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Multiples and future returns

An investigation of pricing multiples' ability to predict abnormal returns on the Oslo Stock Exchange

Harald Berge and Eivind Kvitstein

Supervisor: Torfinn Harding

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This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.

Abstract

The purpose of this master thesis is to investigate the relationship between pricing multiples and future abnormal returns. An important part of the thesis is to find out whether a strategy using multiples as a selection tool can yield positive abnormal returns.

We analyse all available companies on the Oslo Stock Exchange in the period 2000-2015. Using the method introduced by Fama-MacBeth and a portfolio approach, we investigate six different multiples: EV/EBITDA, EV/EBIT, EV/FCFF, P/E, P/FCFE and P/B.

During the whole period, *only* EV/FCFF seems to predict abnormal returns. This result is very surprising. Almost all studies find that EV/EBITDA, EV/EBIT, P/E and P/B predict abnormal returns. In search of an explanation of this surprising result, we divided the whole period (2000-2015) into two sub-periods, one period before the start of the financial crisis in 2008 and one period after.

During the first sub-period (2000-2008), the results are closer to our expectations and more in line with prior research. In this period, EV/EBITDA, EV/EBIT, EV/FCFF and P/E seem to predict abnormal returns. A lower multiple was associated with higher abnormal returns. During the last sub-period (2008-2015), *none* of the multiples seems to predict abnormal returns. These results are quite astonishing. It is an established truth in finance that value stocks (low multiples) provide positive abnormal returns.

We believe that the decrease in the risk-free interest rate from normal to record low levels after the financial crisis offers the best explanation of the surprising results. Holding all other variables constant, we show that growth stocks (high multiples) should outperform value stocks (low multiples) in this environment, as growth stocks are more sensitive to changes in the cost of capital.

Preface

This Master thesis was written to conclude the Master of Science degree in Economics and Business Administration at the Norwegian School of Economics (NHH) during the spring of 2015. We have specialized in Economic Analysis and have used this last semester to immerse ourselves in the exiting subject of multiples and portfolio analysis. The topic is anchored in investments, but the topic is present within other applications as well, such as Corporate Finance and Personal Finance.

The report have been prepared using Microsoft Office 2013, while numerical analysis have been conducted using Stata and Excel. Bloomberg has been our main source of Data, but we have also used other sources.

First and foremost, we would like to express our gratitude towards our supervisor, Associate Professor Torfinn Harding, for invaluable counselling. His advices and suggestions has truly improved our thesis. Furthermore, we would like to thank Åsmund Heen at Sparebanken Vest for great help with downloading data and advices. Moreover, we would like to thank Assistant Professor Francisco Santos for his expertise on financial theory and empirical methods. Last but definitely not least, we would like to thank our parents for sound and vital support throughout our educational run.

The views, findings and conclusions in this thesis are solely those of the authors.

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1. Introduction

The purpose of this master thesis is to analyse the relationship between pricing multiples such as price-to-earnings (P/E) and future abnormal equity returns on the Oslo Stock Exchange in the years 2000-2015. Investopedia (2015a) gives the following definition of abnormal return: *“A term used to describe the returns generated by a given security or portfolio over a period of time that is different from the expected rate of return. The expected rate of return is the estimated return based on an asset pricing model(...)”*

Several studies have found that buying stocks with low multiples yields positive abnormal returns. Basu (1977) was one of the first to find a relationship between pricing multiples and future abnormal equity returns. He examined the US stock market in the period 1957-1971, and found that low P/E stocks outperformed high P/E stocks even after controlling for risk using the Capital Asset Pricing Model (CAPM). Some year later, Fama & French (1992a, 1993) came to the same conclusion. They also showed that low P/B stocks outperformed high P/B stocks.

We mentioned above that several studies have analysed the relationship between pricing multiples and future abnormal returns. However, only a few studies have analysed this relationship on the Oslo Stock Exchange. To the best of our knowledge, this thesis is the first to analyse the relationship between pricing multiples and future abnormal returns on the Oslo Stock Exchange using the following period, multiples and methodology:

- Including the period 2010-2015
- Using the EV/FCFF and P/FCFE multiples
- Using the Fama-MacBeth regression method

The idea for our master thesis comes from Sparebanken Vest. This clearly indicates that our thesis could have value for practitioners. It also indicates that existing studies on pricing multiples on the Oslo Stock Exchange do not satisfy the demand. Hence, we believe that our thesis is relevant.

Our research question is:

Do pricing multiples predict abnormal returns for stocks on the Oslo Stock Exchange?

We try to answer the research question by analysing six multiples in the period 2000-2015 on the Oslo Stock Exchange. We analyse EV/EBITDA¹, EV/EBIT, P/E and P/B due to their popularity among practitioners. EV/FCFF and P/FCFE are analysed due to the strong theoretical relationship between free cash flow and value. Due to short sale² restrictions, we assume that it is difficult to implement a short sale strategy for many investors. Hence, we will focus on multiples' ability to predict *positive* abnormal returns. Based on prior empirical studies and economic theory, our hypothesis is that a low (high) multiple predicts positive (negative) abnormal returns.

We try to answer our research question in the following eight chapters:

Chapter 2 gives the reader some insight into the relevant theory for our master thesis. We describe the asset-pricing models we use to calculate the abnormal returns (the CAPM and Fama-French three-factor model). Further, we describe “the efficient market hypothesis”. According to this hypothesis, stocks with certain characteristics (e.g. low multiples) should not consistently outperform other stocks after adjusting for differences in the cost of equity³. We try to explain why value stocks (low multiples) historically have outperformed growth stocks (high multiples). One possible explanation is that value stocks have higher cost of equity (consistent with the efficient market hypothesis). Stocks with higher cost of equity should have higher realized returns, as compensation for increased risk. Another possible explanation is that value stocks are undervalued by the market. This explanation is in line with “behavioural finance” economists claiming that investors are not as rational as required by the efficient market hypothesis. In this chapter, we also take a deep dive into the relative valuation approach. We describe the key value drivers for each multiple investigated in our thesis, and try to predict which multiples that will give the best predictions of abnormal returns. Towards the end of this chapter, we present prior studies on the relationship between pricing multiples and future returns.

In **chapter 3**, we give a detailed description of the data set used in our thesis.

¹ Please see the appendix (section 11.12) for a complete description of all the abbreviations used in this thesis

² Investopedia (2015b) defines short sale as: “A market transaction in which an investor sells borrowed securities in anticipation of a price decline and is required to return an equal number of shares at some point in the future”

³ The cost of equity is equal to the expected rate of return on equity

Chapter 4 describes the two approaches we use to answer our research question. The first approach (Fama-MacBeth) combines a cross section regression with a time series regression on *individual* stocks. This approach is used to investigate whether certain factors (e.g. systematic risk) are prized on the stock market. In other words, the approach investigates if certain factors can explain the cross section of returns. In the second approach (a portfolio approach), *portfolios* are constructed by sorting stocks based on some factor of interest. Then, we estimate the abnormal return (alpha) for each portfolio by running a regression. The methods in this thesis are mainly based on the papers by Novy-Marx (2010), Fama & French (1992a, 1993), and Gray & Vogel (2012). Hence, we use well-known methods that we adapt for our dataset.

In **chapter 5**, we describe our main findings. Using the Fama-MacBeth approach, we find that there is a significant relationship between the value of the EV/EBITDA, EV/EBIT and EV/FCFF multiples and the future CAPM abnormal returns⁴. As expected, a lower value of the multiples was associated with higher abnormal returns. Using the portfolio approach, *only* EV/FCFF seems to predict CAPM and/or Fama-French abnormal returns⁵ for the whole period (2000-2015). This result is very surprising. Almost all studies find that EV/EBITDA, EV/EBIT, P/E and P/B predict CAPM abnormal returns. In search of an explanation of this surprising result, we divided the whole period into two sub-periods, one period before the start of the financial crisis in 2008 and one period after. Before the start of the financial crisis (2000-2008), EV/EBITDA, EV/EBIT, EV/FCFF and P/E seem to predict CAPM abnormal returns. EV/FCFF also seems to predict Fama-French abnormal returns. As expected, a lower multiple was associated with higher abnormal returns. However, after the start of the financial crisis (2008-2015), *none* of the multiples seems to predict CAPM or Fama-French abnormal returns. Only the EV/FCFF multiple comes close. In this period, growth stocks (high multiples) actually performed marginally better than value stocks (low multiples). These results are quite astonishing, and might be of value for portfolio managers following a strategy of buying stocks with low multiples.

⁴ CAPM abnormal return = Gross return less the expected rate of return estimated using the CAPM

⁵ Fama-French abnormal return = Gross return less the expected rate of return estimated using the Fama-French three-factor model

In **chapter 6**, we try to explain the surprising results after the start of the financial crisis. We believe that the decrease in the risk-free interest rate from normal to record low levels after the financial crisis offers the best explanation of our surprising results. Holding all other variables constant, we show that growth stocks (high multiples) should outperform value stocks (low multiples) in this environment, as growth stocks are more sensitive to changes in the cost of capital. We also investigate why the low EV/FCFF portfolio outperformed the other low multiple portfolios during the whole period. Our analysis indicate that investors have penalized companies making large investments over the last couple of years. The low EV/FCFF companies may have outperformed the other companies due their low investment levels.

In **chapter 7**, we investigate the robustness of our results by comparing alternative assumptions and methodologies. Our results seem very robust.

In **chapter 8**, we investigate our methods with a critical eye and try to identify potential sources of error.

Chapter 9 summarizes the thesis and concludes. We believe that our thesis is relevant and could have value due to two factors. First, we believe that we are the first to include the period 2010-2015 in an analysis of the relationship between pricing multiples and future abnormal returns on the Oslo Stock Exchange. We found that the historical relationship between pricing multiples and future abnormal returns have faded away during this period. Second, we believe that we are the first to investigate the EV/FCFF multiple on the Oslo Stock Exchange. The EV/FCFF multiple is the only multiple that seems to predict CAPM and/or Fama-French abnormal returns during the whole period (2000-2015). As expected, a lower EV/FCFF multiple was associated with higher abnormal returns. For the other multiples we did not find a clear relationship between the value of the multiple and future abnormal returns.

These results indicate that portfolio managers should be wary of basing a portfolio strategy on buying stocks with low multiples (value stocks). They also indicate that portfolio managers that do base their strategy on buying stocks with low multiples should consider using the EV/FCFF multiple as a selection tool. This is the first thesis where you could extract these results on the Oslo Stock Exchange. Thus, we believe that this thesis could have value for portfolio managers that invest in the Norwegian stock market.

2. Theoretical Background

2.1 Overview

In this chapter, we give the reader some insight into the relevant theory for our master thesis. We describe the asset-pricing models we use to calculate the abnormal returns. Further, we present two essential theories for our thesis: “the efficient market hypothesis” and “the behavioural finance theory”. We will also give a description of the relative valuation approach. We describe the key value drivers of each multiple investigated in our thesis, and try to predict which multiples that will give the best predictions of future abnormal returns. Towards the end of this chapter we present the findings of prior studies on the relationship between pricing multiples and future abnormal returns.

2.2 The Capital Asset Pricing Model (CAPM)

The CAPM is one of the most central models in financial economics. It gives a precise prediction of the relationship that we should observe between the risk of an asset and its expected return (Bodie, Kane, & Marcus, 2011). The model is based on several assumptions. We want to highlight two of the most important assumptions. First, all investors must have the same information. Second, all investors are mean-variance optimizers, meaning that they want to maximize the reward-to-risk ratio (Sharpe ratio) defined as:

$$E(S_p) = \frac{[E(r_p) - r_f]}{\sigma_p}$$

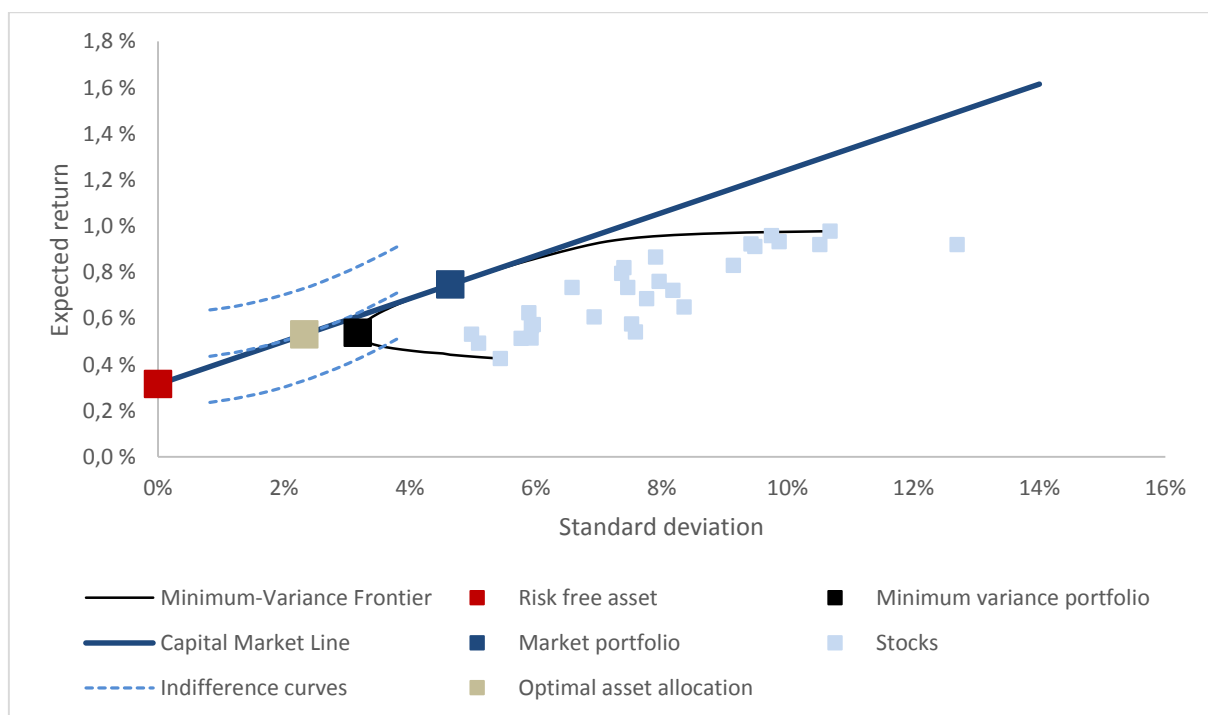
Where $E(S_p)$ is the expected Sharpe ratio for the portfolio, $E(r_p)$ is the expected return on the portfolio, r_f is the return on the risk-free asset, and σ_p is the portfolio standard deviation.

In the simplified CAPM-world, all investors will choose to hold a portfolio of risky assets in proportions that duplicate the market portfolio (Bodie, Kane, & Marcus, 2011). The market portfolio is the optimal portfolio because it offers the highest risk premium per risk unit (Sharpe ratio) of all possible portfolios. The individual investor’s risk aversion decides the optimal allocation of capital between the market portfolio and a risk-free asset. The capital market line (CML) gives all possible combinations between the market portfolio and the risk-free asset, and is given by the following equation:

$$E(r_p) = r_f + \frac{[E(r_M) - r_f]}{\sigma_M} * \sigma_p = r_f + E(S_M) * \sigma_p$$

Where $E(r_p)$ is the expected return on a portfolio that combines an investment in the risk-free asset and the market portfolio. r_f is the return on the risk-free asset, $E(r_M)$ is the expected return on the market portfolio and σ_M is the standard deviation of the market portfolio. σ_p is the standard deviation of a portfolio that combines an investment in the risk-free asset and the market portfolio, and $E(S_M)$ is the expected Sharpe ratio for the market portfolio.

Figure 1: Capital Market Line



The chart above illustrates the process of finding the optimal asset allocation. First, investors try to find the risky portfolio that gives the highest return per risk unit (i.e. steepest slope of the Capital Market Line). In the simplified CAPM-world, the market portfolio is the optimal risky portfolio. Second, the investor maximizes his utility function (represented by indifference curves in the chart) by choosing the optimal allocation of capital between the market portfolio and a risk-free asset (Optimal asset allocation).

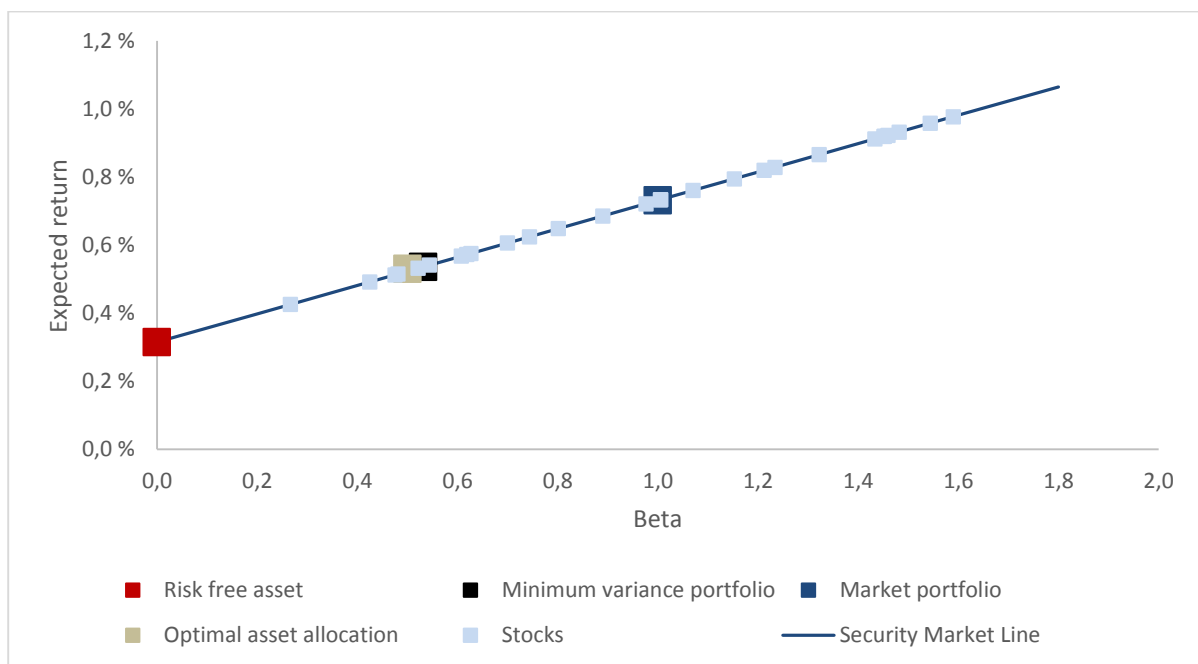
As illustrated in Figure 1, the CML is a straight line in the return-standard deviation plane, with intercept equal to the risk-free rate and slope equal to the Sharpe ratio. By maximizing the Sharpe ratio, investors end up holding the market portfolio. Hence, a passive position in the market portfolio is efficient.

The CML graphs the expected return for efficient portfolios as a function of portfolio standard deviation (total risk). The standard deviation is the appropriate risk measure for an investor's overall portfolio. The relevant risk measure for an individual asset however, is not the standard deviation. It is instead the asset's *contribution* to the portfolio standard deviation. This contribution is measured by the asset's *beta* (defined below) (Bodie, Kane, & Marcus, 2011). The security market line (SML) graphs the individual asset's expected return as a function of the asset's beta, and is given by the following equation:

$$E(r_i) = r_f + \frac{Cov(r_i, r_M)}{Var(r_M)} * [E(r_M) - r_f] = r_f + \beta_i * [E(r_M) - r_f]$$

Where, $Cov(r_i, r_M)$ is the covariance between asset i and the market, $Var(r_M)$ is the variance of the market portfolio and $\beta_i = \frac{Cov(r_i, r_M)}{Var(r_M)}$ is the asset's beta.

Figure 2: Security Market Line



As illustrated in Figure 2, the SML is a straight line in the return-beta plane with intercept equal to the risk-free rate. The SML is valid for both efficient portfolios and individual assets. It is the most commonly used model to estimate the cost of equity (Koller, Goedhart, & Wessels, 2010).

Many empirical studies have questioned the usefulness of the CAPM framework. In a famous article in the Journal of Finance, Fama & French (1992a) concluded: “*In short, our tests do not support the most basic predictions of the SLB (Sharpe-Lintner-Black) Capital Asset Pricing Model that average stock returns are positively related to market betas.*” Due to the lack of empirical support, many studies have tried to expand the CAPM framework with other systematic risk factors. We will present some of the most recognized factors in the next section.

2.3 Multifactor models

The Fama & French Three-Factor Model

Through a series of articles, Fama & French (1992a, 1993) introduced a three-factor model, which they argue is superior to the CAPM. The first factor is the excess market returns (similar to the CAPM). The second factor is the excess returns of small firms minus big firms (SMB). The third factor is the excess returns of high book-to-market stocks minus low book-to-market stocks (HML)⁶. A company does not receive a premium for being small, but instead the company receives a risk premium if its stock return is positively correlated with those of small firms or high book-to-market firms. The three-factor model predicts the following expected excess return for asset i :

$$E(r_i) - r_f = \beta_1[E(r_m) - r_f] + \beta_2SMB + \beta_3HML$$

SMB and HML are factors that based on past evidence seem to predict average returns well and therefore may be capturing risk premiums. Even though SMB and HML are not obvious candidates for relevant risk factors, Fama & French argues that they may proxy for unknown unobservable fundamental risk factors. They argue that firms with high book-to-market ratios (low P/B) are more likely to be in financial distress, and that small firms may be more sensitive to changes in business conditions (Bodie, Kane, & Marcus, 2011).

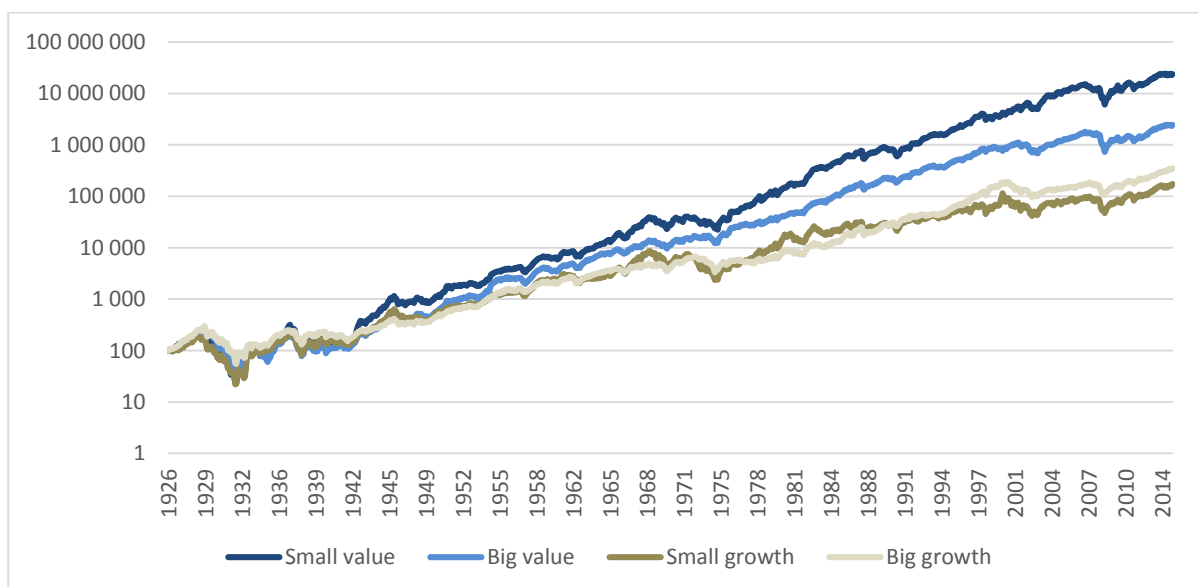
Ever since the introduction of the three-factor model, most of the academic community have relied on it to measure the cost of equity (Koller, Goedhart, & Wessels, 2010). However, many have criticized the model since it is purely based on empirical evidence. When researchers

⁶ High book-to-market is the same as low P/B and low book-to-market is the same as high P/B.

scan the database of security returns in search of explanatory variables, they may uncover past patterns that are due to pure chance (Black F., 1993). Multiple papers find that the SMB-effect disappeared after 1981 ((Ang & Chen, 2007), (Koller, Goedhart, & Wessels, 2010)).

