	4937	4978	5075	4805	5201	5557	5771	6388	6130	6223	6054	6479	4592	4683
Shipping	Mean	14,8 %	13,0 %	14,4 %	14,9 %	13,8 %	15,9 %	22,3 %	20,6 %	11,3 %	9,7 %	13,9 %	14,5 %	11,5 %	17,9 %
	Median	10,1 %	10,6 %	11,0 %	11,7 %	9,4 %	9,7 %	16,2 %	14,7 %	7,4 %	5,8 %	10,6 %	11,2 %	6,7 %	9,1 %
	St Dev	19,0 %	25,3 %	18,3 %	18,5 %	18,0 %	20,2 %	23,7 %	29,5 %	24,1 %	26,7 %	19,6 %	20,7 %	23,6 %	22,5 %
	Frequency	144	143	146	94	102	132	199	203	139	171	163	199	135	159
Transport & Travel	Mean	9,3 %	9,6 %	9,6 %	9,4 %	9,5 %	8,8 %	9,0 %	9,3 %	8,8 %	7,9 %	7,7 %	7,9 %	7,5 %	7,5 %
	Median	7,7 %	8,1 %	8,0 %	7,8 %	7,6 %	6,9 %	7,1 %	7,9 %	7,2 %	5,9 %	5,8 %	6,4 %	5,7 %	5,9 %
	St Dev	9,3 %	10,4 %	10,0 %	9,9 %	9,6 %	8,6 %	9,0 %	9,6 %	9,7 %	9,9 %	8,4 %	8,3 %	8,1 %	8,1 %
	Frequency	664	716	725	628	672	762	825	955	901	932	885	913	664	717
Real Estate	Mean	11,4 %	10,2 %	9,8 %	8,9 %	11,2 %	11,8 %	12,3 %	11,9 %	9,5 %	9,4 %	9,7 %	10,3 %	9,8 %	9,7 %
	Median	8,3 %	8,3 %	7,9 %	7,8 %	9,2 %	9,6 %	10,3 %	9,9 %	8,8 %	8,0 %	8,0 %	8,6 %	7,9 %	7,7 %
	St Dev	17,3 %	17,5 %	16,2 %	13,1 %	13,6 %	12,1 %	15,6 %	13,9 %	19,8 %	14,5 %	13,8 %	15,2 %	12,9 %	13,4 %
	Frequency	1380	1463	1502	1333	1462	1652	1963	2315	2311	2414	2408	2694	2073	2124
IT & Telecom	Mean	-1,2 %	0,2 %	3,2 %	8,1 %	9,9 %	11,0 %	10,2 %	10,7 %	10,5 %	9,6 %	10,2 %	10,4 %	10,0 %	11,4 %
	Median	4,8 %	4,5 %	6,0 %	7,7 %	9,0 %	9,4 %	9,3 %	9,6 %	9,8 %	8,5 %	8,9 %	9,5 %	9,1 %	9,7 %
	St Dev	41,1 %	26,1 %	20,8 %	13,6 %	13,9 %	13,0 %	15,3 %	15,8 %	14,7 %	14,4 %	14,2 %	13,5 %	14,3 %	14,5 %
	Frequency	439	486	494	464	518	531	574	679	688	713	687	701	533	556

Appendix 6: Mean, median, standard deviation and frequency statistics for EBITDA Margin by Industry and year