The graph below illustrates how value stocks (in this case low P/B) have outperformed growth stocks (high P/B) since 1926, giving support to the HML factor. The picture is not that clear for the SMB factor. Among value firms, small firms have outperformed big firms. However, among growth firms, small firms have underperformed big firms. Most of the underperformance stems from the period after 1980, giving support to the papers claiming that the SMB effect has disappeared after 1981.

Figure 3: Value stocks vs. growth stocks



We constructed the graph above using monthly return series for the four portfolios from Kenneth French's data library. Each index is calculated as: $Index(t) = 100 * ([1+r(1)] * [1+r(2)] * \dots * [1+r(t-1)] * [1+r(t)])$, where $r(t)$ is the index return in month t .

A Forth Factor: Momentum

Jegadeesh & Titman (1993) uncovered a tendency for good or bad performance of stocks to persist over several months. This effect is called momentum. Historically, stocks with positive momentum have outperformed stocks with negative momentum over the next three to twelve months. Based on this empirical result, Carhart (1997) constructed a momentum factor and added it to the Fama & French three-factor model. The factor is constructed by taking the return of positive momentum stocks over the return of negative momentum stocks. The factor is called WML (Winners Minus Losers). Most of the academic community agree that the

WML factor is not a rational risk factor. It is rather a result of irrational behaviour of investors (Døskeland, 2014).

A Fifth Factor: Liquidity

Ibbotson, Chen, Kim & Hu (2013) find that illiquid stocks outperform liquid stocks. They argue that less liquid stocks may take longer to trade and/or have higher transaction costs. Hence, if all else is equal, investors should pay more for liquid stocks, and pay less for illiquid stocks.

2.4 The correct asset-pricing model?

There is a clear trade-off between the CAPM and the Fama-French three-factor model. The CAPM is based on solid theory about risk and return, but lack empirical support. The Fama-French three-factor model lack solid theory about risk and return, but have great empirical support. The problem with the Fama-French three-factor model is that we do not know if the SMB and HML factors are true proxies for risk factors, or a result of “data-snooping”. As an example of data-snooping, the correlation between the inverse of Brann’s position in the national soccer league (Tippeligaen) and the Oslo Stock Exchange Benchmark Index was 0.74 between 1995 and 2008 (see Figure 9 in the appendix). This is clearly a spurious relationship. The performance of Brann does not drive the value of companies on the Oslo Stock Exchange or vice versa. However, if we had just focused on the empirical evidence, we would have come to the opposite conclusion. As expected, the relationship has faded away over the last couple of years (just like the SMB factor).

The same data-snooping argument holds for the momentum and liquidity factors as well. It is hard to tell which of the factors presented above that represents true risk factors and which of the factors that are a result of data-snooping.

All the asset-pricing models presented above have some strengths and weaknesses. Practitioners tend to favour the CAPM, while the academic community tend to favour the Fama-French three-factor model. As there is no universally agreed upon asset-pricing model, we decided to calculate the abnormal returns using both the CAPM and the Fama-French three-factor model. If anything, we believe that the use of two different asset-pricing models will make our results more robust.

If the Fama-French three-factor model is the true model, low P/B stocks will not give abnormal returns. Low P/B stocks may give higher returns than high P/B stocks, but not after adjusting for differences in the cost of equity.

2.5 Efficient market hypothesis and “behavioral finance”

The Efficient Market Hypothesis, developed by Eugene Fama, has implications for whether differences in return between firms with high and low multiples are due to mispricing or risk. According to the efficient market hypothesis, stock prices should reflect all available information (Bodie, Kane, & Marcus, 2011). Therefore, price changes should be random and unpredictable. There are three versions of the Efficient Market Hypothesis, where the hypothesis differ in what they regard as all available information (Bodie, Kane, & Marcus, 2011).

The weak-form hypothesis claims that stock prices reflect all available information that can be derived by examining market data such as past prices or trading volume (Bodie, Kane, & Marcus, 2011). All technical and trend analysis is therefore useless. If certain patterns emerge, investors will find and exploit them, making them disappear.

The semistrong-form hypothesis states that all publicly available information about the firm, in addition to the information under the weak-form, is reflected in the stock price (Bodie, Kane, & Marcus, 2011). Thus, a trading strategy based on multiples using market values and accounting variables should not yield abnormal return. Low P/E stocks may have higher returns than high P/E stocks, but not after adjusting for differences in the cost of equity.

Lastly, the strong-form states that stock prices reflect information available to company insiders, in addition to the information under the semi-strong form (Bodie, Kane, & Marcus, 2011). This version of the Efficient Market Hypothesis is extreme. Exploiting insider information is illegal. Evidence of the strong-form on the Oslo Stock Exchange would therefore suggest that a lot of illegal trading take place.

The Efficient Market Hypothesis has received criticism from “behavioural finance” economists. They claim that investors’ psychology can lead to irrational behaviour (Døskeland, 2014). Research has showed that abnormal returns are correlated with weather conditions and results in sporting events. Another example of irrational behaviour is that

investors tend to extrapolate trends (Board, 2014). If investors just extrapolate a company's current performance, stocks with currently depressed earnings will be undervalued while stocks with currently inflated earnings will be overvalued.

2.6 Approaches to Valuation

Three main approaches to valuation

There are three main approaches to valuing a company. The first is the Discounted Cash Flow (DCF) valuation. In this approach, you value the company by discounting the expected future cash flows at the cost of capital. The second is the relative valuation. Then, you value an asset by looking at the price of comparable assets relative to a common variable such as earnings or cash flow. The third is the contingent claim valuation. Contingent claim valuation use option pricing models to value assets with option characteristics (Damodaran, 2012).

The DCF valuation is the preferred approach of both practitioners and the academic community because it relies on the flow of cash in and out of the company, rather than accounting-based earnings (Koller, Goedhart, & Wessels, 2010). However, equity researchers often use relative valuation to triangulate results. As this thesis uses relative valuation, we provide a detailed description of this approach below.

Relative valuation

There are two main approaches within the relative valuation approach.

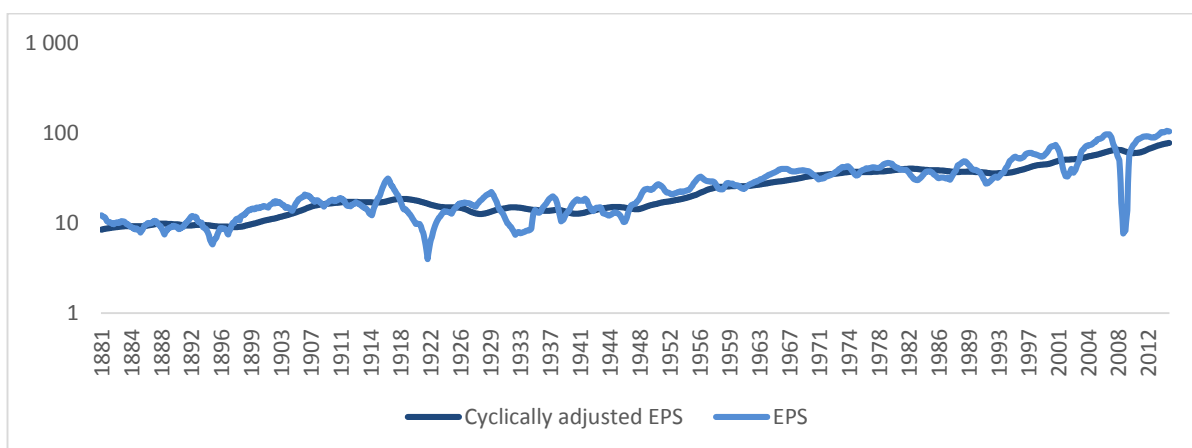
The first is the relative valuation compared with the company's own history. In this approach, you look at the same multiple for a company over a certain period. Using the price-to-earnings multiple (P/E), the basic premise is that you should be willing to pay the same amount for one dollar of earnings today as you were willing to pay in the past. If the current multiple is high (low) compared with the historical average, it may indicate that the company is overvalued (undervalued).

The second approach is the relative valuation compared with other companies (peers), which we use in this thesis. This approach compares the company's current multiple with other companies current multiple. Using the price-to-earnings multiple (P/E), the basic premise is that you should be willing to pay the same amount for one dollar of earnings regardless of the company generating the earnings. If the current multiple is high (low) compared with the peer

average, it may indicate that the company is overvalued (undervalued). However, if the fundamental drivers of the multiple differ among the peers, the company may deserve a higher (lower) multiple than the peer average. Thus, a key issue for a sound relative valuation is to find peers with similar key value drivers (e.g. return on capital, cost of capital and long-term growth). Even if you find comparable peers, this approach may lead to poor investment decisions. If a stock is 10% undervalued compared with the peers, it does not make the stock a good investment if the peers are overvalued by 100%. Nevertheless, if you buy relatively undervalued stocks, you may beat a passive position in the market index. Another strategy could be to buy undervalued stocks and short overvalued stocks (a long-short strategy). If the undervalued stocks fall by less than the overvalued stocks, you will still make money on your investment, even if the overall stock market declines.

What is equal for both approaches is that you should compare the assets relative value to a key value driver such as free cash flow or earnings. We also believe that you should use “cyclically adjusted” accounting variables in the denominator of the multiples. In their famous book *Security Analysis* (1934), Benjamin Graham & David Dodd noted that one-year earnings were too volatile to offer a good idea of the true earning power of a company. Thus, they argued for smoothing the company’s earnings using a five or ten-year average. Robert Shiller used this approach to calculate his famous cyclically adjusted P/E ratio (CAPE) for the S&P 500 index (Shiller, 2015). CAPE is calculated by dividing the price of the S&P 500 index by the 10-year moving average of the real earnings per share. In the chart on the next page, we compare the cyclically adjusted earnings per share (Cyclically adjusted EPS) with the annual earnings per share (EPS):

Figure 4: Cyclically adjusted EPS



The data used in this chart is obtained from Robert Shiller’s homepage (Shiller, 2015).

The cyclically adjusted EPS seems to grow at a relatively stable rate. The annual EPS however, is highly volatile. In the appendix (section 11.2), we show that the cyclically adjusted EPS seems to give a good prediction of the fair *value* of the index. The price of the index seems to fluctuate around 16-17 times the cyclically adjusted EPS. Thus, whenever the price of the index is far above (below) 16-17 times the cyclically adjusted EPS, the price tends to decrease (increase). The annual EPS seems to give a good prediction of the current *price* of the index. The price of the index is often close to 15-16 times the annual EPS. However, the annual EPS does not seem to predict future price movements. This indicates that investors tend to focus too much on the current earnings instead of the underlying earnings (cyclically adjusted EPS). It also indicates that cyclically adjusted accounting variables give better predictions of future returns than unadjusted accounting variables.

The disadvantage with cyclically adjusting the accounting variables for *individual* companies is that you lose a large portion of the total number of observations. You will lose observations for all companies with less than ten years of data if you use a ten-year average to calculate the cyclically adjusted earnings. If you compare the relative value of companies in the same industry, you will adjust for the industry-specific cycle. Thus, in the relative valuation compared with other companies it may be better to use unadjusted accounting variables.

Most of the academic community use trailing multiples (based on past actual variable values), while most practitioners use forward multiples (based on estimated future variable values). The advantage with trailing multiples is that the variables are observable and do not have to be estimated. The advantage with forward multiples is that they are usually normalized, ignoring large one-time charges or gains (Koller, Goedhart, & Wessels, 2010). However, both trailing and forward multiples can deviate from their cyclically adjusted values.

2.7 The key value drivers of each multiple

2.7.1 Introduction

In this sub-chapter (2.7), we give the reader some insight into the key value drivers of each multiple investigated in our thesis. The main insight from this sub-chapter is that you have to make many assumptions if you are going to value a company using the relative valuation approach. The abbreviations and formulas in this sub-chapter are based on Koller, Goedhart & Wessels (2010).

2.7.2 Enterprise multiples

We define enterprise multiples as multiples with enterprise value in the numerator. In the denominator, you should use variables that are attributable to the whole enterprise (both debt and equity investors).

In the appendix (section 11.4), we show that the enterprise value of a company with *constant* return on new invested capital (RONIC) and growth going forward is given by the key value driver formula:

$$EV_t = \frac{FCFF_{t+1}}{WACC - g} = \frac{NOPLAT_{t+1} * \left(1 - \frac{g}{RONIC}\right)}{WACC - g} = \frac{EBIT_{t+1} * (1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g}$$

Where EV_t is the enterprise value year t , $FCFF_{t+1}$ is the Free Cash Flow to the Firm year $t+1$, $WACC$ is the Weighted Average Cost of Capital, and g is the long-term growth rate of NOPLAT. $NOPLAT_{t+1}$ is the Net Operating Profit Less Adjusted Taxes year $t+1$, and $RONIC$ is the Return on New Invested Capital. $EBIT_{t+1}$ is the Earnings Before Interest and Taxes year $t+1$, and t is the tax rate. $\left(\frac{g}{RONIC}\right)$ is the net investment rate (i.e. the proportion of NOPLAT that has to be invested back into the firm to achieve a growth rate equal to the long-term growth rate (g)).

We admit that this formula is very restrictive, as it assumes constant RONIC and growth rate in perpetuity. Nevertheless, we believe that the formula can be useful in identifying the key value drivers of the different multiples.

Be aware that the formulas in this section (2.7.2) are only valid if the cost of capital (WACC) is greater than the long-term growth rate (g).

EV/EBIT

In the appendix (section 11.4), we show that the key value driver formula for the “Enterprise value” to “Earnings Before Interest and Taxes” (EV/EBIT) multiple is given by the following equations:

$$\frac{EV_t}{EBIT_{t+1}} = \frac{(1-t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g}$$

$$\frac{EV_t}{EBIT_{t+1}} = \frac{(1-t)}{RONIC} * \left[1 + \frac{RONIC - WACC}{WACC - g}\right]$$

The second equation is derived in order to isolate the effect of long-term growth (g) on the EV/EBIT multiple.

Holding all other variables constant, the EV/EBIT multiple is an *increasing* function of:

- The return on new invested capital (RONIC)
- The long-term growth rate (g) if RONIC is greater than WACC

Holding all other variables constant, the EV/EBIT multiple is a *decreasing* function of:

- The tax rate
- The cost of capital (WACC)
- The long-term growth rate (g) if RONIC is less than WACC

The EV/EBIT multiple adjusts for differences in revenues, operating expenses and maintenance investments⁷. EBIT is also one of the least volatile accounting variables. Thus, EBIT is often relatively close to the cyclically adjusted value. However, the multiple does not adjust for differences in the tax rate (t), net investment rate (g/RONIC), cost of capital (WACC) or long-term growth rate (g). Thus, companies with different values for these variables should have a different EV/EBIT multiple.

⁷ Assuming that the accounting depreciation is a good proxy for maintenance investments

Note that a higher return on new invested capital always leads to a higher fair EV/EBIT multiple. This is not the case for growth. When the return on new invested capital is *higher* than cost of capital, higher growth creates value. However, when the return on new invested capital is *lower* than the cost of capital, higher growth destroys value. Thus, when the return on new invested capital is lower than the cost of capital, the company should not make new investments. If the return on new invested capital is *equal* to the cost of capital, higher growth neither creates nor destroys value. Thus, higher growth is only good if the new investments generate a satisfactory rate of return. A higher tax rate always leads to a lower fair EV/EBIT multiple.

The most relevant thing to note regarding our research question is the fact that a higher cost of capital (WACC) leads to a lower fair EV/EBIT multiple. Consider two companies that have the same tax rate (t), net investment rate (g/RONIC) and long-term growth (g). The only difference is that one of the companies have higher risk, and therefore a higher cost of capital (WACC). The key value driver formula tells us that the stock with the higher cost of capital should have a lower EV/EBIT multiple. The higher cost of capital will also result in a higher expected return, as compensation for the increased risk. In this situation, pricing multiples do predict future returns. However, pricing multiples do not predict future *abnormal* returns. Stocks with low multiples (high cost of capital) will have high returns, while stocks with high multiples (low cost of capital) will have low returns. However, the difference in return is only a compensation for the difference in the cost of capital. The cost of capital can be estimated using an asset-pricing model like the CAPM or the Fama-French three-factor model.

The investor community often refers to stocks with high multiples as “growth stocks”. Based on the formula above, we notice that this label can be misleading. A high multiple is not necessarily a result of high growth. The high multiple could also be explained by a high return on new invested capital, a low cost of capital or a low tax rate. Further, higher growth only leads to a higher fair multiple if the return on new invested capital is higher than the cost of capital. The investor community often refers to stocks with low multiples as “value stocks”. This label makes more sense as investors only have to pay a low price for the current value of a key value driver such as earnings or free cash flow.

EV/EBITDA

In the appendix (section 11.4), we show that the key value driver formula for the “Enterprise value” to “Earnings Before Interest, Taxes, Depreciation and Amortization” (EV/EBITDA) multiple is given by the following equations:

$$\frac{EV_t}{EBITDA_{t+1}} = \frac{\left(1 - \frac{DA_{t+1}}{EBITDA_{t+1}}\right) * (1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g}$$

$$\frac{EV_t}{EBITDA_{t+1}} = \left[\frac{\left(1 - \frac{DA_{t+1}}{EBITDA_{t+1}}\right) * (1 - t)}{RONIC} \right] * \left[1 + \frac{RONIC - WACC}{WACC - g} \right]$$

Where DA_{t+1} is the depreciation and amortization expense year t+1.

The second equation is derived in order to isolate the effect of long-term growth (g) on the EV/EBITDA multiple.

Holding all other variables constant, the EV/EBITDA multiple is an *increasing* function of:

- The return on new invested capital (RONIC)
- The long-term growth rate (g) if RONIC is greater than WACC

Holding all other variables constant, the EV/EBITDA multiple is a *decreasing* function of:

- Depreciation and amortization as a portion of EBITDA
- The tax rate
- The cost of capital (WACC)
- The long-term growth rate (g) if RONIC is less than WACC.

In the derivation above, we assume that accounting depreciation is a good proxy for maintenance investments.

The only difference between the EV/EBITDA and EV/EBIT multiple is that the EV/EBITDA multiple does not take into account differences in the depreciation rate (depreciation expense measured as a portion of EBITDA). So why should you use the EV/EBITDA multiple if the only difference between the EV/EBITDA and the EV/EBIT multiple is that you have to make one additional assumption using the EV/EBITDA multiple?

For companies with *justified* differences in the depreciation rate (e.g. different capital intensity) it does not make much sense to use the EV/EBITDA multiple instead of the EV/EBIT multiple.

For companies with *unjustified* differences in the depreciation rate (e.g. the same capital intensity, but different accounting depreciation), we prefer the EV/EBITDA multiple over the EV/EBIT multiple. In this situation, accounting depreciation is not a good proxy for maintenance investments.

EV/FCFF

In the appendix (section 11.4), we show that the key value driver formula for the “Enterprise value” to “Free Cash Flow to the Firm” (EV/FCFF) multiple is given by the following equation:

$$\frac{EV_t}{FCFF_{t+1}} = \frac{1}{WACC - g}$$

Holding all other variables constant, the EV/FCFF multiple is an *increasing* function of:

- The long-term growth rate (g)

Holding all other variables constant, the EV/FCFF multiple is a *decreasing* function of:

- The cost of capital (WACC)

The EV/FCFF multiple adjusts for all the components of the free cash flow; revenues, operating expenses, tax rate, maintenance investments and net investments. However, the multiple does not take into account differences in the cost of capital (WACC) or long-term growth rate (g). FCFF is calculated as:

$$\begin{aligned} FCFF_{t+1} &= NOPLAT_{t+1} + DA_{t+1} - \Delta OpWC_{t+1} - Capex_{t+1} \\ &= NOPLAT_{t+1} + DA_{t+1} - Gross Investment_{t+1} \\ &= NOPLAT_{t+1} - Net Investment_{t+1} \end{aligned}$$

Where DA_{t+1} is the depreciation and amortization year $t+1$, $\Delta OpWC_{t+1}$ is the change in operating working capital year $t+1$, and $Capex_{t+1}$ is the capital expenditure year $t+1$.

Changes in operating working capital and capital expenditure are often much more volatile than changes in NOPLAT and depreciation. Thus, we fear that that the FCFF measure is too volatile to give a precise estimate of the relative value of companies. We believe that FCFF often deviates significantly from the cyclically adjusted value.

2.7.3 Equity multiples

We define equity multiples as multiples with equity value in the numerator. In the denominator, you should use variables that are attributable to equity investors only.

In the appendix (section 11.5), we show that the equity value per share of a company with *constant* return on new equity investments (RONE) and growth going forward is given by the key value driver formula for equity:

$$P_t = \frac{FCFE_{t+1}}{k - g} = \frac{E_{t+1} * \left(1 - \frac{g}{RONE}\right)}{k - g}$$

Where P_t is the value per share year t. $FCFE_{t+1}$ is the Free Cash Flow to Equity per share year t+1, k is the cost of equity and g is the long-term growth rate in earnings per share. E_{t+1} is the earnings per share year t+1, and $RONE$ is the Return On New Equity investments. $\left(\frac{g}{RONE}\right)$ is the net investment rate (i.e. the proportion of the earnings per share that has to be invested back into the firm to achieve a growth rate equal to the long-term growth rate (g)).

The great disadvantage with equity multiples compared with enterprise multiples is that equity multiples are affected by the company's capital structure. In the appendix (section 11.6), we show that the company's capital structure (debt-to-equity ratio) will affect both the return on equity (ROE) and cost of equity (k). Thus, you should not compare the relative value of companies with different leverage (i.e. the vast majority).

Be aware that the formulas in this section (2.7.3) are only valid if the cost of equity (k) is greater than the long-term growth rate (g).

P/E

In the appendix (section 11.5), we show that the key value driver formula for the price-to-earnings (P/E) multiple is given by the following equations:

$$\frac{P_t}{E_{t+1}} = \frac{\left(1 - \frac{g}{RONE}\right)}{k - g}$$

$$\frac{P_t}{E_{t+1}} = \frac{1}{RONE} * \left[1 + \frac{RONE - k}{k - g}\right]$$

The second equation is derived in order to isolate the effect of long-term growth (g) on the P/E multiple.

Holding all other variables constant, the P/E multiple is an *increasing* function of:

- The return on new equity investments (RONE)
- The long-term growth rate (g) if RONE is greater than the cost of equity (k)

Holding all other variables constant, the P/E multiple is a *decreasing* function of:

- The cost of equity (k)
- The long-term growth rate (g) if RONE is less than the cost of equity (k).

The P/E multiple takes into account differences in revenues, operating expenses, financial expenses, tax rate and maintenance investments. However, it does not take into account differences in the net investment rate (g/RONE), cost of equity (k) or long-term growth rate (g). We also believe that the earnings per share is more volatile than EBITDA and EBIT. Thus, we believe that the earnings per share is less likely to be close to the cyclically adjusted value.

P/FCFE

In the appendix (section 11.5), we show that the key value driver formula for the “Price” to “Free Cash Flow to Equity per share” (P/FCFE) multiple is given by the following equation:

$$\frac{P_t}{FCFE_{t+1}} = \frac{1}{k - g}$$

Holding all other variables constant, the P/FCFE multiple is an *increasing* function of:

- The long-term growth rate (g)

Holding all other variables constant, the P/FCFE multiple is a *decreasing* function of:

- The cost of equity (k)

The P/FCFE multiple adjusts for all the components of the free cash flow to equity; revenues, operating expenses, financial expenses, tax rate, maintenance investments and net investments. However, the multiple does not take into account differences in the cost of equity (k) or long-term growth rate (g). We believe that the FCFE is even more volatile than the FCFF. FCFE is calculated as:

$$FCFE_{t+1} = FCFF_{t+1} - Net\ interest * (1 - t) + \Delta Net\ Debt$$

The increase/decrease in net debt can be relatively large. Thus, we fear that that this measure is too volatile to give a precise estimate of the relative value of companies. We believe that FCFE often deviates significantly from the cyclically adjusted value.

P/B

The “Price” to “Book value of equity per share” (P/B) multiple is a different kind of multiple compared with the other multiples. Instead of measuring how much investors are willing to pay per dollar of earnings or cash flow, the P/B multiple measures how much investors are willing to pay per dollar of equity capital in the firm. In the appendix (section 11.5), we show that the key value driver formula for the P/B multiple is given by the following equations:

$$\frac{P_t}{B_t} = \frac{ROE_{t+1} * \left(1 - \frac{g}{RONE}\right)}{k - g}$$

$$\frac{P_t}{B_t} = \frac{ROE_{t+1}}{RONE} * \left[1 + \frac{RONE - k}{k - g}\right]$$

The second equation is derived in order to isolate the effect of long-term growth (g) on the P/B multiple.

Holding all other variables constant, the P/B multiple is an *increasing* function of:

- The return on equity (ROE)
- The return on new equity investments (RONE)
- The long-term growth rate (g) if RONE is greater than the cost of equity (k)

Holding all other variables constant, the P/B multiple is a *decreasing* function of:

- The cost of equity (k)
- The long-term growth rate (g) if RONE is less than the cost of equity (k).

The P/B multiple does not take into account differences in the return on equity (ROE), net investment rate (g/RONE), cost of equity (k) or long-term growth rate (g). The great advantage with the P/B multiple is that the book value is very stable and often equal to the cyclically adjusted value.

Naturally, your willingness to pay for one dollar of the equity capital is highly dependent on the quality of the equity capital, measured as the return on equity (ROE). Holding all other variables constant, we notice that there is a perfect linear relationship between the fair P/B multiple and ROE. Thus, if you believe that the company’s current ROE will converge to the peer average, the P/B multiple is an ideal multiple. If you do not believe that the company’s

current ROE will converge to the peer average, you should not use the P/B ratio to compare the relative value of companies. Koller, Goedhart & Wessels (2010) find a high level of persistency in companies' return on invested capital. We believe that the same pattern holds for the return on equity. Thus, it may not be a realistic assumption to assume that the company's current ROE will converge to the peer average.

2.7.4 Summary

Table 1: Summary multiples

Multipel	Description	Assume equal	Pros and cons
EV/FCFF	EV = Enterprise Value FCFF = Free Cash Flow to firm	WACC Growth rate	+ Few assumptions - FCFF could deviate a lot from cyclical adjusted value
EV/EBIT	EV = Enterprise Value EBIT = Earnings Before - Interest and Taxes	WACC Growth rate Tax rate Net investment rate	+ EBIT is closer to cyclical adjusted value than FCFF - More assumptions than EV/FCFF
EV/EBITDA	EV = Enterprise Value EBITDA= Earnings Before - Interest, Taxes, Depreciation - and Amortization	WACC Growth rate Tax rate Net investment rate Depreciation rate	+ Removes the problem with unjustified differences in the depreciation rate + Less negative values - A lot of assumptions
P/FCFE	P = Price FCFE = Free Cash Flow to Equity	Cost of equity Growth rate	+ Few assumptions - FCFE could deviate a lot from cyclical adjusted value - Affected by the company's capital structure
P/E	P = Price E = Earnings per share	Cost of equity Growth rate Net investment rate	+ Earnings is closer to cyclical adjusted value than FCFE - Assumes equal investment rate - Affected by the company's capital structure
P/B	P = Price B = Book value per share	Cost of equity Growth rate Net investment rate ROE	+ Book value is stable and close to cyclical adjusted value - Much of the variation in P/B is due to variation in ROE - Affected by the company's capital structure

2.8 Pricing multiples and future returns

We have identified four possible explanations for the variation in multiples across companies. The different explanations have different implications for multiples' ability to predict future returns. We will exemplify the explanations by investigating the key value driver formula for the P/E multiple:

$$\frac{P_t}{E_{t+1}} = \frac{\left(1 - \frac{g}{RONE}\right)}{k - g}$$

Where P_t is the value per share year t and E_{t+1} is the earnings per share year t+1. g is the long-term growth rate in earnings per share, $RONE$ is the Return On New Equity investments, and k is the cost of equity.

1) Low (high) P/E stocks are undervalued (overvalued):

Based on the key value driver formula for the P/E ratio, we notice several possible explanations that are consistent with the notion that low P/E stocks are undervalued. First, investors underestimate the return on new equity investments (RONE) or long-term growth⁸ (g) for low P/E stocks. Second, investors overestimate the cost of equity (k) for low P/E stocks. Third, weak investor sentiment may push the share price far below its fair value for low P/E stocks. As time goes by, investors may discover the mispricing and rush to buy the undervalued stocks, resulting in increased share prices and positive abnormal returns. These explanations are in line with the behavioural finance theory. In this situation, pricing multiples do predict abnormal returns.

We would like to mention that that the relationship between multiples and future returns could be the opposite, i.e. that growth stocks (high multiples) are undervalued and value stocks (low multiples) are overvalued. Based on prior studies we find this unlikely. If investors misestimate the key value drivers, undervalued companies will have a relatively low multiple, while overvalued companies will have a relatively high multiple (compared with the fair multiple). Then, companies with a relatively low multiple should yield positive abnormal returns, while companies with a relatively high multiple should yield negative abnormal returns. A similar intuitive explanation indicating that growth stocks are undervalued and value stocks overvalued is difficult to produce. Investors tend to extrapolate trends. Thus, it is more likely that investors undervalue stocks with currently depressed performance and overvalue stocks with currently inflated performance.

2) Low (high) P/E stocks have higher (lower) cost of equity

Holding all other variables constant, the key value driver formula tells us that a stock with a higher cost of equity should have a lower P/E multiple. The higher cost of equity will also result in a higher expected return, as compensation for the increased risk. This explanation is in line with the efficient market hypothesis. In this situation, pricing multiples do predict returns. However, pricing multiples do not predict *abnormal* returns. Stocks with low multiples (high cost of equity) will have high returns, while stocks with high multiples (low cost of equity) will have low returns. However, the difference in return is only a compensation

⁸ We assume that the return on new equity investments is higher than the cost of equity. Then, higher growth leads to a higher fair multiple.

for the difference in the cost of equity. The question is as always, what is the appropriate measure of risk (cost of equity), the CAPM, Fama-French three-factor model or any other asset-pricing model?

3) The variation in multiples across companies is explained by different values of the key value drivers other than the cost of equity

In this situation, pricing multiples do not predict abnormal returns nor returns.

4) The variation in multiples across companies is explained by a volatile denominator in the multiple that is different from the cyclically adjusted value

The fair value of a company is driven by the cyclically adjusted value of the free cash flows. Consider two companies that have a fair P/E value of 10 and cyclically adjusted earnings per share of 10 dollars. Then, both companies should trade at a price around 100 dollars. However, if the annual earnings per share is very volatile and fluctuates randomly between 5 dollars and 20 dollars, the unadjusted P/E ratio will fluctuate between 20 and 5. Then, the P/E ratio is too volatile to give a precise estimate of the relative value of companies. In this situation, pricing multiples do not predict abnormal returns nor returns.

Theoretical conclusion

Situation 1 and 2 above can explain why value stocks historically have outperformed growth stocks (as shown in Figure 3). We believe that the true situation is a combination of all four situations above. Thus, we do believe that pricing multiples can provide some information about future abnormal returns. The best predictors of abnormal returns would be the multiples with few assumptions and accounting variables with low volatility close to the cyclically adjusted value.

2.9 Literature overview

Investing in companies with low multiples is often called value investing. Value investing originates among others from the ideas of Benjamin Graham & David Dodd, which they made public through their book, *Security Analysis* (1934). By looking at firm fundamentals and comparing it with the market values, they discovered that it was possible to earn abnormal returns. Benjamin Graham later wrote the *Intelligent investor* (1949) on the same topic, which Warren Buffet (one of the world's most successful investors of the 20th century) has described as "*the best book about investing ever written*" (Wikipedia, 2015a).

Basu (1977) was one of the first to examine value investing in light of the Capital Asset Pricing Model of Sharpe (1964), Lintner (1965) & Black (1972) and the efficient market hypothesis of Eugene F. Fama (1970). He sorted stocks on P/E and found that low P/E stocks outperformed high P/E stocks with 4.5% per year after adjusting for risk during the period 1957-1971 in the US. Even though these findings were not consistent with the efficient market hypothesis, he could not reject the hypothesis due to exclusion of transaction costs, search costs and tax effects.

Stattman (1980) and Rosenberg, Reid & Lanstein (1985) found a negative relationship between P/B and average return in the US. Chan, Hamamao & Lakonishok (1991) examined the Japanese stock market in the period 1971-1988, and found a significant relationship between P/E, market capitalization (market cap), cash flow multiple (Market cap/FCFF), P/B and abnormal returns. A lower multiple increased the abnormal return.

Fama & French (1992a, 1993, 1996, 1998) analysed the relationship between P/B, P/E, P/D (price-to-dividend), P/C (price-to-cash flow) and CAPM abnormal return. They discovered that stocks with low multiples (value stocks) had higher returns than stocks with high multiples (growth stocks). For the period 1975-1995, a global portfolio consisting of value stocks outperformed growth stocks with 7.86% per year (Fama & French, 1998). In addition to this, Fama & French (1998) found that value stocks outperformed growth stocks in 12 out of 13 markets.

Based on their finding in 1992, Fama & French formulated the three-factor model (1993, 1996), which they later expanded to a five factor model (2014). As mentioned earlier, Fama & French believe that using multiples is just a way of extracting the expected return from the stock price. Due to the stability of the book value, they chose P/B to represent the risk factor associated with investing in stocks with low multiples (Fama & French, Q&A, 2011). However, Fama & French points out that one pricing multiple is just as good as another: *“We always emphasize that different price ratios are just different ways to scale a stock's price with a fundamental, to extract the information in the cross-section of stock prices about expected returns. One fundamental (book value, earnings, or cashflow) is pretty much as good as another for this job, and the average return spreads produced by different ratios are similar to and, in statistical terms, indistinguishable from one another. We like BtM because the book value in the numerator is more stable over time than earnings or cashflow, which is important for keeping turnover down in a value portfolio”* (Fama & French, Q&A, 2011).

Loughran & Wellman (2011) created an enterprise multiple factor by buying low EV/EBITDA stocks and selling high EV/EBITDA stocks. The enterprise multiple factor gave an abnormal return of 1.92% per year after controlling for risk using the Carhart four-factor model (the Fama-French three-factor model plus momentum). Loughran & Wellman claim that low EV/EBITDA stocks have higher cost of capital than high EV/EBITDA stocks and hence give higher returns.

Gray & Vogel (2012) compared the performance of different multiples in the period 1971-2010. They sorted stocks on P/B, P/E, EV/EBITDA, EV/EBIT, EV/FCF and EV/Gross-profit and evaluated the performance of the different portfolios. Over the 40-year period in the US, Gray & Vogel found that EV/EBITDA has been the best selection tool to predict abnormal returns. Low EV/EBITDA firms gave an abnormal return of 2.91% per year after adjusting for risk using the Fama-French factors. They got similar results using the EV/EBIT multiple.

Gray & Vogel (2012) also tried using forward earnings obtained from analysts and normalized accounting variables. The normalisation was done by taking a five-year average of the accounting variable. The portfolio consisting of low P/E stocks based on forward earning did considerably worse than all other measures: *“The evidence suggests that investors should be weary of using forward earnings estimates in their valuation toolkit.”* (Gray & Vogel, 2012). Gray & Vogel did not find evidence of improvement using normalisation either. *“If anything, the evidence suggests that the one-year valuation measure is superior to normalized metrics.”* (Gray & Vogel, 2012).

There have also been conducted some research on the relationship between pricing multiples and future abnormal returns on the Oslo Stock Exchange. Egeberg & Enge (2009) sorted stocks into portfolios based on the four multiples P/SALES, P/BOK, P/EBIT and P/EBITDA. They found that stocks with low P/B, P/EBIT or P/EBITDA outperformed the market. Rettedal (2012) found that stocks with low P/B outperformed stocks with a high P/B in the period 1994-2012. Ødegaard (2015a) calculated the HML factor for Oslo Stock Exchange (low P/B stocks minus high P/B stocks) and found that it has given a positive return in the period 1980-2012.

Internationally, the evidence that multiples predict future CAPM abnormal returns is overwhelming. Several studies have shown that EV/EBITDA, EV/EBIT, P/E and P/B predict CAPM abnormal returns. EV/EBITDA and EV/EBIT also seem to have the ability to predict Fama-French abnormal returns, while the abnormal returns using P/E and P/B disappear when

adjusting for risk using the Fama-French model. In all studies presented above, a lower multiple was associated with higher returns. We expect to see the same pattern in Norway. The EV/FCFF and P/FCFE multiples have not received a lot of attention internationally nor domestic. Thus, our expectations for the EV/FCFF and P/FCFE multiples are mainly based on the theoretical discussion above.

2.10 Our preferred multiple

Based on the theoretical analysis and the literature presented above, we rank the multiples' expected ability to predict abnormal returns from 1 (best) to 6 (worst):

1. *EV/EBIT*

We believe that the EV/EBIT multiple offers the best trade-off between relevance for the value of the firm and low volatility of the accounting variable.

2. *EV/EBITDA*

We consider the EV/EBITDA multiple almost as good as the EV/EBIT multiple. However, the EV/EBITDA multiple does not take into account differences in expected maintenance investments. Thus, we rank the EV/EBITDA multiple below the EV/EBIT multiple.

3. *EV/FCFF*

The EV/FCFF multiple is the most relevant measure for the value of the company. However, we fear that the FCFF measure is too volatile to give a precise estimate of the relative value of companies. Thus, we rank the EV/FCFF multiple below both EV/EBIT and EV/EBITDA.

4. *P/E*

The major flaw of the P/E multiple compared with the EV/EBIT multiple is that the P/E multiple does not take into account differences in leverage. Thus, you should not compare the P/E multiple for companies with different capital structure. We also believe that the earnings per share measure is more volatile than EBIT.

5. *P/FCFE*

P/FCFE is the most relevant measure for the equity value per share. However, we fear that the FCFE measure is too volatile to give a precise estimate of the relative value of companies. Thus we rank the P/FCFE below the P/E multiple.

6. *P/B*

The major problem with the P/B multiple is that it does not adjust for differences in the return on equity. If you use this multiple to compare the value of companies, you assume that every dollar of equity capital in the firm is worth the same across companies. However, you should be willing to pay more for a company that returns 15 dollars for every 100 dollars of equity capital than for a company that only returns 10 dollars for every 100 dollars of equity capital. The great advantage with the P/B multiple is that the equity capital (book value) is very stable and often equal to the cyclically adjusted value. If you believe that the company's current ROE will converge to the peer average, the P/B multiple is an ideal multiple. The multiple may also identify companies with currently depressed (inflated) ROE that is undervalued (overvalued) by the market.

Based on the theoretical discussion and literature presented above, we believe that all multiples can predict abnormal returns. We expect a lower multiple to increase the abnormal return.

Table 2: Theoretical conclusion

Relationship between multiples and abnormal returns?					
EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
✓	✓	✓	✓	✓	✓

3. Data

3.1 Dataset

Our dataset consists of all available stocks listed on the Oslo Stock Exchange in the period 1998-2015. All companies that have been delisted, listed or gone bankrupt are included. Hence, we correct for survivorship bias. Market data such as the returns and market capitalization of stocks are obtained monthly, while accounting data like EBIT is obtained on a yearly basis. We used Bloomberg and the Oslo Stock Exchange (Oslo børs, 2015a) as sources to get an overview of the stocks listed on the Oslo Stock Exchange. In addition, we have used the following sources for data:

- *Bloomberg*: market (monthly) and accounting data (yearly), see the appendix for a definition of the variables (Bloomberg, 2015).
- *Kenneth R. French's homepage*: Fama-French factors and portfolios based on P/E and P/B using monthly returns (Kenneth R. French, 2015).
- *Bernt Arne Ødegaard*: Fama-French factors for the Norwegian market using monthly returns (Ødegaard, 2015b).
- *Robert J. Shiller*: Cyclically adjusted earnings per share (yearly) and P/E (yearly) for the S&P 500 index (Shiller, 2015).
- *IMF*: Inflation (yearly) and GDP forecasts (yearly) (IMF, 2015).

3.2 Sample period

Our dataset on the Oslo Stock Exchange starts in January 1998 and ends in January 2015. Due to our exclusion criteria (see below), we could not start the Fama-MacBeth approach before January 2000. We chose to start our analysis in October 2000, so we could start at a peak in order to analyse two complete recessions and one complete expansion period. Our data set includes two major stock market declines, namely the burst of the IT-bubble in 2000 and the financial crisis in 2008. Further, our dataset includes a whole expansion period from 2003 to 2008. We cannot yet say whether the period 2008-2015 is a full cycle.

In the portfolio analysis, we analyse three periods. First, we analyse the entire period from October 2000 to January 2015. Then, we divide the whole period into two sub-periods. The first sub-period starts in October 2000 and ends in May 2008. The second sub-period starts in May 2008 and ends in January 2015. We chose May 2008 as the cut-off date, partly because it was the stock market peak before the financial crisis in 2008. In the Fama-Macbeth analysis, we will only look at the entire period.

3.3 Screening of the data

3.3.1 General screening

In our empirical tests, we exclude all financial firms as was done by Fama & French (1992a). *“We exclude financial firms because the high leverage that is normal for these firms probably does not have the same meaning as for non-financial firms, where high leverage more likely indicates distress”* (Fama & French, 1992a). As a robustness test, we have also done our analysis including financial firms, without major differences in the results (see section 7.3).

As Egeberg & Enge (2009), we gave stocks that went bankrupt a return of -100% in the month of bankruptcy. When a company goes bankrupt, the value of equity is zero. Thus, all equity investors will get a return of -100%.⁹

As Fama & French (1992a) and Loughran & Wellman (2011), we exclude observations with negative multiples, both due to negative values in the denominator and in the numerator. Collins, Maydew & Weiss (1997) show that the predictability of multiples decline when you include negative multiples. Further, researchers do not agree on the classification of stocks with negative multiples. Some consider them as growth stocks, while others consider them as value stocks (Loughran & Wellman, 2011). Due to these issues, we chose to exclude stocks with negative multiples.

⁹ The low multiple portfolios performed marginally better when we did not give companies that went bankrupt a return of -100%.

Firms that do not have the required information for a certain multiple are excluded from the analysis in the following portfolio year (July year t to June year $t+1$). As missing values differ among the different multiples, so does the available stocks for each multiple. An alternative could be to only include a stock if it fulfils all the exclusion criteria for all the multiples. Due to an already small sample size, we chose to include as many stocks as possible for the different multiples, even though this makes our results less comparable across multiples. If missing multiples are randomly distributed, it should not affect our results. In chapter 7, we analyse the different multiples using the exact same sample.

As described below, the Fama-MacBeth and the portfolio approach use some additional screening criteria that differ from each other. This is mainly due to the practical implementation of the two approaches.

3.3.2 Fama-MacBeth screening

In the Fama-MacBeth analysis, only stocks with returns for the past 24 months are included. We add this restriction because we want to calculate the betas using no less than 24 months of data. Otherwise, the dataset is identical to that described in section 3.3.1

3.3.3 Portfolio screening

In order to avoid very illiquid stocks, we only include stocks that have been traded at least 9 out of the 12 last months before portfolio formation. The stock must have an average turnover of minimum NOK 1m per month over the last year (July year $t-1$ to June year t). Moreover, the stock must have a market capitalization and be traded in June year t . Our exclusion criteria are not very strict. However, they make sure of that the stocks included in the portfolios have a minimum degree of liquidity, that they can be traded without major difficulties. Otherwise, the dataset is identical to that described in section 3.3.1. In the table below, you can see how many stocks that satisfied the inclusion criteria for the different multiples each year compared with the total number of stocks on the Oslo Stock Exchange.

Table 3: Number of stocks satisfying the inclusion criteria

Stocks satisfying the inclusion criteria for the different multiples							
Year	Oslo Stock Exchange	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
2000	215	70	67	26	83	60	125
2001	213	71	69	18	71	49	125
2002	204	64	57	27	58	44	110
2003	179	54	44	25	46	33	94
2004	189	81	63	30	68	47	110
2005	220	80	67	30	86	31	129
2006	230	99	94	44	102	43	135
2007	242	102	96	33	105	45	158
2008	225	134	120	39	117	55	175
2009	209	118	102	40	84	64	156
2010	206	110	88	45	85	54	147
2011	198	105	90	40	75	49	134
2012	194	106	93	35	77	55	127
2013	186	98	90	39	69	65	117
2014	185	96	84	47	76	70	111

All non-financial firms with a positive multiple, that have a market capitalization and return in June year t , an average turnover of NOK1m over the last 12 months and have been traded 9 out of the last 12 months are included in the portfolios.