Debt Ratio

Industry	Statistic	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Oil & Gas	Mean	72,5 %	72,1 %	70,5 %	68,6 %	70,3 %	71,6 %	70,9 %	71,6 %	76,3 %	74,2 %	73,9 %	74,3 %	74,4 %	71,7 %
	Median	78,1 %	75,5 %	75,3 %	74,2 %	75,3 %	78,4 %	76,0 %	76,4 %	79,6 %	76,4 %	81,5 %	79,3 %	79,2 %	75,8 %
	St Dev	20,5 %	16,5 %	19,8 %	21,7 %	21,2 %	20,2 %	20,8 %	21,7 %	17,6 %	19,8 %	19,2 %	24,5 %	21,5 %	26,1 %
	Frequency	55	66	70	67	80	71	78	95	89	86	71	76	56	57
Industrial	Mean	70,1 %	71,2 %	72,8 %	73,1 %	74,5 %	71,2 %	70,9 %	70,0 %	68,4 %	65,7 %	64,8 %	65,1 %	63,9 %	63,6 %
	Median	73,0 %	74,5 %	75,9 %	75,5 %	78,8 %	74,1 %	73,5 %	72,3 %	70,7 %	67,2 %	66,3 %	66,5 %	65,2 %	64,9 %
	St Dev	20,1 %	21,3 %	21,7 %	24,6 %	19,0 %	18,8 %	18,7 %	18,9 %	20,1 %	20,7 %	20,9 %	21,2 %	21,7 %	22,3 %
	Frequency	3155	3271	3218	3011	3152	3280	3396	3633	3313	3288	3100	3186	2269	2157
Construction & Energy	Mean	75,0 %	76,7 %	79,9 %	80,6 %	84,0 %	78,4 %	77,2 %	75,2 %	72,0 %	69,3 %	68,6 %	70,1 %	68,7 %	67,6 %
	Median	76,6 %	79,0 %	82,9 %	84,2 %	88,7 %	79,9 %	79,0 %	77,4 %	73,9 %	71,1 %	69,9 %	71,7 %	70,1 %	69,2 %
	St Dev	16,4 %	16,6 %	16,0 %	14,0 %	11,7 %	13,7 %	14,6 %	15,1 %	16,3 %	17,1 %	17,9 %	18,5 %	18,4 %	18,5 %
	Frequency	1911	2016	2139	2038	2334	2551	2857	3394	3230	3130	3018	3238	2253	2277
Commerce	Mean	76,4 %	76,4 %	77,9 %	78,2 %	80,6 %	77,0 %	76,7 %	75,7 %	74,3 %	72,5 %	71,6 %	73,1 %	71,1 %	70,4 %
	Median	78,2 %	79,0 %	81,7 %	82,4 %	86,1 %	79,9 %	79,6 %	78,6 %	77,2 %	74,9 %	74,3 %	74,8 %	73,7 %	72,7 %
	St Dev	23,6 %	20,7 %	20,3 %	19,1 %	17,6 %	18,6 %	18,0 %	18,6 %	19,9 %	20,5 %	20,3 %	26,0 %	21,7 %	21,9 %
	Frequency	4937	4978	5075	4805	5201	5557	5771	6388	6130	6223	6054	6479	4592	4683
Shipping	Mean	72,0 %	73,7 %	71,5 %	76,5 %	77,4 %	73,6 %	72,6 %	72,6 %	76,5 %	79,1 %	72,2 %	73,1 %	73,6 %	69,3 %
	Median	78,4 %	80,1 %	78,3 %	81,8 %	79,5 %	76,6 %	75,9 %	75,5 %	75,7 %	77,1 %	74,4 %	73,2 %	76,4 %	70,2 %
	St Dev	24,5 %	26,9 %	25,2 %	29,6 %	23,5 %	26,9 %	27,9 %	23,8 %	31,5 %	35,3 %	24,5 %	26,9 %	32,5 %	24,4 %
	Frequency	144	143	146	94	102	132	199	203	139	171	163	199	135	159
Transport & Travel	Mean	79,0 %	79,6 %	79,4 %	81,1 %	82,7 %	80,5 %	79,8 %	78,6 %	76,6 %	75,1 %	74,3 %	73,7 %	71,7 %	72,2 %
	Median	81,2 %	82,7 %	83,4 %	84,9 %	87,7 %	82,7 %	81,3 %	80,2 %	78,6 %	76,4 %	75,9 %	75,5 %	74,4 %	73,9 %
	St Dev	18,1 %	17,8 %	17,7 %	18,2 %	15,4 %	17,9 %	19,5 %	19,7 %	20,3 %	21,0 %	20,3 %	20,5 %	19,7 %	20,1 %
	Frequency	664	716	725	628	672	762	825	955	901	932	885	913	664	717
Real Estate	Mean	74,0 %	76,6 %	78,3 %	80,3 %	81,4 %	75,4 %	77,1 %	76,4 %	74,8 %	73,3 %	73,6 %	74,3 %	72,7 %	73,1 %
	Median	77,1 %	79,8 %	82,1 %	83,2 %	86,7 %	79,1 %	80,7 %	80,4 %	78,3 %	76,4 %	76,5 %	77,5 %	76,4 %	76,5 %
	St Dev	20,8 %	20,9 %	20,6 %	26,7 %	23,0 %	17,9 %	17,1 %	19,6 %	19,6 %	20,4 %	21,0 %	21,6 %	20,2 %	20,9 %
	Frequency	1380	1463	1502	1333	1462	1652	1963	2315	2311	2414	2408	2694	2073	2124
IT & Telecom	Mean	70,4 %	72,0 %	71,8 %	70,7 %	71,5 %	66,7 %	67,5 %	66,3 %	67,1 %	65,2 %	65,1 %	66,8 %	67,8 %	67,0 %
	Median	71,6 %	74,0 %	75,7 %	73,6 %	75,7 %	68,7 %	68,8 %	69,4 %	69,5 %	66,5 %	67,3 %	69,1 %	69,2 %	68,1 %
	St Dev	29,3 %	27,4 %	22,7 %	24,3 %	21,9 %	23,1 %	23,0 %	21,4 %	21,5 %	22,2 %	21,0 %	20,5 %	22,1 %	22,7 %
	Frequency	439	486	494	464	518	531	574	679	688	713	687	701	533	556

Appendix 7: Mean, median, standard deviation and frequency statistics for Debt Ratio by Industry and year