3.4 Time series variables

Risk-free rate

As a proxy for the risk-free rate, we use the yield on 12 months Norwegian treasury bills. It is natural to use 12 months, due to our 12 months investment horizon. For the portfolios, the risk-free rate is set equal to the yield on June 30th in year t for the portfolio year (July year t to June year $t+1$). Then, the risk-free rate represent the risk-free alternative cost of investing in the portfolios for a year:

$$r_{f,July-August} = (1 + r_{f,June})^{\frac{1}{12}} - 1$$

In the Fama-MacBeth analysis, the risk-free rate is set equal to the yield at the start of each month:

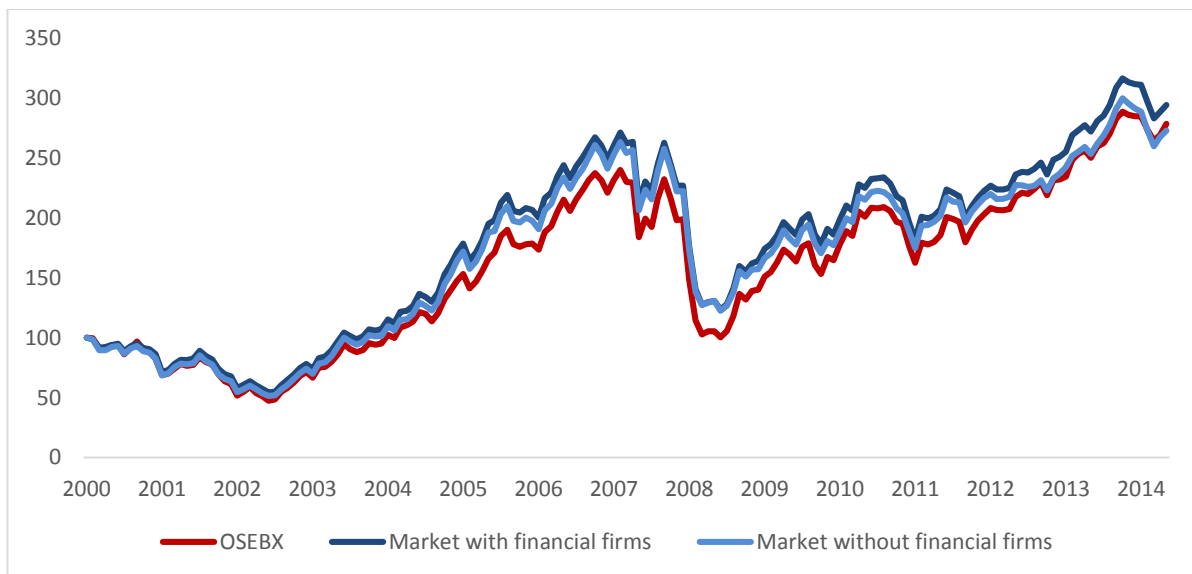
$$r_{f,t} = (1 + r_{f,t-1})^{\frac{1}{12}} - 1.$$

Market

As a proxy for the market, we chose to use the OSEBX index. According to the Oslo Stock Exchange homepage, OSEBX consists of 54 stocks and is supposed to be an investable index

tracking the performance of the Oslo Stock Exchange (Oslo børs, 2015b). Since we are excluding financial firms, an alternative could be to use an index without financial firms. However, we believe that it is easier to compare with a well-known index. Below you can see a comparison of two indexes composed of all the stocks in our sample (with and without financial firms) and the OSEBX. The graph shows the monthly cumulative return for the period October 2000 to January 2015. We can see that the difference between OSEBX and the value-weighted indexes is relatively small.

Figure 5: OSEBX vs. market



Fama-French factors

Using our sample, we created Fama-French factors for the Oslo Stock Exchange following the Fama-French methodology (1993).

All firms (including financial firms) with a positive book value in December year $t-1$ that fulfils the screening criteria in section 3.3.3 are sorted into six groups based on the market capitalizations in June year t and the book-to-market values in December year $t-1$ (see the table below). Monthly value-weighted returns from July year t to June year $t+1$ are then calculated.

Table 4: Fama-French factors

	Book/Market		
	L	M	H
Small size	S/L	S/M	S/H
Big size	B/L	B/M	B/H

The pricing factors are constructed as follows.

$$\text{SMB} = \text{average}(\text{S/L}, \text{S/M}, \text{S/H}) - \text{average}(\text{B/L}, \text{B/M}, \text{B/H}).$$

$$\text{HML} = \text{average}(\text{S/H}, \text{B/H}) - \text{average}(\text{S/L}, \text{B/L})$$

Table 5: Correlations

	HML	SMB	SMB δ	HML δ	OSEBX
HML	1.0000				
SMB	-0.2153	1.0000			
SMB δ	-0.0475	0.5791	1.0000		
HML δ	0.5596	-0.2714	0.0362	1.0000	
OSEBX	0.0139	-0.2465	-0.5233	-0.2380	1.0000

Ødegaard (2015a) has constructed similar factors for the Oslo Stock Exchange. However, these factors are not available after June 2012¹⁰. Johnsen (2011) argues that the Fama-French factors for the Norwegian market is unstable due to the small size of the Oslo Stock Exchange and the concentration on a few sectors. He finds that different methodologies of constructing the same factor could give negatively correlated results. From the table above, we can see that the correlations between our Fama-French factors and those made by Ødegaard are 0.5596 and 0.5791 for the HML and SMB factors respectively. As we use the same methodology as Ødegaard and only the screening criteria differ to some extent, it seems like the Fama-French factors are not very stable in Norway. This may affect the robustness of the estimated Fama-French alphas.

3.5 Multiples

As argued in section 2.6, a key issue for a sound relative valuation is to find peers with similar key value drivers (e.g. tax rate, return on capital, cost of capital and long-term growth). We assume that domestic companies in the same industry have similar tax rates and cost of capital. Thus, we wanted to base our relative valuation on companies in the same industry. However, we did not manage to find a narrow industry-classification on Bloomberg. Therefore, we based the relative valuation on all the companies on the Oslo Stock Exchange. We believe that this

¹⁰ Ødegaard has now updated his Fama-French factors, making values for 2012, 2013 and 2014 available.

approach reduces the quality of our analysis. However, the approach is in line with Fama & French (1992a, 1993, 1996, 1998) and Gray & Vogel (2012).

We also argued that you should base the relative valuation on cyclically adjusted accounting variables. Cyclically adjusted accounting variables are often calculated as a five or ten-year average. Thus, you will lose observations for all companies with less than five or ten years of data using this approach. Due to an already small sample size, we chose to use unadjusted accounting variables. We believe that this is another point that reduces the quality of our analysis. However, using unadjusted accounting variables is also in line with Fama & French (1992a, 1993, 1996, 1998) and Gray & Vogel (2012).

As Fama & French (1992a) and most articles on the topic (see also (Gray & Vogel, 2012)), we match accounting data for year $t-1$ used in the multiples with the monthly returns from July year t to June year $t+1$. *“The 6-month (minimum) gap between fiscal’s yearend and the return tests is conservative. Firms are indeed required to file their 10-K reports with the SEC within 90 days of their fiscal year ends, but on average 19.8% do not comply. In addition more than 40% of the December fiscal year ends firms that do comply with the 90 day rule file on March 31, and their reports are not made public until April.”* (Fama & French, 1992a). In Norway, firms listed on the Oslo Stock Exchange must publish their annual report within 4 months after the fiscal year end cf. Verdipapirhandeloven § 5-5 first paragraph, second and third sentence.

Unlike Fama & French (1992a, 1993, 1996, 1998), we use the market values at the end of June year t in the multiples instead of the market values at the end of December year $t-1$. We believe that updated market values from June year t will be better predictors of returns from July year t to June year $t+1$ than outdated market values from December year $t-1$. For example, if the share price of a company with a low P/B at the end of December year $t-1$ increases with 100% from December year $t-1$ to June year t , we believe that it is less likely that the company is undervalued in June year t . The use of updated market values is in line with Gray & Vogel (2012) and earlier master theses on the subject in Norway (cf. (Engeberg & Enge, 2009)). Regarding the accounting variables for year $t-1$, we do not assume that they are available before the end of June year t . Ødegaard (2015a) does the same when he creates his Fama-French factors for the Norwegian stock market. Earlier theses done by students in Norway differ in their assumptions, but they all assume that the accounting variables for year $t-1$ are published sometime between the start of April year t to the start of July year t .

For the multiples used in the Fama-MacBeth analysis, we also match accounting variables for year $t-1$ with the returns from July year t to June year $t+1$, but we update the market values each month. As mentioned above, we believe that updated market values will be better predictors of future returns than market values that are outdated.

$$\text{Portfolio multiple} = \frac{\text{Market value}_{\text{June year } t}}{\text{Accounting variable}_{\text{year } t-1}}$$

$$\text{Fama MacBeth multiple} = \frac{\text{Market value}_{\text{start of the month}}}{\text{Accounting variable}_{\text{year } t-1}}$$

4. Method

4.1 Overview

We use two approaches in order to answer our research question. The first was introduced by Fama-MacBeth in 1973, while the second is a portfolio formation approach. As explained below, both the portfolio and Fama-MacBeth approach has some weaknesses. However, by using both we believe that our results become more robust.

We use the Fama-MacBeth method because it works well for answering our basic research question. That is, whether there exist a relationship between multiples and future abnormal returns. Contrary to the portfolio approach, we can change the multiples each month (at least the market values). We believe that this will make a possible relationship between the multiples and future abnormal returns clearer. Stocks performing exceptionally well (bad) will go from being a low (high) multiple stock to a high (low) multiple stock. Using the portfolio approach, stocks are considered as a low (high) multiple stocks until rebalancing 12 months later, no matter how they perform. Another advantage with the Fama-MacBeth approach is that it utilizes information about the relationship between pricing multiples and abnormal returns for *individual* stocks. Using the portfolio approach, you will only register if the *portfolio* composed of stocks with low multiples yields higher/lower abnormal returns than the other *portfolios*. You will not register if stocks with lower multiples yield higher/lower abnormal returns than stocks with higher multiples *within* the low multiple portfolio.

However, the Fama-Macbeth approach has its weaknesses as stated by Novy-Marx:”*These regressions, because they weight each observation equally, put tremendous weight on the nano- and micro-cap stocks, which make up roughly two-thirds of the market by name but less than 6% of the market by capitalization. The Fama-MacBeth regressions are also sensitive to outliers, and impose a potentially misspecified parametric relation between the variables, making the economic significance of the results difficult to judge*” (Marx, 2010).

The main advantage of the portfolio approach is that it is replicable in the real world. For Sparebanken Vest and other practitioners, it is more interesting to know whether a possible relationship can be exploited than if it exists. Hence, our focus will be on the portfolio approach. As Basu (1977), Fama & French (1993) and Gray & Vogel (2012), we sort stocks into portfolios and examine whether value stocks (low multiples) give positive abnormal

returns and/or outperform growth stocks (high multiples). The portfolio approach using value-weighted returns solves the weighting issue as it puts a higher weight on big stocks. Contrary to the Fama-MacBeth approach, the portfolio approach will be able to distinguish multiples ability to predict positive and negative abnormal returns. Some multiples may only be good at identifying undervalued stocks.

4.2 Fama-MacBeth

Fama-MacBeth description

The Fama-MacBeth method combines a cross section regression with a time series regression. The approach is used to investigate whether certain factors (e.g. systematic risk) are prized on the stock market. In other words, the approach investigates if certain factors can explain the cross section of returns. First, we run the following regression:

$$r_i - r_f = \alpha + \beta_1 \text{CAPMbeta}_i + \beta_2 \log(\text{Multiple}_i) + \epsilon_i.$$

Each month the excess return for firm i is regressed against the CAPM beta¹¹ of the firm and the value of a multiple. Then, the coefficients are added across time and the standard errors are calculated.

As Novy-Marx (2010) and Fama & French (1992a), we do the analysis on individual securities rather than portfolios as first done by Fama-MacBeth (1973). We take the log of all the multiples. Then, a one percent increase in the value of the multiple is estimated to increase the excess return with approximately $\frac{\beta}{100}$ %. Earlier research shows that use of the logarithmic transformation reduces the skewedness and kurtosis of the data sample. Hence, the distribution becomes more symmetric and improves inference (Wilcoxon, 1999). All multiples and betas are winsorized at the 1% and 99% levels, meaning that the extreme multiple values are replaced with those from the 1st and 99th percentiles. We do this to avoid putting too much weight on outliers.

¹¹ We retrieved the CAPM beta from Bloomberg

Fama-MacBeth analysis

We will now go through what results we expect in the Fama-MacBeth analysis. That is, what kind of sign of we believe that the coefficients will have. Our hypothesis are summarized in the table below.

Table 6: Hypotheses Fama-MacBeth

Acronym	Description	Hypothesis - coefficient
Beta	log of CAPM Beta	+
ln(EV/EBITDA)	log of enterprise value-to-EBITDA	-
ln(EV/EBIT)	log of enterprise value-to-EBIT	-
ln(EV/FCFF)	log of enterprise value-to-FCFF	-
ln(P/E)	log of price-to-earnings	-
ln(P/FCFE)	log of market cap-to-FCFE	-
ln(P/B)	log of price-to-book	-

In the theory section, we showed that the excess return for a company should be the product of the company's beta and the excess market return. As the excess market return on average is positive (Døskeland, 2014), we expect the relationship between the company's beta and the company's excess return to be positive. Thus, based on the theory we believe that the CAPM beta coefficient should be positive.

Holding the beta constant, we expect the excess return to increase when the multiple decreases. If stocks with low multiples are undervalued, they should yield higher returns than stocks with high multiples in both increasing and decreasing markets. Thus, we believe that the multiple coefficients should be negative.

4.3 Portfolios

Portfolio description

At the end of June each year, stocks are sorted into tertiles (three equally large groups) based on the value of a multiple. We rank and sort stocks based on the value of EV/EBITDA, EV/EBIT, EV/FCFF, P/E, P/FCFE and P/B. This approach yields six different sets of portfolios. For P/E for instance, the high multiple portfolio contains stocks with a high P/E value, the medium multiple portfolio contains stocks with a medium P/E value, and the low multiple portfolio contains stocks with a low P/E value. Each June, the portfolios are rebalanced and the sample of stocks included in each portfolio is changed.

After the portfolio formation, the returns for the following 12 months (July year t to June year $t+1$) are calculated. Both equally weighted and value-weighted returns are computed. We use a buy and hold strategy, meaning that the portfolios are not rebalanced during the 12-month period. Further, we assume that all dividends are reinvested into the stocks. Stocks that are delisted due to a merger, bankruptcy or any other reason during the 12-month period get zero return after delisting.

Our focus will be on the value-weighted portfolios¹². Big investors like Sparebanken Vest cannot invest the same amount in every stock on the Oslo Stock Exchange. If a big investor were to invest a large amount in a company with a very small market capitalization, he would have pushed the demand for the stock far above the supply. This would push the average buying price far above its current price. However, if the big investor were to invest a large amount in a company with a very large market capitalization, he would not have a large effect on the demand. Then, he would not have a large effect on the average buying price. For small investors, it may be more realistic to invest equally in all stocks, as they do not have a large impact on the demand of the stock. Therefore, the equally weighted portfolios¹³ will also be considered when we make our conclusion. Fama & French (1992a, 1993, 1996, 1998) and Novy-Marx (2010) use value-weighted returns.

We chose to sort the portfolios into tertiles¹⁴, because we want the portfolios to be well diversified. According to Ødegaard (2015c), portfolios are well diversified when the number of stocks in each portfolio is higher than 20. However, even five stocks in each portfolio removes much of the idiosyncratic risk. In Table 3, you will find an overview of the number of stocks in each portfolio each year. The lowest number of stocks in a portfolio is five, while the highest number of stocks in a portfolio is 59. An alternative could be to sort the stocks into quartiles¹⁵ or quintiles¹⁶. The problem would be fewer stocks in each portfolio and more idiosyncratic risk, creating problems with inference.

¹² Value weighted portfolio = weight each stock according to its market capitalization at the date of portfolio formation.

¹³ Equally weighted portfolio = all stocks have the same weight at the date of portfolio formation.

¹⁴ Tertiles = three groups

¹⁵ Quartiles = four groups

¹⁶ Quintiles = five groups

In addition to the three portfolios created for each multiple, we create a fourth portfolio for each multiple which we call long-short. In the fourth portfolio, we buy (long) the low multiple portfolio and sell (short) the high multiple portfolio. This portfolio will show whether value stocks outperform growth stocks.

Portfolio analysis

We analyse the performance of the portfolios by examining the CAPM and Fama-French abnormal returns. The CAPM abnormal returns are estimated running the following regression:

$$r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \epsilon_t$$

The excess return for each portfolio in month t is regressed against the market premium (the market return ($r_{m,t}$) less the risk-free rate ($r_{f,t}$)). β_1 gives the portfolio's exposure to the market. If the beta is equal to one, the portfolio has the same systematic risk as the market. α gives the average monthly *CAPM abnormal return* and is often called Jensen's alpha (Jensen, 1967). Since the average return is the best predictor of future return, it is the expected CAPM abnormal return. If the alpha is statistically greater than zero, the portfolio yielded a higher risk adjusted return than the market.

The Fama-French abnormal returns are estimated running the following regression:

$$r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$$

The excess return for each portfolio in month t is regressed against the market premium (the market return less the risk-free rate), the HML¹⁷ factor and the SMB¹⁸ factor. β_1 is still the portfolio's exposure to the market, β_2 is the portfolio's exposure to the HML factor and β_3 is the portfolio's exposure to the SMB factor. All else equal, a lower P/B ratio (load positive on HML) or a smaller firm size (load positive on SMB) increases the risk of the firm and hence the required return according to the Fama-French model. If the HML and SMB factors are positive, portfolios consisting of small stocks with low P/B ratios need much higher returns

¹⁷ HML = the excess returns of high book-to-market stocks minus low book-to-market stocks

¹⁸ SMB = the excess returns of small firms minus big firms

than portfolios consisting of big stocks with high P/B ratios in order to yield positive abnormal returns (α).

As Fama & French points out, portfolio evaluation is easy if you believe in their three-factor model. *“If our results are taken at face value, evaluating performance of a managed portfolio is straightforward. The intercept (α) in the time-series regression of the managed portfolio’s excess return on our five explanatory returns (three if the portfolio consist of only stocks) is the average abnormal return needed to judge whether a manager can beat the market, that is, whether he can use special information to generate average returns greater than those on passive combinations of the mimicking returns for the five risk factors (market, SMB and HML + Def and Term for bonds).”* (Fama & French, 1993).

Table 7: Sign and size of alpha for low multiple and long-short portfolios

Multiples and size/sign of alpha						
	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM alpha	+	+	+	+	+	+
Fama-French alpha	+	+	+	~	+	~

The table above shows our expectations of the alphas (abnormal returns) for the low and long-short portfolios. As we mentioned in section 2.10, we expect the EV/EBITDA, EV/EBIT and EV/FCFF multiples to be the best predictors of abnormal returns, and hence produce the highest alphas. We expect the P/E, P/FCFE and P/B multiples to yield somewhat weaker predictions of abnormal returns. The signs are positive, because we expect value stocks to outperform growth stocks and the market.

By using the Fama-French factors to correct for risk, we are implicitly assuming that low P/B firms are riskier than high P/B firms (as we control for the HML factor). Therefore, we will most likely not get significant Fama-French alphas for the low P/B portfolio. We do not expect the low P/E portfolio to produce significant Fama-French alphas either, because Fama & French (1992a) show that the returns of low P/B stocks and low P/E stocks are highly correlated.

As mentioned earlier, Fama & French (2011) believe that it does not matter which multiple you use to represent the risk associated with value stocks. Hence, they claim that all CAPM abnormal returns associated with value stocks should disappear if you correct for risk using the Fama-French model. On the other hand, Gray & Vogel (2012) show that multiples' ability to predict returns vary quite much between the different multiples. They get significant Fama-French alphas for several multiples. We believe it is valuable to correct for risk by using Fama-French model. It will show if the other multiples can give abnormal returns beyond the well-documented value premium of low P/B stocks.

We would like to point out that a positive CAPM or Fama-French alpha is not the equivalent of a "true" positive abnormal return. The positive alphas may be a result of exposure to other risk factors (not controlled for by the CAPM or Fama-French model). However, by using both the CAPM and the Fama-French model, we believe that our results are more robust against a possible misspecification.

4.4 How we make our conclusion

We evaluate the following requirements when we make our conclusion:

1. Statistically significant negative coefficient on the multiple using the Fama-MacBeth approach.
2. The long-short portfolio yields statistically significant positive CAPM alpha.
3. The low multiple portfolio yields statistically significant positive CAPM alpha.
4. The long-short portfolio yields statistically significant positive Fama-French alpha.
5. The low multiple portfolio yields statistically significant positive Fama-French alpha.

We consider multiples satisfying requirement 1 through 3 to predict CAPM abnormal returns. We consider multiples satisfying requirement 4 and 5 to predict Fama-French abnormal returns. An opposite relationship of the ones described in requirement 1 through 5 (reversed signs) would be surprising and must be evaluated with caution, as we hardly find any theoretical or empirical support for such a relationship.

4.5 Regression assumptions

In this thesis, we conduct several regressions analysis. We will now go through the necessary assumptions for large sample time series regressions.

1. The model is linear in parameters (Wooldridge, 2013). Both the CAPM and the Fama-French regressions are linear in parameters. In addition, the independent and dependent variables should be stationary and weakly dependent (Wooldridge, 2013). Monthly returns fluctuate a lot from month to month. This indicates that monthly returns are weakly dependent and stationary. As we can see from the table below, the correlation between the return in month t and month $t-1$ is almost zero.

Table 8: Weakly dependent?

	Totalr~n	lagTot~n
Totalreturn	1.0000	
lagTotalre~n	0.0115	1.0000

In addition, if we run a Dickey Fuller test on the return of OSEBX, we find that we can reject the null hypothesis that the return of OSEBX exhibits unit root at all reasonable significance levels (see Table 24). As expected, neither the return of OSEBX nor the return of the individual stocks show any sign of unit root. Assumption 1 seems to be satisfied.

2. There is no perfect collinearity among the explanatory variables (Wooldridge, 2013). The HML and SMB factor are created such that they are not very correlated with each other or the market, see Table 5. This assumption seems to be satisfied.
3. $E(u_t | x_{t1}, \dots, x_{tk}) = E(u_t) = 0$, where t is time t , u is the residual and x_k is the independent variable k . This assumption is called contemporaneous exogeneity assumption (Wooldridge, 2013). The independent variables should not be correlated with the residuals. If neither the CAPM nor the Fama-French model is the correct asset-pricing model, there could exist other risk factors (present in the residuals) that affect both the independent variables (market, HML and SMB) and the returns of the portfolios, resulting in biased estimates of the betas and violation of assumption 3. This is definitely a source of error in our thesis. By using both the CAPM and the Fama-French model, we believe that our results are more robust against a possible misspecification.

-
4. For all t , $var(u_t|X) = \sigma^2$, where σ^2 is the variance. This assumption is called the homoscedasticity assumption (Wooldridge, 2013). The variance cannot fluctuate over time or conditional on variables. In financial market, the variance may fluctuate over time. For instance under the financial crisis, the variance were much higher than normal. Therefore, we use robust standard errors in all our regressions and assume contemporaneous homoscedasticity: $var(u_t|x_t) = \sigma^2$.
 5. There should be no autocorrelation, $E(u_t, u_s|x_t, x_s) = 0$, for period s and t (Wooldridge, 2013). The residuals should not be correlated across time. We find no evidence of autocorrelation in the portfolio regressions (see Table 25 in the appendix). We cannot reject the null hypothesis that there is no autocorrelation at any reasonable significance level.

Under the assumptions 1 through 5, the OLS estimators are approximately normally distributed as the number of observations goes to infinity. In addition to this, the t-statistics are asymptotic standard normal and the F statistics are valid in large samples. The usual OLS confidence intervals are also valid (Wooldridge, 2013). As discussed above, we find no clear evidence that the regression assumptions are violated.

For the Fama-MacBeth analysis, we use Newey-West standard errors as Novy-Marx (2010), to correct for autocorrelation. We use 12 lags to correct for autocorrelation. We also tested the Fama-MacBeth regressions with two lags and with no correction for autocorrelation. This did not change our results very much (see Table 26 for the Fama-MacBeth analysis with no correction for autocorrelation).

5. Results

5.1 Fama-MacBeth

In the table below, we present the regression output from the Fama-MacBeth approach. The excess returns for each stock is regressed against the CAPM beta and the value of a pricing multiple, before the coefficients are averaged across time. Thus, if the coefficient of the pricing multiple is significant, we conclude that the pricing multiple predicts CAPM abnormal returns.

Table 9: Fama-MacBeth 2000-2015

2000-2015	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf
Beta	0.0961 (0.520)	-0.122 (0.578)	-0.302 (0.538)	-0.334 (0.527)	-0.978* (0.588)	-0.440 (0.405)
Log(EV/EVEBITDA)	-0.433** (0.205)					
Log(EV/EVEBIT)		-0.561*** (0.160)				
Log(EVFCFF)			-0.281* (0.166)			
Log (P/E)				0.120 (0.144)		
Log (P/FCFE)					0.0265 (0.125)	
Log (P/B)						0.229 (0.245)
Constant	1.312 (0.852)	2.084*** (0.639)	1.842** (0.801)	0.596 (0.683)	1.401* (0.821)	0.816 (0.716)
Observations	16042	13942	5941	13970	8982	22944
R-squared	0.051	0.054	0.087	0.053	0.073	0.049

The cross section of excess monthly returns measured in percentage terms is regressed against the beta of the stock and the multiple, before the coefficients are averaged. Only stocks that have a positive multiple and have been traded for two years are included in the sample. The return is measured from July year t to June year $t+1$, the accounting variable is from year $t-1$. The market cap and the enterprise value used in the multiples are from start of the month. * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. Standard errors are in the parentheses.

According to the CAPM theory, the betas should explain most of the variation in the cross section of equity returns. However, only one of the coefficients of the CAPM betas are significant at any reasonable significance level. The coefficients also have the wrong sign¹⁹. Thus, like the majority of empirical studies, we do not find any support for the CAPM theory (cf. (Fama & French, 1992a)).

We expected stocks with low multiples to outperform stocks with high multiples. Increased value of the multiple should therefore result in decreased returns. Thus, we expected the coefficient on the multiples to be negative. From the regression output above, we notice that the coefficient on EV/EBITDA, EV/EBIT and EV/FCFF is negative and significantly different from zero. An increase of 100% in the EV/EBIT multiple is estimated to decrease the average excess return by approximately 0.561% per month, holding the beta risk constant. This is statistically significant even at a significance level of 1%. With an average EV/EBIT multiple of 21.3 and a standard deviation of 17.9, a difference of 100% in the EV/EBIT multiple between two companies is not unusual. The coefficient of EV/EBITDA is significant at the 5% significance level, while the coefficient of EV/FCFF is significant at the 10% level.

Neither P/E, P/FCFE nor P/B have significant coefficients. The coefficients also have the wrong sign. These results are very surprising. Almost all studies find a negative relationship between the excess return of a stock and the value of P/E and P/B (cf. Fama-French (1992a)). We will investigate these finding further under the portfolio approach.

5.2 Portfolios

In this section, we present our main findings using the portfolio approach. In section 5.3, we discuss our findings. Ex ante, we believed that the long-short portfolios and the low multiple portfolios would yield statistically significant *positive* abnormal returns. We will focus on the alphas from the regressions since they show whether you achieve abnormal returns or not. A positive alpha represents positive abnormal return, while a negative alpha represents negative abnormal return. First, we present the results for the whole period, before we examine the sub-periods. As mentioned earlier, the value-weighted portfolios will be our main focus. A

¹⁹ In the theory section, we showed that the excess return of a stock should be positively related to the CAPM beta when the excess market return is positive (as it was in the period 2000-2015).

discussion of the gross returns and r-squared can be found in the appendix (section 11.8 and 11.9). All the tables in this section show the CAPM and Fama-French alphas for the equally weighted and value-weighted portfolios.

Table 10: Alphas 2000-2015

2000-2015							
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	0.158	0.174	0.760**	0.247	0.307	-0.136
	Medium	0.200	0.146	0.250	-0.116	0.109	0.133
	High	-0.461*	-0.385	0.162	-0.113	0.0469	-0.125
	Long-short	0.619	0.559	0.598	0.360	0.260	-0.0110
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	0.130	0.143	0.685**	0.169	0.255	-0.319
	Medium	0.180	0.161	0.269	-0.0887	0.176	0.119
	High	-0.448*	-0.370	0.194	-0.0926	0.0403	-0.0363
	Long-short	0.577	0.513	0.491	0.262	0.215	-0.283
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	0.154	0.262	0.701***	0.0618	0.0993	-0.0363
	Medium	-0.0337	-0.0160	0.340	-0.0490	0.251	0.0266
	High	-0.0690	-0.0337	-0.0385	0.222	-0.102	-0.138
	Long-short	0.223	0.295	0.740**	-0.160	0.201	0.102
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	0.0714	0.218	0.695***	-0.0280	0.0642	-0.234
	Medium	-0.0589	-0.0567	0.334	-0.0470	0.274	0.0243
	High	-0.0953	-0.0549	-0.0333	0.225	-0.144	-0.0239
	Long-short	0.167	0.273	0.728**	-0.253	0.208	-0.210

The regressions $r_t - r_{f,t} = \alpha + \beta_1(r_m - r_{f,t}) + \epsilon_t$ and $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ are run for each portfolio and the alphas are collected. All variables are measured in percentage terms. There are 172 monthly observation between 2000 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicates that the portfolio yields positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

From the table above, we notice that both asset-pricing models give similar results. Calculating equally or value-weighted returns do not make much difference either. The portfolio consisting of low EV/FCFF stocks is the only low multiple portfolio that has yielded a significant positive alpha over the whole period. For the value-weighted portfolios, buying low EV/FCFF firms has yielded a significant positive CAPM alpha of 0.76% per month. The monthly abnormal return of 0.76% translates into an impressive annual abnormal return of 9.12%, significant at the 5% level. Correcting for risk using the Fama-French model reduces the alpha to 0.685% per month, but it is still significant at the 5% level. As expected, we find no evidence indicating that higher multiples increase the abnormal returns.

We notice that the long-short strategy using EV/FCFF only yields significant positive alphas for the equally weighted portfolios. This indicates that EV/FCFF is a better selection tool for small firms than big firms, which also makes sense intuitively. Small firms are less analysed and therefore more likely to be mispriced. As we control for the risk associated with small firms using the Fama-French factors, the positive Fama-French alpha cannot be explained by the higher risk associated with small firms.

The other multiples do not seem to predict CAPM or Fama-French alphas. These results are very surprising and contradicts all prior research we have read. Almost all studies find that the low P/E and low P/B portfolios yield positive CAPM alphas (cf. (Fama & French, 1992a), (S.Basu, 1977)). EV/EBITDA and EV/EBIT have also shown the ability to predict Fama-French alphas (cf. (Gray & Vogel, 2012), (Loughran & Wellman, 2011)). In search of an explanation of these surprising results, we divided the whole period (2000-2015) into two sub-periods, one period before the start of the financial crisis in 2008 and one period after.

Table 11: Alphas 2000-2008

2000-2008							
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	0.622**	0.657*	1.096**	0.636*	0.843*	0.0467
	Medium	-0.0579	0.0163	0.320	0.0482	0.0330	0.473*
	High	-0.511	-0.580	0.127	-0.602	-0.262	-0.237
	Long-short	1.133*	1.237*	0.969	1.238	1.104	0.283
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	0.375	0.420	0.826*	0.401	0.603	-0.481
	Medium	-0.0682	-0.0421	0.248	0.0652	0.154	0.370
	High	-0.356	-0.317	-0.0281	-0.603	0.0404	0.149
	Long-short	0.731	0.736	0.854	1.004	0.563	-0.630
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	0.759**	0.612**	0.742**	0.649**	0.566	0.620
	Medium	0.00775	-0.0386	0.439	0.0434	0.277	0.140
	High	-0.300	-0.302	-0.0676	-0.177	0.0226	-0.545
	Long-short	1.059**	0.914**	0.809**	0.826**	0.544	1.165***
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	0.401	0.431*	0.678*	0.301	0.417	-0.0640
	Medium	-0.0760	-0.312	0.315	0.0521	0.276	0.121
	High	-0.272	-0.185	-0.00174	-0.321	-0.125	-0.214
	Long-short	0.673	0.616	0.680	0.622*	0.543	0.150

The regressions $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \epsilon_t$ and $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ are run for each portfolio and the alphas are collected. All variables are measured in percentage terms. There are 92 monthly observation between 2000 and 2008. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicates that the portfolio yields positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

In the period before the start of the financial crisis (2000-2008), our results are almost exactly as expected and more in line with prior studies. In this period, a lower multiple was associated with higher abnormal returns. Among the low multiple portfolios, EV/EBITDA, EV/EBIT, EV/FCFF and P/E seem to predict significant positive CAPM alphas. Low P/FCFE and low P/B perform weaker than expected. Low P/FCFE only yields a positive CAPM alpha for the value-weighted portfolio, while low P/B does not yield any significant CAPM alphas.

Using the long-short strategy, EV/EBITDA and EV/EBIT is the best performing portfolios, yielding significant positive CAPM alphas for both the equally and value-weighted portfolios. The long-short strategy using EV/FCFF, P/E and P/B only yields positive CAPM alphas for the equally weighted portfolios, while the long-short P/FCFE portfolio does not yield any significant CAPM alphas.

We notice that most of the CAPM abnormal returns disappear when correcting for risk using the Fama-French three-factor model. Only the low EV/FCFF portfolio yields significant positive Fama-French alphas for both the equally weighted and value-weighted portfolios. In the theory section, we explained that Fama & French (1992a) believe that value stocks are riskier than other stocks. In Table 27 in the appendix, we show that all of the low multiple portfolios include an overweight of low P/B stocks as they load positive on the HML factor between 2000 and 2008. Hence, according to the Fama-French model, stocks included in the low multiple portfolios are riskier than other stocks. Therefore, they should yield higher returns to compensate investors for the increased risk. Adjusting for risk however, there should be no difference. This holds for all the low multiple portfolios investigated in our thesis, except from the low EV/FCFF portfolio.

Table 12: Alphas 2008-2015

2008-2015							
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	-0.381	-0.406	0.464	-0.156	-0.324	-0.357
	Medium	0.487*	0.293	0.164	-0.330	0.160	-0.244
	High	-0.425	-0.144	0.204	0.422	0.455	-0.0239
	Long-short	0.0438	-0.263	0.260	-0.578	-0.779	-0.333
Method	Value-weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	-0.449*	-0.467*	0.482	-0.147	-0.248	-0.0427
	Medium	0.567**	0.246	0.0943	-0.362	0.0663	-0.279
	High	-0.351	-0.0520	0.0316	0.510	0.519	-0.103
	Long-short	-0.0982	-0.415	0.450	-0.657	-0.767	0.0605
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
CAPM	Low	-0.565	-0.149	0.626*	-0.600*	-0.468	-0.825
	Medium	-0.106	-0.0304	0.209	-0.193	0.188	-0.131
	High	0.177	0.274	-0.0184	0.674*	-0.261	0.271
	Long-short	-0.742	-0.422	0.645	-1.274***	-0.207	-1.096*
Method	Equally weighted	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Fama-French	Low	-0.359	-0.00574	0.735**	-0.418	-0.277	-0.332
	Medium	0.0597	0.0909	0.236	-0.0808	0.270	0.0335
	High	0.441	0.577	0.0988	0.806***	-0.150	0.312
	Long-short	-0.800	-0.583	0.637	-1.224***	-0.126	-0.644

The regressions $r_t - r_{f,t} = \alpha + \beta_1(r_m - r_{f,t}) + \epsilon_t$ and $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ are run for each portfolio and the alphas are collected. All variables are measured in percentage terms. There are 80 monthly observation between 2008 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicates that the portfolio yields positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

In the period after the start of the financial crisis (2008-2015), none of the multiples seems to predict CAPM and/or Fama-French abnormal returns. Only the EV/FCFF multiple comes close, yielding significant positive CAPM and Fama-French alphas for the equally weighted low multiple portfolio. In general, the high multiple portfolios performed a bit better than the low multiple portfolios in this period. Thus, the surprising results for the whole period seem to stem from the period after the start of the financial crisis.

We notice that most of the low multiple portfolios have negative risk adjusted returns, even after controlling for the exposure to the Fama-French factors. Hence, the poor performance of the low multiple portfolios cannot be explained solely by the HML and SMB factors.

5.3 Theory vs. results

Answer to research question

Our research question is “*Do pricing multiples predict abnormal returns for stocks on the Oslo Stock Exchange?*” In order to answer our research question, we evaluate the following requirements:

1. Statistically significant negative coefficient on the multiple using the Fama-MacBeth approach.
2. The long-short portfolio yields statistically significant positive CAPM alpha.
3. The low multiple portfolio yields statistically significant positive CAPM alpha.
4. The long-short portfolio yields statistically significant positive Fama-French alpha.
5. The low multiple portfolio yields statistically significant positive Fama-French alpha.

We consider multiples satisfying requirement 1 through 3 to predict CAPM abnormal returns. We consider multiples satisfying requirement 4 and 5 to predict Fama-French abnormal returns. The table below summarizes our results. Below we only show whether value stocks have outperformed the market and growth stocks and not the other way around. This is in line with our hypothesis. Moreover, we did not find evidence indicating that growth stocks outperformed value stocks during the entire period. Thus, it was no point of showing a table for such a relationship.

Table 13: Theory vs. Results 2000-2015

Do pricing multiples predict future abnormal returns on the Oslo Stock Exchange?							
Approach	Portfolio	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Theoretical conclusion		✓	✓	✓	✓	✓	✓
Negative Fama-MacBeth coefficient?		✓	✓	✓	✗	✗	✗
Positive CAPM alpha for the long-short portfolio?	Value-weighted	✗	✗	✗	✗	✗	✗
	Equal-weighted	✗	✗	✓	✗	✗	✗
Positive CAPM alpha for the low multiple portfolio?	Value-weighted	✗	✗	✓	✗	✗	✗
	Equal-weighted	✗	✗	✓	✗	✗	✗
Positive Fama-French alpha for the long-short portfolio?	Value-weighted	✗	✗	✗	✗	✗	✗
	Equal-weighted	✗	✗	✓	✗	✗	✗
Positive Fama-French alpha for the low multiple portfolio?	Value-weighted	✗	✗	✓	✗	✗	✗
	Equal-weighted	✗	✗	✓	✗	✗	✗

In the theory part, we concluded that all multiples should be able to predict abnormal returns, at least when using the CAPM. We believed that EV/EBIT would be the best selection tool, followed by EV/EBITDA and EV/FCFF.

Based on the Fama-MacBeth approach, our expectations were in line with the realized results. The coefficients on the EV/EBIT, EV/EBITDA and EV/FCFF multiples were negative and statistically significant. However, none of the other multiples had statistically significant coefficients.

Using the portfolio approach, our expectations were far from the realized results. Only the EV/FCFF multiple seems to predict CAPM and/or Fama-French abnormal returns. A lower EV/FCFF multiple was associated with higher abnormal returns. During the whole period, EV/FCFF satisfies seven out of our nine criteria. We especially want to highlight the equally weighted EV/FCFF portfolio. The equally weighted EV/FCFF portfolio satisfies four out of the four portfolio criteria. As the Fama-MacBeth approach also is based on equally weighted returns, the equally weighted EV/FCFF multiple satisfies five out of the five criteria. According to the CAPM and Fama-French model, low EV/FCFF firms are undervalued while high EV/FCFF firms are relatively overvalued. *None* of the other multiples seems to predict CAPM and/or Fama-French abnormal returns. We notice that our conclusion is the same whether we estimate the abnormal returns using the CAPM or the Fama-French model. EV/FCFF is the only multiple satisfying requirement 1 through 3 and/or requirement 4 and 5.

The Fama-MacBeth approach on the individual stocks and the portfolio approach did not give similar results for EV/EBITDA and EV/EBIT. One explanation is that the Fama-MacBeth approach is too sensitive to outliers and extreme observations for these multiples, as explained by Novy Marx (2013). A second explanation is that we update the multiples every month in the Fama-MacBeth approach, while we only update the multiples once every year in the portfolio approach. Another explanation is that sorting stocks into three portfolios was not enough to capture the difference between growth and value stocks. Nevertheless, in the robustness section we change the sorting to 20-60-20 portfolios²⁰ without major differences in

²⁰ We sort the stocks with the 20 percent lowest pricing multiples in one portfolio (low), the stocks with the 20 percent highest pricing multiples in another portfolio (high) and the remaining 60 percent of the stocks in a third portfolio (medium).

the results. As the Fama-MacBeth and portfolio approach yield different results, we do not find the relationship strong enough to conclude that EV/EBIT and EV/EBITDA predict CAPM abnormal returns.

Our results are quite astonishing. It is an established truth in finance that value stocks (e.g. low P/B) provide positive CAPM abnormal returns. Most of the academic community use an asset-pricing model based on this notion. If this turns out to be a spurious relationship, it will have great implications for portfolio managers following a strategy of buying stocks with low multiples (value stocks). It will also have great implications for researchers and practitioners using the Fama-French three-factor model to estimate the cost of capital.

Volatility of accounting variables

In the theory section, we argued that you should use cyclically adjusted accounting variables in the denominator of the multiples. However, due to our small sample size, we decided to use unadjusted accounting variables. In the table below, we show the volatility of the unadjusted accounting variables:

Table 14: Volatility of accounting²¹ variables

	EBITDA	EBIT	FCFF	Net income	FCFE	Book value
Average(std/mean)	0.48	0.66	3.19	0.94	3.19	0.44
Rank	2	3	6	4	5	1

The table is constructed by dividing the standard deviation by the mean value of the accounting variable for each company. Then, we calculated the average of this measure for all companies

The table above is constructed by dividing the standard deviation by the mean of the accounting variable for each company. Then, we calculated the average of this measure for all companies. As expected, the book value has the lowest volatility, followed by EBITDA and EBIT. Net income has a lower volatility than we first believed. Both FCFF and FCFE are very volatile, as expected. Interestingly, the best performing multiple (EV/FCFF) has the most volatile accounting variable. An explanation could be that FCFF co-varies across firms. Then depressed and inflated FCFF happen at the same time across companies, making deviation from cyclical adjusted FCFF values less problematic. Firms may tend to invest at the same time, resulting in a highly volatile FCFF that co-varies across firms.

²¹ FCFF and FCFE are not accounting variables per se, but can be derived from the financial report.

6. Analysis

6.1 Overview

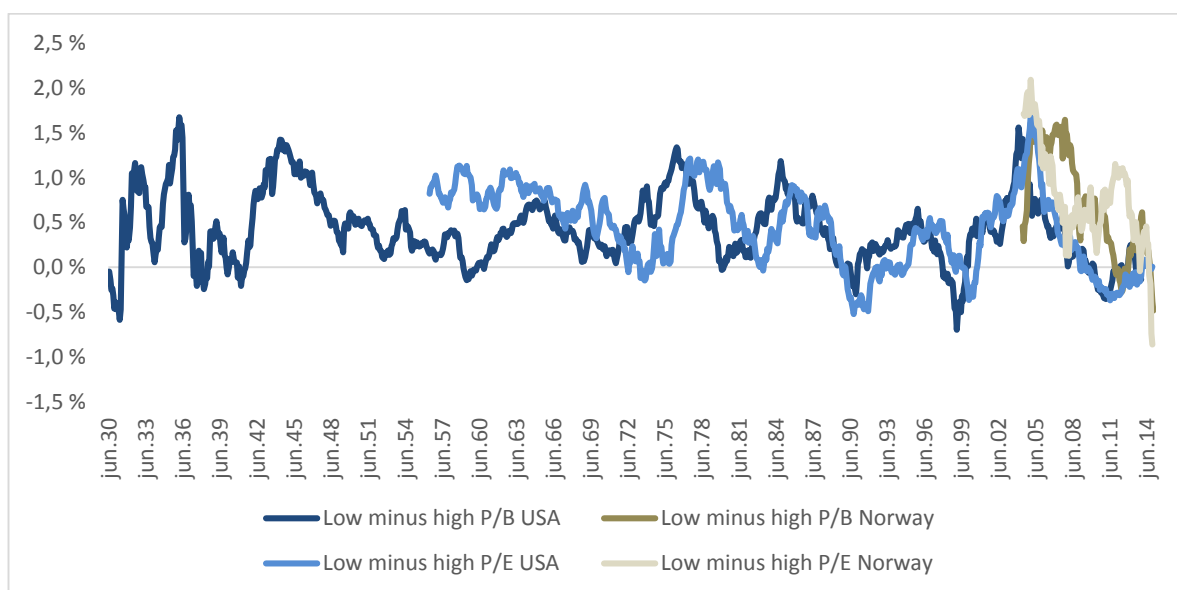
In this chapter, we try to investigate potential explanations of the surprising results during the last period (2008-2015). It is worth noting that not all of the low multiple portfolios started to perform poorly from 2008 and onwards. However, by looking at the cumulative return for the different portfolios (not shown in the thesis), the trend is clear. On average, the shift seems to occur in the period 2008-2015. We will also try to explain why the low EV/FCFF portfolio outperformed the other low multiple portfolios. In the appendix (see 11.11), we show evidence indicating that the introduction of IFRS have not changed the relationship between multiples and future returns.

6.2 Why did value firms fail?

Cyclical returns

One possible explanation of the surprising results is that value stocks have cyclical returns compared to growth stocks. Most of the time, they outperform growth stocks, but in some periods they underperform. Fama & French (1992a) argues that is the case. They claim that stocks with low multiples have higher risk and should therefore get a risk premium.

Figure 6: Cyclical returns



Above we show the 60 months trailing moving average return for a long-short strategy using P/E and P/B in USA and Norway. The graph illustrates that the relative return of value stocks compared to growth stocks seems to move in cycles. For our sample period (2000-2015), value stocks seem to have outperformed growth stocks in the period before the financial crisis. After the crisis in 2008 however, value stocks have performed poorly. The return of value stocks compared to growth stocks seems to follow the same pattern in Norway and USA. Hence, it may be the case that we are just “unlucky” with our sample period.

One question may arise. Why did we get negative alphas after controlling for the HML factor for all of the low multiple portfolios except from the low EV/FCFF portfolio? Should not the Fama-French factors take into account the bad performance of the value stocks compared to the growth stocks? A possible explanation may be that the return of value and growth stocks fluctuate differently for the different multiples, e.g. that the long-short EV/EBIT portfolio fluctuates differently than the long-short P/B portfolio.

Even though we have found that value stocks have cyclical returns compared to growth stocks, it does not explain the sudden change in the last sub-period (2008-2015). In the next sub-chapters, we try to outline possible explanations for this sudden change.

Financial crisis

Our last period (2008-2015) includes the financial crisis. If value stocks performed very poorly during the crisis, this would affect the results for the entire sub-period. However, the low EV/FCFF portfolio is the *only* low multiple portfolio that underperformed the market during the financial crisis with a return of -64% compared with the market return of -56%. Thus, the market crash in 2008 cannot explain the bad performance of the low multiple portfolios. These results are in line with Gray & Vogel (2012). They claim that value stocks outperform the market both in expansion and contraction periods “...we do find evidence that valuation-based strategies do outperform the market in both expanding and contracting economic environments” (Gray & Vogel, 2012).

The risk-free rate

One of the most striking characteristics of the period after the start of the financial crisis is the very low risk-free interest rates. According to the Bank of England, the current risk-free interest rate is the lowest in 5000 years (Ringholm, 2015). From the theory section, we remember that the CAPM estimate the cost of equity as:

$$k = r_f + \beta_i * [E(r_M) - r_f]$$

If we assume that the beta (β_i) and market risk premium $[E(r_M) - r_f]$ have stayed constant, the decrease in the risk-free interest rate (r_f) should result in a lower cost of equity (k). This may very well be the explanation for why value stocks have not outperformed growth stocks since the start of the financial crisis. Let us assume that the major difference between growth stocks and value stocks is that growth stocks have a higher growth rate²². Then, growth stocks will have a higher sensitivity to changes in the cost of equity. We will illustrate the impact of a lower cost of equity using the key value driver formula for equity:

$$P_0 = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1+k)^t} = \sum_{t=1}^{\infty} \frac{FCFE_1 * (1+g)^{t-1}}{(1+k)^t} = \frac{FCFE_1}{k-g} = \frac{EPS_1 * \left(1 - \frac{g}{RONE}\right)}{k-g}$$

Where P_0 is the fair share price, $FCFE_t$ is the free cash flow to equity year t , and EPS_t is the earnings per share year t . g is the long-term growth rate, $RONE$ is the return on new equity investments, and k is the cost of equity.

Consider two companies (*Growth* and *Value*) that are identical on all aspects except from one. Both companies have a beta of one, return on new equity investments (RONE) of 15% and earnings per share (EPS) of 10 dollars next year. The only difference is that *Growth*'s EPS will grow at a rate of 4% per year in perpetuity, while *Value*'s EPS will only grow at a rate of 1% per year in perpetuity. Let us assume that the market risk premium is 5% and that the long-term risk-free interest rate decreases from 5% to 3%²³. With a beta of one, the companies' cost of equity (k) will decrease from 10% to 8%. This will have the following implication for the fair price of the two companies:

Table 15: Effect of risk-free rate

Company	EPS(t+1)	Growth	RONE	Fair price (k = 10%)	Fair price (k = 8%)	Difference
<i>Growth</i>	10	4 %	15 %	122	183	50 %
<i>Value</i>	10	1 %	15 %	104	133	29 %
Difference	0	3 %	0 %	19	50	21 %

²² From the theory section, we know that higher growth rates translates into a higher fair multiple if the return on new equity investments is greater than the cost of equity.

²³ The yield on 10-year Norwegian government bonds decreased from 4.8% in May 2008 to 1.3% in January 2015

We notice that *Growth* will outperform *Value* by 21 percentage points when the long-term risk-free interest rate decreases from 5% to 3%. We can explain this outperformance with a concept from bond pricing called duration. Santos (2014) gives the following definition of duration: “The duration of a cash flow stream provides the “weighted-average” arrival time of cash flows, where the weight of time t is determined by the relative contribution of the present value of the cash flows obtained at time t to the total present value of all the cash flows”.

$$Duration = \sum_{t=1}^T t * \frac{\text{Present value } (FCFE_t)}{\text{Total present value}} = \frac{\sum_{t=1}^T \frac{t * FCFE_t}{(1+k)^t}}{\sum_{t=1}^T \frac{FCFE_t}{(1+k)^t}}$$

A higher duration translates into a higher sensitivity to changes in the discount rate (cost of equity). Because a relatively large portion of the FCFE for *Growth* arrives later than the FCFE for *Value*, *Growth* will have a higher duration and a higher sensitivity to changes in the cost of equity. Thus, the decrease in the long-term risk-free interest rate may explain why value stocks have not outperformed growth stocks since the start of the financial crisis. If this is the true explanation, the poor performance of value stocks is a one-time event.

As many different factors affect the CAPM beta (e.g. capital structure and GDP sensitivity), the interest rate risk is not entirely captured by the CAPM. For multiples that are highly correlated with P/B, the interest rate risk is controlled for using the HML factor. However, for multiples that are not highly correlated with P/B, the decrease in the risk-free interest rate may also explain the change in the Fama-French alphas.

In the example above, we assumed that only the cost of equity would change when the risk-free interest rate decreases. This may not be a realistic assumption. However, in the appendix (section 11.10) we argue that it is reasonable to assume that the long-term growth rate and return on new equity investments have stayed constant during this period.

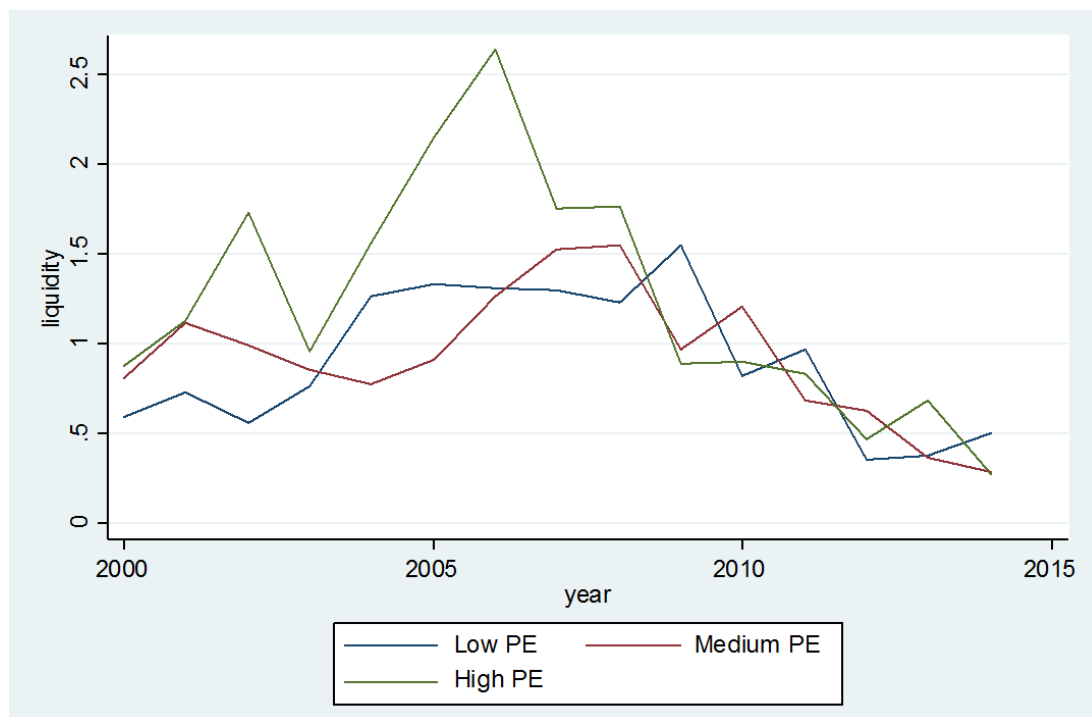
Based on the argumentation above, we believe that the decrease in the long-term risk-free interest rate offers the best explanation for why value stocks have performed poorly after the financial crisis. Holding all other variables constant growth stocks should outperform value stocks in this environment. This may have neutralized the “underlying” value premium and in some cases actually made growth stocks outperform value stocks.

Liquidity

“It is an established truth in finance that value stocks (low pricing) and small stocks (low market capitalization) provide excess return. The last few years, however, both factors failed, both at home and abroad.” (Bergh, 2012).

Finn Øystein Bergh (Chief Investment Officer at Pareto AS) claims that the bad performance of the value stocks is explained by lower liquidity. This has resulted in lower returns for value stocks over the last couple of years, but higher expected returns in the future as compensation for the decreased liquidity. We do not control for liquidity in either the CAPM or the Fama-French model. Thus, lower liquidity can explain the negative alphas for the low multiple portfolios. To get an overview of the liquidity of the portfolios, we computed liquidity as the total turnover²⁴ divided by the average market capitalization during a portfolio year (July year t to June year $t+1$).

Figure 7: Liquidity for P/E value-weighted portfolios



Liquidity is measured as: (sum turnover from July year to June year $t+1$)/(Average market cap from July year t to June year $t+1$) The liquidity for the portfolios is the value-weighted average of the liquidity of the firms.

²⁴ Turnover is the number stocks traded during a month multiplied with the price.

We can see that the liquidity fell drastically for all portfolios between 2008 and 2015. When liquidity falls, the liquidity premium increases and returns tend to be low. If Bergh's theory is correct, value stocks should have the greatest decline in liquidity. Bergh published his article in 2012. From the chart above, we notice that the liquidity dropped much for value stocks in the period 2008-2012²⁵. However, the difference in the decline between value stocks and growth stocks is only marginal. Thus, we believe that this is only part of the explanation.

6.3 Why did the low EV/FCFF portfolio perform best?

In this section, we try to investigate why the low EV/FCFF portfolio outperformed the other low multiple portfolios. In the table below, all value-weighted portfolios with annualized gross return higher than the market (OSEBX) are marked with green.

Table 16: Gross return for the value-weighted portfolios

09.2000-01.2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	8.7 %	8.8 %	16.1 %	9.7 %	10.1 %	4.9 %
Medium	9.3 %	8.2 %	9.8 %	5.2 %	8.0 %	8.7 %
High	0.9 %	1.7 %	8.3 %	4.7 %	6.6 %	5.2 %
OSEBX	7.4 %	7.4 %	7.4 %	7.4 %	7.4 %	7.4 %
09.2000-05.2008	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	18.7 %	19.2 %	24.4 %	19.0 %	21.7 %	11.8 %
Medium	9.8 %	10.1 %	14.2 %	11.1 %	10.8 %	17.5 %
High	4.6 %	3.2 %	12.0 %	2.5 %	6.2 %	7.4 %
OSEBX	11.6 %	11.6 %	11.6 %	11.6 %	11.6 %	11.6 %
05.2008-01.2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	-1.7 %	-2.0 %	7.2 %	-0.1 %	-1.9 %	-2.5 %
Medium	8.8 %	6.1 %	4.9 %	-1.2 %	4.8 %	-0.6 %
High	-3.3 %	0.0 %	4.2 %	7.3 %	7.1 %	2.7 %
OSEBX	2.8 %	2.8 %	2.8 %	2.8 %	2.8 %	2.8 %

The gross return is computed as the annualized geometric average return. All portfolios with annualized gross return higher than the market (OSEBX) are marked with green.

Notice that *all* EV/FCFF portfolios yielded higher gross returns than the market in both sub-periods. This illustrates that the companies with a valid EV/FCFF multiple are not a representative sample of the stocks on the Oslo Stock Exchange. The biased sample may explain why the low EV/FCFF portfolio outperformed the other low multiple portfolios. However, we still consider EV/FCFF as a good selection tool to predict returns, as the gross return decreases when you go from the low EV/FCFF portfolio to the high EV/FCFF portfolio

²⁵ The other multiples show the same pattern when it comes to liquidity.

in both sub-periods. This is supported by the positive alphas on the long-short EV/FCFF portfolio using equally weighted returns in section 5.2.

In the table below, we compare some of the key value drivers for the low multiple portfolios:

Table 17 Characteristics for the low multiple portfolios

Characteristics for the low multiple portfolios						
	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Market cap	20,275	20,366	9,920	14,960	12,198	4,041
Enterprise value	24,595	23,944	11,698	21,124	18,343	7,813
Growth rate	19 %	19 %	16 %	18 %	22 %	23 %
ROIC	15 %	20 %	18 %	13 %	8 %	1 %
Tax rate	29 %	27 %	24 %	17 %	23 %	26 %
WACC	7.5 %	7.9 %	8.1 %	7.5 %	7.3 %	6.9 %
EBIT	5,212	5,330	1,770	3,648	3,846	751
FCFF	2,493	2,204	1,361	2,020	1,704	638
Net investment rate	32 %	44 %	-1 %	33 %	43 %	-15 %
Observations	450	411	170	400	232	580

The variables are obtained by taking a simple mean for each portfolio using yearly observations. All variables except market cap and enterprise value are winsorized at the 5th and 95th percentile. Please see the appendix (section 11.12) for a complete description of the abbreviations in this table. The “growth rate” is the 5-year average growth rate in revenues. Enterprise value market capitalization, EBIT and FCFF are measured in millions.

We notice that the low EV/FCFF portfolio is exposed to relatively small companies and has a relatively high return on invested capital (ROIC). Moreover, the low EV/FCFF portfolio has the highest cost of capital (WACC) among the low multiple portfolios. The higher cost of capital should also result in a higher expected return, as compensation for the increased risk. However, we adjusted for differences in the cost of capital when we calculated the abnormal returns. Thus, differences in the cost of capital cannot explain the outperformance of the low EV/FCFF portfolio. The most striking characteristic of the low EV/FCFF portfolio is the very low net investment rate of -1%. We measure the net investment rate using the following formula:

$$\text{Net investment rate} = \frac{EBIT * (1 - t) - FCFF}{EBIT * (1 - t)} = \frac{\text{Net investment}}{EBIT * (1 - t)}$$

Where *EBIT* is the earnings before interest and taxes, *t* is the tax rate and *FCFF* is the free cash flow to the firm.

The low EV/EBITDA, EV/EBIT, P/E and P/FCFE portfolios have net investment rates ranging from 32% to 44%. The low P/B portfolio has a very low net investment rate of -15%.

However, the average low P/B company actually has a negative net income (not shown in the table above). With a negative net income, the company does not have to pay any taxes. Thus, the formula above will most likely underestimate the net investment rates for the low P/B companies. If we use a tax rate of 0% instead of 26% for the low P/B portfolio in the formula above, we end up with a net investment rate of 15%.

If we exclude the low P/B portfolio, the low EV/FCFF companies seem to invest significantly less than the other companies. As the low EV/FCFF portfolio has outperformed the other low multiple portfolios, investors seem to have penalized companies making large investments over the last couple of years. Investors should only penalize companies making large investments if they believe that the return on new invested capital is below the cost of capital. It *may* be the case that investors were pessimistic regarding return on new investments in the years after the financial crisis of 2008.

One *major* flaw with our analysis above is that it requires FCFF and EBIT observations for all the firms. Many firms only have EBIT observations and not FCFF observations. This could make the estimated net investment rates biased. However, below we compare the net investment rates for all the EV/FCFF portfolios, which have both EBIT and FCFF observations. We can see the same pattern for the EV/FCFF portfolios. The low EV/FCFF portfolio, which outperforms both the medium and high EV/FCFF portfolios, has a much lower net investment rate. This result supports our hypothesis from above that investors seem to have penalized companies making large investments over the last couple of years. As the low EV/FCFF companies do not seem to make large investments, they outperform companies that do make large investments.

Table 18: Characteristics for the EV/FCFF portfolios

Characteristics for the EV/FCFF portfolios			
	Low	Medium	High
Market cap	9,920	33,128	21,049
Enterprise value	11,698	39,721	26,335
Growth rate	16 %	15 %	20 %
ROIC	18 %	16 %	13 %
Tax rate	24 %	29 %	29 %
WACC	8.1 %	8.2 %	8.1 %
EBIT	1,770	7,618	3,616
FCFF	1,361	2,439	650
Net investment rate	-1 %	55 %	75 %
Observations	170	170	169

The variables are obtained by taking a simple mean for each portfolio using yearly observations. All variables except market cap and enterprise value are winsorized at the 5th and 95th percentile. Please see the appendix (section 11.12) for a complete description of the abbreviations in this table. The “growth rate” is the 5-year average growth rate in revenues. Enterprise value market capitalization, EBIT and FCFF are measured in millions.

6.4 Summary

In this chapter, we have outlined several potential explanations for the surprising results during the period after the start of the financial crisis (2008-2015). During this period, we do not find any relationship between pricing multiples and future abnormal returns. We believe that the most likely explanation of the surprising results after the start of the financial crisis is our specific sample period. Since the 1920s, value stocks have massively outperformed growth stocks on average. However, growth stocks have outperformed value stocks during several sub-periods. It may be the case that the period 2008-2015 is just one of the few sub-periods where value stocks do not outperform growth stocks. We believe that the decrease in the risk-free interest rate from normal to record low levels after the financial crisis offers the best explanation of the surprising results. Holding all other variables constant, growth stocks should outperform value stocks in this environment, as growth stocks are more sensitive to changes in the cost of capital. We have also found evidence indicating that decreased liquidity has affected both the CAPM and Fama-French alphas, as we do not control for liquidity using the Fama-French factors.

We have also investigated why the low EV/FCFF portfolio outperformed the other low multiple portfolios during the whole period. Our analysis indicate that investors have penalized companies making large investments over the last couple of years. The low EV/FCFF companies may have outperformed the other companies due to their very low net investment rates.

7. Robustness

7.1 Overview

In this section, we test the robustness of our results by comparing alternative assumptions and methodologies. All the tables in this chapter show *Fama-French* alphas using *value-weighted* returns for the whole period (2000-2015). As the EV/FCFF multiple is the only multiple that seems to predict abnormal returns, our focus will be to test the robustness of that conclusion. We use the Fama-French model to show that the EV/FCFF premium is not only due to exposure to the Fama-French factors.

7.2 33 vs. 20 percentile

Instead of dividing the stocks into three equally sized portfolios based on the value of the pricing multiple, we could divide them into the following portfolios:

- The stocks with the 20 percent lowest pricing multiples in one portfolio (low)
- The stocks with the 20 percent highest pricing multiples in another portfolio (high)
- The remaining 60 percent of the stocks in a third portfolio (medium)

Table 19: 33 vs. 20 percentile

3 portfolios	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.130	0.143	0.685**	0.169	0.255	-0.319
Medium	0.180	0.161	0.269	-0.0887	0.176	0.119
High	-0.448*	-0.370	0.194	-0.0926	0.0403	-0.0363
Long-short	0.577	0.513	0.491	0.262	0.215	-0.283
20-60-20 portfolios	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.229	0.277	0.635*	0.396	1.062***	-0.708*
Medium	-0.0357	-0.0389	0.453**	0.183	-0.0710	0.0578
High	-0.605	0.186	-0.250	-0.481	0.223	0.0460
Long-short	0.834	0.0904	0.884*	0.877	0.838	-0.754

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas are collected. All variables are measured in percentage terms and value-weighted returns are used. There are 172 monthly observations between 2000 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicate that the portfolio yield positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

As we can see from the table above, there are some differences between the 3 equally sized portfolios and the 20-60-20 portfolios. Using the 20-60-20 portfolios, low P/FCFE yields a significant positive alpha, while low P/B yields a significant negative alpha. P/FCFE is one of the most unstable measures as the alpha changes a lot when we change our assumptions. For the 20-60-20 portfolios, low P/FCFE do not yield a significant alpha for the *equally weighted* returns for instance. Hence, we do not find P/FCFE a good predictor of future returns. Using the 20-60-20 portfolios, the long-short strategy based on EV/FCFF yields a significant positive alpha. Changing the portfolio cut-off strengthens our conclusion that the EV/FCFF multiple predicts future abnormal returns.

7.3 Financial firms

Our main sample excludes 67 financial firms. The largest financial firms on the Oslo Stock Exchange are DNB, Storebrand and Gjensidige Forsirking. In Figure 5, we saw that an index with financial firms marginally outperformed the index without financial firms.

Table 20: With and without financial firms

Without financial firms	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.130	0.143	0.685**	0.169	0.255	-0.319
Medium	0.180	0.161	0.269	-0.0887	0.176	0.119
High	-0.448*	-0.370	0.194	-0.0926	0.0403	-0.0363
Long-short	0.577	0.513	0.491	0.262	0.215	-0.283
Financial firms	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.212	0.149	0.665**	0.317	0.388	-0.505**
Medium	0.147	0.140	0.260	0.0405	0.0954	0.169
High	-0.438*	-0.375	0.131	-0.293	0.0744	-0.0536
Long-short	0.650*	0.524	0.534	0.610	0.314	-0.451

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas are collected. All variables are measured in percentage terms and value-weighted returns are used. There are 172 monthly observations between 2000 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicate that the portfolio yield positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

The table above shows portfolios formed with and without financial firms. As expected, the difference is not very large. Using the sample including financial firms, low P/B yields a significant negative alpha, while the long-short strategy using EV/EBITDA yields a significant positive alpha. Including or excluding financial firms, low EV/FCFF is still the best performing portfolio.

7.4 Fama-French Factors

In our analyses until now, we have used the Fama-French factors created by us. To test the robustness of these factors, we have downloaded similar factors for the Norwegian market constructed by Ødegaard (2015a). These factors are not updated after June 2012²⁶. Thus, we compare the results for the period 2000-2012.

Table 21: Ødegaard's Fama-French factors

Our Fama-French factors	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.354*	0.338	0.648*	0.554**	0.577	-0.344
Medium	0.105	0.242	0.157	0.0514	0.165	0.244
High	-0.559*	-0.644**	0.0862	-0.440	-0.148	-0.0678
Long-short	0.913**	0.982**	0.562	0.995**	0.725	-0.276
Ødegaard Fama-French factors	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.362	0.358	0.782*	0.679**	0.502	-0.307
Medium	0.145	0.115	0.144	-0.0408	0.0398	0.227
High	-0.667**	-0.614**	0.0398	-0.539	-0.00537	-0.115
Long-short	1.029**	0.972**	0.742	1.218**	0.507	-0.192

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas are collected. All variables are measured in percentage terms and value-weighted returns are used. There are 141 monthly observations between 2000 and June 2012. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicates that the portfolio yield positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

As we can see from the table above, the results are very similar. The main difference is that the alpha of the low EV/EBITDA portfolio goes from being significant at a 10% level to being insignificant using the Fama-French factors constructed by Ødegaard. EV/FCFF remains the best performing low multiple portfolio.

²⁶ While this text has been prepared, Ødegaard has updated the HML and SMB factor.

7.5 Market values from year-end

Fama & French (1992a, 1993, 1996, 1998) use market capitalization and enterprise value from December year t-1 in their multiples. We use market capitalization from June year t. Below, we have compared the two different approaches.

Table 22: Market values from year-end

Market values from June	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.130	0.143	0.685**	0.169	0.255	-0.319
Medium	0.180	0.161	0.269	-0.0887	0.176	0.119
High	-0.448*	-0.370	0.194	-0.0926	0.0403	-0.0363
Long-short	0.577	0.513	0.491	0.262	0.215	-0.283
Market values from December	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.242	0.230	0.907***	0.299	0.280	-0.146
Medium	0.120	0.125	0.233	-0.122	0.309	0.291*
High	-0.680**	-0.301	-0.00676	-0.309	-0.170	-0.347*
Long-short	0.923**	0.531	0.914*	0.609	0.450	0.201

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas are collected. All variables are measured in percentage terms and value-weighted returns are used. There are 172 monthly observations between 2000 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicate that the portfolio yield positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

Most of the portfolios perform better using market values from December year t-1 than June year t. Low EV/FCFF now gets an alpha of 0.907%, significant at the 1% level. Using market values from December year t-1, the long-short strategy using EV/EBITDA and EV/FCFF yields significant positive alphas.

These results indicates that it is better to use market values from December year t-1. Based on our arguments in section 3.5, we find this very surprising. We believe that updated market values from June year t will be better predictors of returns from July year t to June year t+1 than outdated market values from December year t-1.

7.6 Sample

In order to be included in the portfolios, we needed both market data and accounting data. For some accounting variables such as book value and earnings per share, we have data for almost all the firms. On the other hand, Bloomberg only provided FCFE and FCFF for relatively few companies, as you can see from Table 3. Therefore, the good performance of the EV/FCFF multiple could be due to a biased sample. In section 6.3, we showed that that *all* EV/FCFF

portfolios yielded higher gross returns than the market. This illustrates that the companies with a valid EV/FCFF multiple are not a representative sample of the stocks on the Oslo Stock Exchange.

Table 23: EV/FCFF sample

Ordinary sample	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.130	0.143	0.685**	0.169	0.255	-0.319
Medium	0.180	0.161	0.269	-0.0887	0.176	0.119
High	-0.448*	-0.370	0.194	-0.0926	0.0403	-0.0363
Long-short	0.577	0.513	0.491	0.262	0.215	-0.283
EV/FCFF sample	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.140	0.146	0.685**	0.287	0.151	-0.230
Medium	0.379	0.435	0.269	-0.355	0.633**	0.164
High	-0.467	-0.394	0.194	-0.675*	-0.145	-0.270
Long-short	0.607	0.540	0.491	0.962*	0.296	0.0399

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas are collected. All variables are measured in percentage terms and value-weighted returns are used. There are 172 monthly observations between 2000 and 2015. $H_0: \alpha=0$, $H_a: \alpha \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The colour green indicate that the portfolio yield positive significant abnormal return, while the colour red indicates that the abnormal return is significant negative.

Using the EV/FCFF sample for all multiples, low EV/FCFF is still the only low multiple portfolio with a significant positive alpha. Buying low P/E and selling high P/E now gives a positive abnormal return. EV/FCFF remains the best selection tool if you want do identify stocks with positive abnormal returns.

7.7 Summary

Our results seem quite robust to changes in assumptions. No matter what kind of assumption we test, investing in stocks with a low EV/FCFF multiples yields positive abnormal returns and is the best selection tool for finding “winners”. In addition, a long-short strategy using EV/FCFF yields positive abnormal returns in two of the five robustness tests. Hence, the robustness tests seem to strengthen our conclusion that the EV/FCFF multiple predicts abnormal returns.

8. Sources of Error

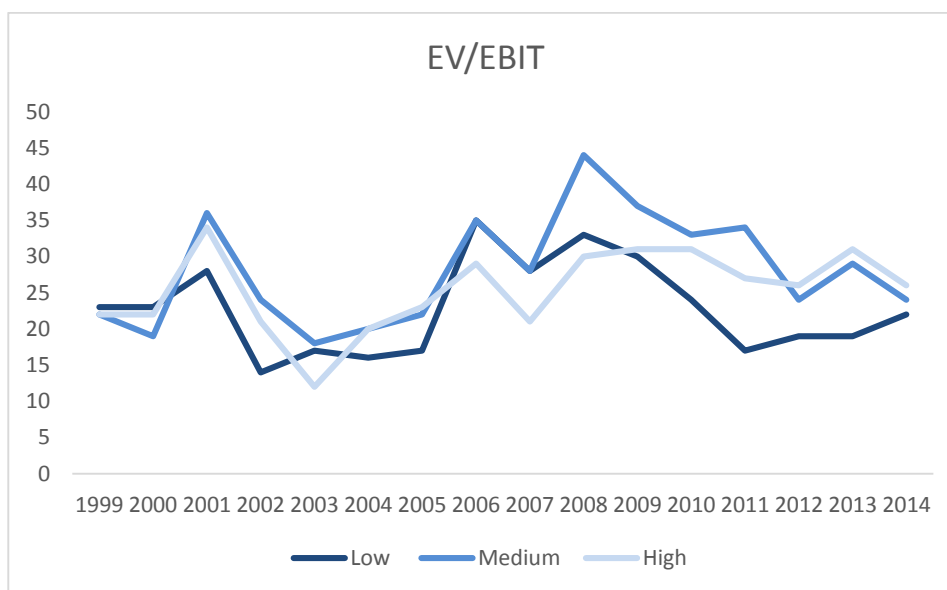
8.1 Period

We investigate stocks in the period 2000-2015 using monthly data. Compared with other master theses on the subject, 15 years of data is quite much. Engeberg & Enge (2009) used 9 years of data, while Lofoll (2009) used 10 years of data. As discussed earlier, the bad performance of stocks with low multiples could be due to the sample period. Only time will show whether the change around the financial crisis was permanent or just temporary.

8.2 Transaction cost and taxes

In our analysis, we have not taken into account transaction costs or taxes. Transaction costs occur when you buy and sell stocks. Non-financial institutions have to pay brokerage commission to the broker. For small investors, commission for buying and selling is on average 2.23% and 2.76 % of the share price respectively (Døskeland, 2014). As we can see in Table 28 - Table 30, the number of stocks bought and sold each year is quite high. In addition to broker commission, you also face a bid-ask spread. According to Døskeland (2014), these are on average 0.94% of the share price.

Figure 8: Stock bought or sold in each portfolio - EV/EBIT



The figure shows the sum of the number of stocks bought and sold each year in each portfolio. Delisted companies are not included as stocks sold.

As illustrated above, the number of stocks sold and bought each year in the different portfolios are almost the same, resulting in similar size of the transaction costs. The picture is not very different for the other multiples.

For private Norwegian investors, the tax on capital gains and dividends is 27 %. However, if you invest through a corporation you do not have to pay tax on stock investments in Norway, but then losses are not tax-deductible cf. skatteloven.

As we have seen, transaction costs will have a significant effect on the return you get. Adjusting for transaction costs may erode the positive abnormal returns for all the portfolios. As stated by Cochrane, avoiding taxes and transaction costs is therefore an important task for a portfolio manager: *“The most important piece of portfolio advice applies as much as ever: avoid taxes and transaction costs”* (Cochrane, 1999).

8.3 Delisted companies

Companies that got delisted were given a return of zero for the rest of the portfolio year (July year t to June year $t+1$). If a company is delisted in August, it gets zero return until June the following year. A more realistic assumption would have been that the money was reinvested in other stocks.

The problem with delisted companies (no return after delisting) and transaction costs work in opposite directions. Delisted companies were not a problem for the Fama-MacBeth analysis, since companies that become delisted were removed from the sample at once and not at the end of the portfolio year.

8.4 Data snooping bias

In this thesis, we examine the performance of six multiples. The chance that one of the multiples will outperform the market just by chance is definitely present. Analysing enough multiples you would probably end up with a multiple that yields abnormal returns. Our choice of multiples was not based on results, but on data availability, earlier research, popularity among investors and whether the multiples were theoretically well founded or not. We believe that our selection method in combination with several robustness tests makes the results less affected by data snooping bias.

8.5 Adjusting for risk

As we have discussed, there is no universally agreed upon asset-pricing model to measure the cost of equity. In this thesis we try to find a relationship between multiples and abnormal returns. Hence, the measure of the cost of equity is very central. To make our results more robust, we have risk adjusted our returns using both the CAPM and the Fama-French model. However, we may not have controlled for all the risk, making the EV/FCFF premium a consequence for risk and not a consequence of mispricing as suggested in this thesis.

9. Conclusion

In this thesis, we have examined whether pricing multiples predict abnormal returns for stocks on the Oslo Stock Exchange. We analysed all available companies on the Oslo Stock Exchange in the period 2000-2015. Using the method introduced by Fama-MacBeth and a portfolio approach, we investigated six different multiples: EV/EBITDA, EV/EBIT, EV/FCFF, P/E, P/FCFE and P/B.

To the best of our knowledge, this thesis is the first to analyse the relationship between pricing multiples and future abnormal returns on the Oslo Stock Exchange using the following period, multiples and methodology:

- Including the period 2010-2015
- Using the EV/FCFF and P/FCFE multiples.
- Using the Fama-MacBeth regression method

During the whole period, *only* EV/FCFF seems to predict CAPM and/or Fama-French abnormal returns. This result is very surprising. Almost all studies find that EV/EBITDA, EV/EBIT, P/E and P/B predict CAPM abnormal returns. In search of an explanation of this surprising result, we divided the whole period (2000-2015) into two sub-periods, one period before the start of the financial crisis in 2008 and one period after.

During the period before the start of the financial crisis (2000-2008), the results are closer to our expectations and more in line with prior research. In this period, EV/EBITDA, EV/EBIT, EV/FCFF and P/E seem to predict CAPM abnormal returns. These results are in line with Basu (1977) and Fama & French (1992a). EV/FCFF also seems to predict Fama-French abnormal returns. As expected, a lower multiple was associated with higher abnormal returns.

Thus, the surprising results for the whole period stem from the period after the start of the financial crisis (2008-2015). During this period, *none* of the multiples seems to predict abnormal returns. Only the EV/FCFF multiple comes close. In this period, growth stocks (high multiples) actually performed marginally better than value stocks (low multiples). These results are quite astonishing. It is an established truth in finance that value stocks (e.g. low P/B) provide positive CAPM abnormal returns. Most of the academic community use an asset-pricing model based on this notion. If this turns out to be a spurious relationship, it will have great implications for portfolio managers following a strategy of buying stocks with low

multiples. It will also have great implications for researchers and practitioners using the Fama-French three-factor model to estimate the cost of capital.

We believe that the most likely explanation of the surprising results in the period after the start of the financial crisis is our specific sample period. Since the 1920s, value stocks (low multiples) have massively outperformed growth stocks (high multiples) on average. However, growth stocks have outperformed value stocks during several sub-periods. It may be the case that the period 2008-2015 is just one of the few sub-periods where value stocks do not outperform growth stocks. We believe that the decrease in the risk-free interest rate from normal to record low levels after the financial crisis offers the best explanation of the surprising results. Holding all other variables constant, we show that growth stocks should outperform value stocks in this environment, as growth stocks are more sensitive to changes in the cost of capital.

We also investigate why the low EV/FCFF portfolio outperformed the other low multiple portfolios during the whole period. Our analysis indicate that investors have penalized companies making large investments over the last couple of years. The low EV/FCFF companies may have outperformed the other companies due to their very low net investment rates.

We believe that our thesis is relevant and could have value due to two factors. First, we believe that we are the first to include the period 2010-2015 in an analysis of the relationship between pricing multiples and future abnormal returns on the Oslo Stock Exchange. We found that the historical relationship between pricing multiples and future abnormal returns have faded away during this period. Second, we believe that we are the first to investigate the EV/FCFF multiple on the Oslo Stock Exchange. The EV/FCFF multiple is the only multiple that seems to predict CAPM and/or Fama-French abnormal returns during the whole period (2000-2015). As expected, a lower EV/FCFF multiple was associated with higher abnormal returns. For the other multiples we did not find a clear relationship between the value of the multiple and future abnormal returns.

These results indicate that portfolio managers should be wary of basing a portfolio strategy on buying stocks with low multiples. They also indicate that portfolio managers that do base their strategy on buying stocks with low multiples should consider using the EV/FCFF multiple as a selection tool. This is the first thesis where you could extract these results on the Oslo Stock

Exchange. Thus, we believe that this thesis could have value for portfolio managers that invest in the Norwegian stock market.

We believe that the most likely explanation of our surprising results is our specific sample period (2000-2015). Thus, we would encourage further studies of pricing multiples on the Oslo Stock Exchange in the future to investigate whether our surprising results are due to a permanent shift in the abnormal returns for value stocks or due to our specific sample period.

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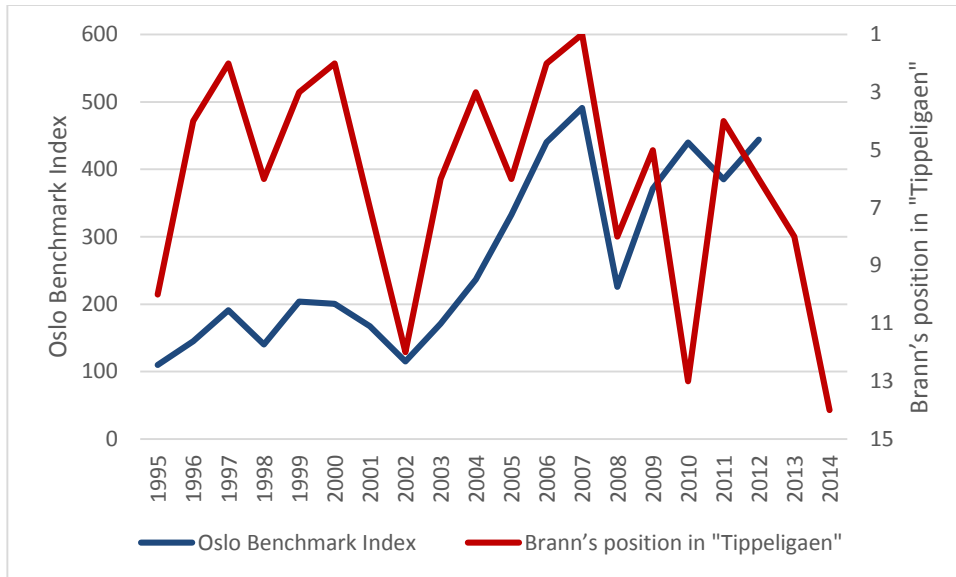
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11. Appendix

11.1 Tables and figures

Figure 9: Oslo Stock Exchange vs. Brann



The graph is constructed using end of year values of OSEBX and the ending position of BRANN in "Tippeligaen".

Table 24: Dickey-Fuller test

```
. dfuller OSEBX, regress
```

```
Dickey-Fuller test for unit root          Number of obs =      198
```

	Test Statistic	Interpolated Dickey-Fuller		
		1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-11.779	-3.477	-2.883	-2.573

```
MacKinnon approximate p-value for Z(t) = 0.0000
```

D.OSEBX	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
OSEBX					
L1.	-.8290925	.07039	-11.78	0.000	-.9679116 - .6902735
_cons	.7050877	.4695584	1.50	0.135	-.2209478 1.631123

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Table 25: Autocorrelation

	(1) uhatPE
laguhatPE	0.0114 (0.0758)
RfOSEBX	-0.000740 (0.0474)
Constant	0.0242 (0.266)
Observations	171
R^2	0.000

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

	(1) uhatEVEBIT
laguhatEVEBIT	-0.0145 (0.0796)
RfOSEBX	-0.00122 (0.0398)
Constant	0.0177 (0.232)
Observations	171
R^2	0.000

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \epsilon_t$ is run and the residuals are saved. Then the residual in time t (monthly observations) is regressed against the market (OSEBX) and the residual in time $t-1$. A significant intercept is sign of autocorrelation.

Table 26: Fama-MacBeth without adjusting for autocorrelation 2000-2015

2000-2015	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf	Ri-Rf
Beta	0.0961 (0.459)	-0.122 (0.477)	-0.302 (0.666)	-0.334 (0.488)	-0.978 (0.599)	-0.440 (0.446)
Log(EV/EVEBITDA)	-0.433** (0.182)					
Log(EV/EVEBIT)		-0.561*** (0.140)				
Log(EVFCFF)			-0.281* (0.145)			
Log (P/E)				0.120 (0.123)		
Log (P/FCFE)					0.0265 (0.136)	
Log (P/B)						0.229 (0.194)
Constant	1.312** (0.591)	2.084*** (0.546)	1.842*** (0.618)	0.596 (0.548)	1.401** (0.691)	0.816* (0.439)
Observations	16042	13942	5941	13970	8982	22944
R-squared	0.051	0.054	0.087	0.053	0.073	0.049

The cross section of monthly excess return measured in percentage terms is regressed against the beta of the stock and the multiple. Only stocks that have a positive multiple and have been traded for two years are included in the sample. The return is measured from July year t to June year $t+1$, the accounting variable is from year $t-1$. The market cap and the enterprise value in the multiples are from start of the month. * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. Standard errors are in the parentheses.

Table 27: Fama-French betas and alphas for low multiple portfolios

2000-2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
OSEBX	0.798***	0.780***	0.936***	0.913***	0.999***	1.079***
HML	0.0361	0.0230	0.135	0.111*	0.168**	0.448***
SMB	-0.110*	-0.183**	-0.130	-0.250***	0.211**	0.158*
Alpha	0.130	0.143	0.685**	0.169	0.255	-0.319
2000-2008	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
OSEBX	0.820***	0.821***	0.796***	0.859***	1.037***	1.144***
HML	0.157*	0.130	0.172	0.136	0.198	0.408***
SMB	-0.155**	-0.315***	-0.171	-0.255***	0.220*	0.257**
Alpha	0.375	0.420	0.826*	0.401	0.603	-0.481
2008-2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
OSEBX	0.806***	0.778***	1.135***	0.989***	0.952***	0.964***
HML	-0.113**	-0.109*	0.0305	0.0385	0.108	0.533***
SMB	-0.00884	0.0666	-0.00393	-0.221	0.186	-0.0514
Alpha	-0.449*	-0.467*	0.482	-0.147	-0.248	-0.0427

The regression $r_t - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ is run for each portfolio and the alphas and betas are collected. There are 172 monthly observation between 2000 and 2015, 92 between 2000 and 2008 and 80 between 2008 and 2015. All variables are measured in percentage terms and value-weighted returns are used. $H_0: \alpha/\beta_i=0$, $H_a: \alpha/\beta_i \neq 0$, * = 10 % significance level, ** = 5 % significance level, *** = 1% significance level. The alphas and betas are for the value-weighted portfolios.

Table 28: Stock bought and sold for low multiple portfolios

Number of stocks bought						
Year	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	23	23	8	29	20	39
2000	16	14	9	18	16	23
2001	17	18	5	18	14	27
2002	15	8	7	15	13	19
2003	9	9	6	8	11	14
2004	20	13	7	16	13	24
2005	14	11	9	20	6	23
2006	21	24	13	22	13	26
2007	15	16	9	24	11	35
2008	26	23	10	30	14	34
2009	20	18	12	17	18	31
2010	16	14	9	25	13	21
2011	20	11	10	16	12	20
2012	15	13	8	16	12	18
2013	11	11	11	13	15	18
2014	16	13	13	19	16	15
Number of stocks sold						
Year	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	0	0	0	0	0	0
2000	10	9	1	14	4	13
2001	10	10	2	9	6	18
2002	11	6	1	10	7	9
2003	9	8	3	6	5	13
2004	8	3	2	5	4	13
2005	9	6	1	15	4	12
2006	10	11	5	17	2	19
2007	11	12	4	16	5	23
2008	14	10	2	19	4	28
2009	13	12	6	10	11	26
2010	9	10	2	17	5	18
2011	16	6	7	12	6	15
2012	9	6	3	8	3	11
2013	7	8	4	9	8	13
2014	13	9	5	13	10	11

The tables show the number of stocks bought and sold each year in each portfolio.

Delisted companies are not included as stocks sold.

Table 29: Stocks bought and sold for medium multiple portfolios

Number of stocks bought						
Year	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	22	22	8	29	20	39
2000	15	13	6	15	13	17
2001	18	22	5	15	13	16
2002	17	14	8	14	11	14
2003	11	10	7	11	7	11
2004	18	13	8	15	13	16
2005	19	16	8	21	7	19
2006	23	23	13	21	14	20
2007	20	19	9	24	9	28
2008	28	27	8	27	14	30
2009	21	21	8	17	15	20
2010	18	18	12	22	12	14
2011	22	20	11	19	14	11
2012	19	15	8	21	15	14
2013	18	16	10	15	18	9
2014	19	14	13	15	19	8
Number of stocks sold						
Year	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	0	0	0	0	0	0
2000	9	6	1	9	3	8
2001	9	14	2	10	6	9
2002	12	10	1	3	5	9
2003	8	8	1	3	3	4
2004	10	7	3	4	4	7
2005	12	6	5	5	4	7
2006	12	12	4	6	3	12
2007	10	9	4	8	4	14
2008	16	17	4	10	4	16
2009	18	16	4	14	5	17
2010	16	15	5	11	6	12
2011	18	14	5	8	4	5
2012	14	9	4	8	6	8
2013	14	13	5	7	7	8
2014	14	10	5	7	6	5

The tables show the number of stocks bought and sold each year in each portfolio.

Delisted companies are not included as stocks sold.

Table 30: Stocks bought and sold for high multiple portfolios

Number of stocks bought						
	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	22	22	8	29	19	39
2000	17	15	7	6	15	9
2001	12	19	4	9	14	9
2002	12	13	9	8	10	11
2003	10	8	6	5	8	9
2004	21	16	8	4	14	11
2005	13	16	8	11	8	16
2006	23	23	11	12	11	12
2007	21	20	9	9	11	11
2008	26	23	8	19	14	20
2009	20	16	9	10	18	20
2010	20	18	13	12	13	11
2011	22	19	9	14	13	13
2012	22	20	6	10	14	9
2013	17	18	11	12	15	8
2014	17	16	9	10	17	8
Number of stocks sold						
	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
1999	0	0	0	0	0	0
2000	5	7	3	9	20	19
2001	9	15	0	9	18	16
2002	6	8	3	4	15	15
2003	4	4	4	2	12	9
2004	6	4	3	4	20	14
2005	6	7	4	7	19	20
2006	7	6	1	3	22	21
2007	3	1	6	8	27	14
2008	7	7	3	11	34	26
2009	17	15	2	15	24	14
2010	13	13	5	11	14	20
2011	11	8	4	11	14	17
2012	12	6	1	9	13	17
2013	15	13	6	7	11	15
2014	12	10	3	10	10	19

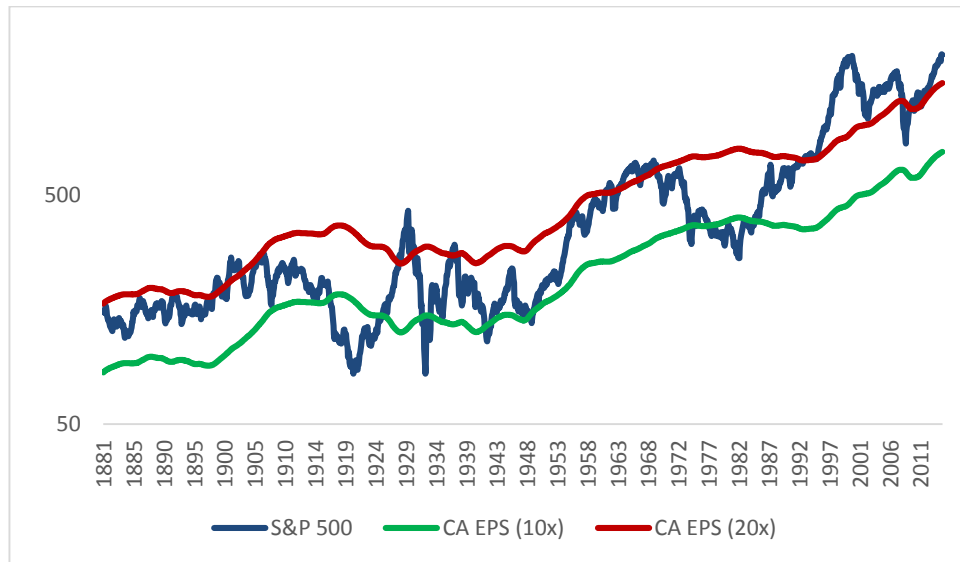
The tables show the number of stocks bought and sold each year in each portfolio.

Delisted companies are not included as stocks sold.

11.2 Shiller P/E

The cyclically adjusted P/E ratio seems to be a good tool to identify the fair *value* of the S&P 500 index:

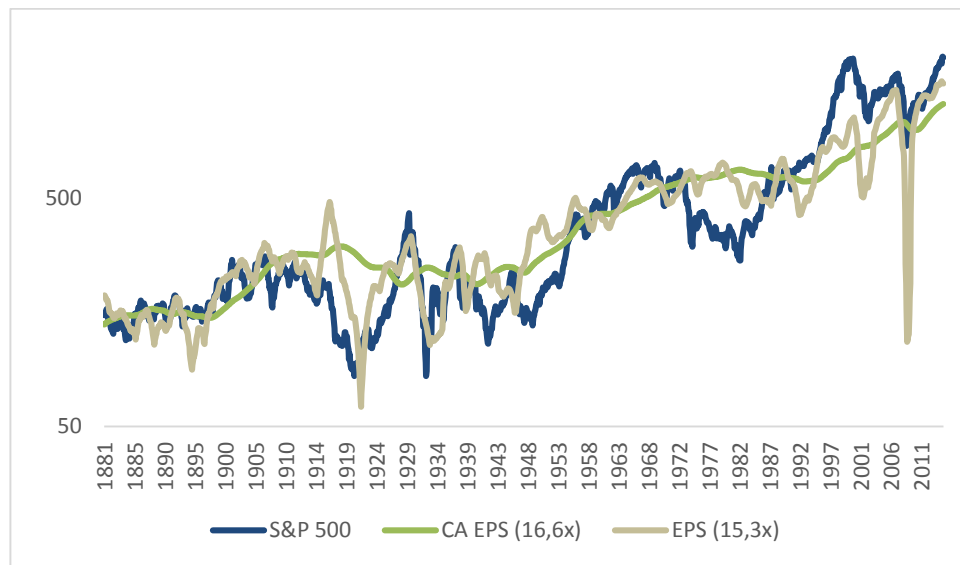
Figure 10: Cyclical adjusted P/E



The lower green line represents a cyclically adjusted P/E of 10x, while the upper red line represents a cyclically adjusted P/E of 20x. Historically, it has been wise to buy the S&P 500 index when the cyclically adjusted P/E is below 10x, and sell the index when the cyclically adjusted P/E is above 20x.

However, unadjusted earnings per share seem to explain more of the short-term variation in the *price* of the S&P 500 index:

Figure 11: Unadjusted P/E



Based on the graphs above, the cyclically adjusted earnings per share seems to be a good indicator of the *value* of the index, while the unadjusted earnings per share seems to be a good indicator of the short-term *price* of the index. This indicates that investors tend to focus too much on the volatile current earnings

11.3 DCF

In the Discounted Cash Flow (DCF) valuation approach, you value an asset by discounting the expected future cash flows (CF_t) at the appropriate discount rate (k). Assuming that the asset's cash flow is growing at a constant rate (g), the DCF-value of the asset (P) is given by the following equation:

$$P_0 = \sum_{t=1}^n \frac{CF_t}{(1+k)^t} = \sum_{t=1}^n \frac{CF_1 * (1+g)^{t-1}}{(1+k)^t}$$

Writing the terms of the equation above gives equation 1:

$$P_0 = \frac{CF_1}{(1+k)} + \frac{CF_1 * (1+g)}{(1+k)^2} + \frac{CF_1 * (1+g)^2}{(1+k)^3} + \dots + \frac{CF_1 * (1+g)^{n-1}}{(1+k)^n}$$

Multiplying equation 1 by $(1+k)$ on both sides gives equation 2:

$$P_0 * (1+k) = CF_1 + \frac{CF_1 * (1+g)}{(1+k)} + \frac{CF_1 * (1+g)^2}{(1+k)^2} + \dots + \frac{CF_1 * (1+g)^{n-1}}{(1+k)^{n-1}}$$

Multiplying equation 1 by $(1+g)$ on both sides gives equation 3:

$$P_0 * (1+g) = \frac{CF_1 * (1+g)}{(1+k)} + \frac{CF_1 * (1+g)^2}{(1+k)^2} + \frac{CF_1 * (1+g)^3}{(1+k)^3} + \dots + \frac{CF_1 * (1+g)^n}{(1+k)^n}$$

Subtracting equation 3 from equation 2 gives:

$$P_0 * (1+k) - P_0 * (1+g) = CF_1 - \frac{CF_1 * (1+g)^n}{(1+k)^n}$$

Simplifying the equation above on both sides gives:

$$P_0 * (k-g) = CF_1 * \left[1 - \left(\frac{1+g}{1+k} \right)^n \right]$$

Dividing by $(k-g)$ on both sides gives a simplified expression for the value of the asset:

$$P_0 = \frac{CF_1 * \left[1 - \left(\frac{1+g}{1+k} \right)^n \right]}{k-g}$$

Assuming that $k > g$ and $n \rightarrow \infty$ gives the well-known Gordon's growth formula:

$$P_0 = \frac{CF_1}{k - g}$$

11.4 Derivation of enterprise multiples

In this sub-chapter, we will derive the key value drivers of the enterprise multiples investigated in our thesis. The derivations are based on the derivations in Koller, Goedhart & Wessels (2010).

Assuming that the company's cash flow is growing at a constant rate, the DCF-value of the company is given by the well-known Gordon's growth formula derived above (substituting FCFE for CF and WACC for k):

$$EV_t = \frac{FCFF_{t+1}}{WACC - g} = \frac{NOPLAT_{t+1} + DA_{t+1} - \Delta OpWC_{t+1} - Capex_{t+1}}{WACC - g} = \frac{NOPLAT_{t+1} - Net Investment_{t+1}}{WACC - g}$$

Where:

EV_t = Enterprise value year t

$FCFF_{t+1}$ = The Free Cash Flow to the Firm year t+1

$WACC$ = The Weighted Average Cost of Capital

g = The long-term growth rate in the FCFE

$NOPLAT_{t+1} = EBIT_{t+1} * (1 - t)$ = Net Operating Profit Less Adjusted Taxes year t+1

DA_{t+1} = The Depreciation and Amortization year t+1

$\Delta OpWC_{t+1}$ = The Change in Operating Working Capital year t+1

$Capex_{t+1}$ = The Capital Expenditure year t+1

$Net Investment_{t+1}$ = The increase in Invested Capital from year t to year t+1

The formula is only valid for $WACC > g$.

The net investment rate (IR) is defined as the proportion of NOPLAT invested back into the business.

$$IR_{t+1} = \frac{\Delta OpWC_{t+1} + Capex_{t+1} - DA_{t+1}}{NOPLAT_{t+1}} = \frac{Net Investment_{t+1}}{NOPLAT_{t+1}}$$

We can now define FCFF as a function of NOPLAT and the net investment rate:

$$FCFF_{t+1} = NOPLAT_{t+1} - (NOPLAT_{t+1} * IR_{t+1}) = NOPLAT_{t+1} * (1 - IR_{t+1})$$

The Return on Invested Capital is defined as the return the company earns on each dollar invested in the firm.

$$ROIC_{t+1} = \frac{NOPLAT_{t+1}}{Invested Capital_t}$$

The Return on New Invested Capital is defined as the return the company earns on each dollar of new investments.

$$RONIC_{t+1} = \frac{NOPLAT_{t+2} - NOPLAT_{t+1}}{Net Investment_{t+1}} = \frac{\Delta NOPLAT_{t+1}}{Net Investment_{t+1}}$$

In the following, we will assume that RONIC is constant. Multiplying both sides of the RONIC equation by $Net Investment_{t+1}$ and dividing by $NOPLAT_{t+1}$ gives:

$$\frac{RONIC * Net Investment_{t+1}}{NOPLAT_{t+1}} = \frac{\Delta NOPLAT_{t+1}}{NOPLAT_{t+1}} \rightarrow RONIC * IR_{t+1} = g$$

Solving for IR_{t+1} gives:

$$IR_{t+1} = \frac{g}{RONIC}$$

Inserting this expression into the FCFF expression yields:

$$FCFF_{t+1} = NOPLAT_{t+1} * \left(1 - \frac{g}{RONIC}\right)$$

Finally, inserting this expression into the Grodon's growth formula gives the key value driver formula:

$$EV_t = \frac{NOPLAT_{t+1} * \left(1 - \frac{g}{RONIC}\right)}{WACC - g} = \frac{EBIT_{t+1} * (1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g}$$

EV/EBIT

Dividing the key value driver formula with EBIT yields the key value driver formula for the Enterprise value-to-EBIT multiple:

$$\begin{aligned} \frac{EV_t}{EBIT_{t+1}} &= \frac{(1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g} = \frac{(1 - t) * \left(\frac{RONIC - g}{RONIC}\right)}{WACC - g} = \frac{(1 - t)}{RONIC} * \frac{RONIC - g}{WACC - g} \\ &= \frac{(1 - t)}{RONIC} * \left[1 + \frac{RONIC - g}{WACC - g} - 1\right] = \frac{(1 - t)}{RONIC} * \left[1 + \frac{RONIC - WACC}{WACC - g}\right] \end{aligned}$$

EV/EBITDA

To get the key value driver for the Enterprise value-to-EBITDA formula, we rewrite the key value driver formula to:

$$EV_t = \frac{[EBITDA_{t+1} - DA_{t+1}] * (1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g}$$

Dividing this expression by EBITDA and using similar algebraic steps as for the EV/EBIT formula yields:

$$\begin{aligned} \frac{EV_t}{EBITDA_{t+1}} &= \frac{\left(1 - \frac{DA_{t+1}}{EBITDA_{t+1}}\right) * (1 - t) * \left(1 - \frac{g}{RONIC}\right)}{WACC - g} \\ &= \left[\frac{\left(1 - \frac{DA_{t+1}}{EBITDA_{t+1}}\right) * (1 - t)}{RONIC}\right] * \left[1 + \frac{RONIC - WACC}{WACC - g}\right] \end{aligned}$$

EV/FCFF

Dividing the Gordon's growth formula with FCFF yields the key value driver formula for the Enterprise value-to-FCFF multiple:

$$\frac{EV_t}{FCFF_{t+1}} = \frac{1}{WACC - g}$$

11.5 Derivation of equity multiples

In this sub-chapter, we will derive the key value drivers of the equity multiples investigated in our thesis. The derivations are based on the derivation in Koller, Goedhart & Wessels (2010).

Assuming that the company's cash flow is growing at a constant rate, the DCF-value of the equity is given by the well-known Gordon's growth formula:

$$P_t = \frac{FCFE_{t+1}}{k - g}$$

Where P_t is the value per share year t . $FCFE_{t+1}$ is the Free Cash Flow to Equity per year $t+1$, k is the cost of equity, and g is the long-term growth rate in earnings per share.

Substituting earnings per share (E) with NOPLAT and Return on New Equity investments (RONE) with RONIC, we derive the key value driver formula for equity:

$$P_t = \frac{E_{t+1} * \left(1 - \frac{g}{RONE}\right)}{k - g}$$

Where E_{t+1} is the earnings per share year $t+1$ and $RONE$ is the Return On New Equity investments.

P/E

Dividing the key value driver formula by the earnings per share yields the key value driver formula for the price-to-earnings ratio:

$$\begin{aligned}\frac{P_t}{E_{t+1}} &= \frac{\left(1 - \frac{g}{RONE}\right)}{k - g} = \frac{\left(\frac{RONE - g}{RONE}\right)}{k - g} = \frac{1}{RONE} * \frac{RONE - g}{k - g} \\ &= \frac{1}{RONE} * \left[1 + \frac{RONE - g}{k - g} - 1\right] = \frac{1}{RONE} * \left[1 + \frac{RONE - k}{k - g}\right]\end{aligned}$$

P/FCFE

Dividing the Gordon's growth formula by the Free Cash Flow to Equity per share yields the key value driver formula for the price-to-FCFE ratio:

$$\frac{P_t}{FCFE_{t+1}} = \frac{1}{k - g}$$

P/B

Dividing the key value driver formula by the book value per share (B) yields the key value driver formula for the price-to-book ratio:

$$\begin{aligned}\frac{P_t}{B_t} &= \frac{ROE_{t+1} * \left(1 - \frac{g}{RONE}\right)}{k - g} = \frac{ROE_{t+1} * \left(\frac{RONE - g}{RONE}\right)}{k - g} = \frac{ROE_{t+1}}{RONE} * \frac{RONE - g}{k - g} \\ &= \frac{ROE_{t+1}}{RONE} * \left[1 + \frac{RONE - k}{k - g}\right]\end{aligned}$$

Where ROE_{t+1} is the Return on Equity defined as:

$$ROE_{t+1} = \frac{E_{t+1}}{B_t}$$

If we assume that the ROE is constant and equal to RONE, the key value driver simplifies to:

$$\frac{P_t}{B_t} = 1 + \frac{ROE - k}{k - g}$$

From this equation we notice that P/B should be greater than one if $ROE > k$, and less than one if $ROE < k$.

It is possible to show that if the company's cash flow grow at a constant rate and the ROE is constant and equal to RONE, there is a perfect linear relationship between the P/B ratio and the ROE:

$$\frac{P_t}{B_t} = 1 + \frac{ROE - k}{k - g} = \frac{k - g}{k - g} + \frac{ROE}{k - g} - \frac{k}{k - g} = -\left(\frac{g}{k - g}\right) + \left(\frac{1}{k - g}\right) * ROE$$

11.6 Leverage

The company's capital structure (debt-to-equity ratio) will affect both the return on equity (ROE) and cost of equity (k).

Return on Equity (ROE)

$$\begin{aligned} \text{Net income} &= (\text{EBIT} - \text{Interest expense}) * (1 - t) \\ &= \mathbf{EBIT * (1 - t) - Interest expense * (1 - t)} \end{aligned}$$

$$\text{ROE} = \frac{\text{Net income}}{\text{Book value of equity}} = \frac{\text{Net income}}{E}$$

$$\text{ROIC} = \frac{\text{EBIT} * (1 - t)}{\text{Invested Capital}} = \frac{\text{EBIT} * (1 - t)}{IC}$$

$$k_d = \text{Cost of Debt} = \frac{\text{Interest expense}}{\text{Book value of debt}} = \frac{\text{Interest expense}}{D}$$

$$t = \text{tax rate}$$

Solving the equations above for net income, $\text{EBIT}(1-t)$ and Interest expense, and inserting these expressions into the "net income" expression above gives:

$$\mathbf{ROE * E = ROIC * IC - k_d * D * (1 - t)}$$

$$IC = E + D$$

Inserting this equation for IC, and dividing both sides of the equation by E gives the following equation:

$$\text{ROE} = \text{ROIC} * \left(\frac{E + D}{E} \right) - k_d * \frac{D}{E} * (1 - t)$$

Collecting the (D/E) terms gives a formula showing the capital structure affect the ROE:

$$\mathbf{ROE = ROIC + \frac{D}{E} * [ROIC - k_d * (1 - t)]}$$

This formula clearly illustrates that the capital structure (D/E) affects the return on equity.

Cost of Equity (k)

Koller, Goedhart & Wessels (2010) show that the cost of equity is affected by the company's capital structure. They start with Modigliani & Miller's postulation saying that the market value of a company's economic assets, such as operating assets (V_u) and tax shields (V_{txa}), should equal the market value of its financial claims, such as debt (D) and equity (E):

$$V_u + V_{txa} = \textit{Enterprise value} = D + E$$

Then, they refer to a second result of Modigliani & Miller saying that the total risk of the company's economic assets must equal the total risk of the financial claims:

$$\frac{V_u}{V_u + V_{txa}} (k_u) + \frac{V_{txa}}{V_u + V_{txa}} (k_{txa}) = \frac{D}{D + E} (k_d) + \frac{E}{D + E} (k_e)$$

Where:

$$k_u = \textit{unlevered cost of equity}$$

$$k_{txa} = \textit{cost of capital for the company's interest tax shield}$$

$$k_d = \textit{cost of debt}$$

$$k_e = \textit{cost of equity}$$

Multiplying both sides of the equation above by the enterprise value gives:

$$V_u * (k_u) + V_{txa} * (k_{txa}) = D * (k_d) + E * (k_e)$$

Subtracting $D * (k_d)$ from both sides of the equation and dividing by E gives:

$$k_e = \frac{V_u}{E} (k_u) + \frac{V_{txa}}{E} (k_{txa}) - \frac{D}{E} (k_d)$$

From the first equation, we know that $V_u = D + E - V_{txa}$. Inserting this expression for V_u in the equation above gives:

$$k_e = \frac{(D + E - V_{txa})}{E} (k_u) + \frac{V_{txa}}{E} (k_{txa}) - \frac{D}{E} (k_d)$$

Collecting terms gives the general equation for the cost of equity:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) - \frac{V_{txa}}{E}(k_u - k_{txa})$$

If the company has a target capital structure (i.e. a target D/E ratio), the value of debt will fluctuate with the enterprise value. If we assume that the cost of debt is relatively constant, which is reasonable when the debt-to-equity ratio is constant, the interest expense and consequently interest tax shield will also fluctuate with the enterprise value. In this situation, it is reasonable to assume that the cost of capital for the company's interest tax shield is equal to the unlevered cost of equity. Then, the last term in the equation drops out, and the equation for the cost of equity becomes:

$$k_e = k_u + \frac{D}{E}(k_u - k_d)$$

This formula clearly shows that the capital structure (D/E) affects the cost of equity.

11.7 Bloomberg variables

In this section, we define the most central variables retrieved from Bloomberg. The definitions are from Bloomberg – how they define these variables.

“Total return gross dividend” is used as the measure of return; this includes dividends and adjust for changes in the number of stocks. As Fama-French (1992a, 1993, 1996, 1998), we use discreet returns.

We obtained adjusted betas $\beta_{adjusted} = \beta_{calculated} \times \frac{2}{3} + 1 \times \frac{1}{3}$. Bloomberg calculate the betas using weekly returns for two years and the OBX index as the market. The adjusted beta is an estimate of a securities future beta. Evidence suggest that stock’s beta move towards that of the market, hence they converge towards one (Wright).

The variables used in the multiples are defined as follows:

Market capitalization (Market cap) = Total value of a company’s outstanding shares.

Enterprise value = Market cap + preferred equity + minority interest + total debt – cash & equivalent.

Book value = Total common equity according to the balance sheet.

Net income = Earnings per share before extraordinary items x number of shares.

EBITDA = Earnings before interest expenses, income taxes, depreciation and amortization.

EBIT = Earnings before interest expenses and income taxes.

FCFF = Operating cash flow (net income + depreciation & amortization + other noncash + changes in non-cash working capital) - capital expenditures + interest expenses*(1-effective tax rate).

FCFE = Cash flows from operating (net income + depreciation & amortization + other noncash + changes in non-cash working capital) + capital expenditures/property additions + disposal of fixed assets + increase/decrease ST borrowings + net change in LT debt (cash flow) + increased preferred stock- total cash preferred dividends.

11.8 Gross return

Table 31: Gross return for the value-weighted portfolios (2)

09.2000-01.2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	8,7 %	8,8 %	16,1 %	9,7 %	10,1 %	4,9 %
Medium	9,3 %	8,2 %	9,8 %	5,2 %	8,0 %	8,7 %
High	0,9 %	1,7 %	8,3 %	4,7 %	6,6 %	5,2 %
OSEBX	7,4 %	7,4 %	7,4 %	7,4 %	7,4 %	7,4 %
09.2000-05.2008	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	18,7 %	19,2 %	24,4 %	19,0 %	21,7 %	11,8 %
Medium	9,8 %	10,1 %	14,2 %	11,1 %	10,8 %	17,5 %
High	4,6 %	3,2 %	12,0 %	2,5 %	6,2 %	7,4 %
OSEBX	11,6 %	11,6 %	11,6 %	11,6 %	11,6 %	11,6 %
05.2008-01.2015	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	-1,7 %	-2,0 %	7,2 %	-0,1 %	-1,9 %	-2,5 %
Medium	8,8 %	6,1 %	4,9 %	-1,2 %	4,8 %	-0,6 %
High	-3,3 %	0,0 %	4,2 %	7,3 %	7,1 %	2,7 %
OSEBX	2,8 %	2,8 %	2,8 %	2,8 %	2,8 %	2,8 %

The gross return is computed as the annualized geometric average return. All portfolios with annualized gross return higher than the market (OSEBX) are marked with green.

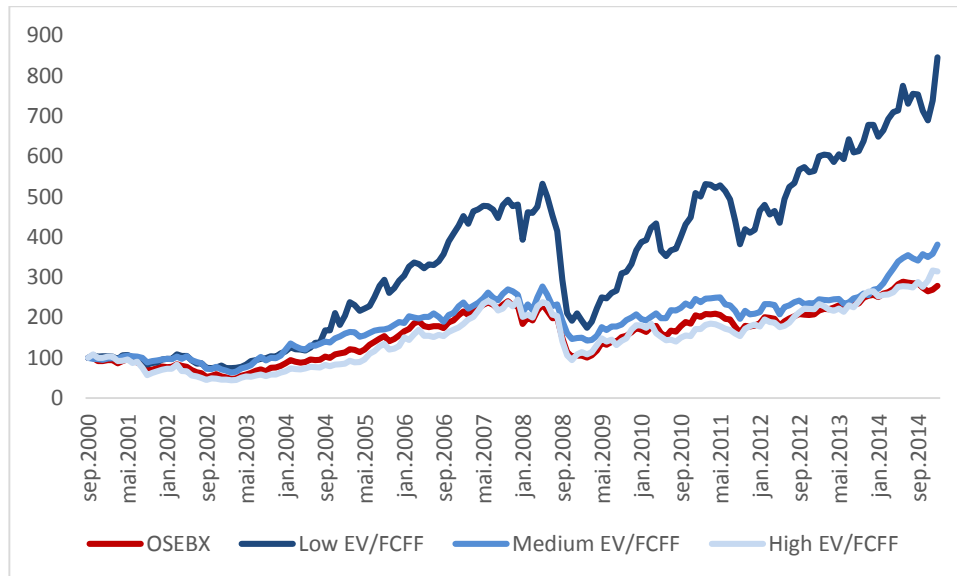
In the table above, all value-weighted portfolios with annualized gross returns higher than the market (OSEBX) are marked with green. Except from the P/B multiple, buying portfolios with low multiples yielded higher gross returns than the market for the whole period (2000-2015). Dividing the whole period in a period before the start of the financial crisis (2000-2008) and a period after the start of the financial crisis (2008-2015) reveals huge differences in the relative gross return (compared with the market). In the period before the financial crisis, all portfolios with low multiples yielded higher gross returns than the market. In the period after the financial crisis, only low EV/FCFF yielded a higher gross return than the market. Except from P/B, the gross returns falls as you go from the low multiple portfolio to the high multiple portfolio in the first period. In the second period, this is just the case for the EV/FCFF multiple.

We notice that *all* EV/FCFF portfolios yielded higher gross returns than the market in both sub-periods. This indicates that the companies with a valid EV/FCFF multiple is not a representative sample of the stocks on the Oslo Stock Exchange.

EV/FCFF seems to be the best selection tool based on the gross returns. It is the only multiple with a clear relationship between the value of the multiple and future gross returns in all periods. This is in line with what we found after correcting for risk. Hence, EV/FCFF seems to be the best selection tool to predict both gross and abnormal returns. Below, we show a graph of the cumulative return for the value-weighted EV/FCFF portfolios. By examining the

graph, we can clearly see that low EV/FCFF has been a much better investment than OSEBX. Investing NOK100 in OSEBX and low EV/FCFF in 2000 have resulted in a wealth of NOK279 and NOK845 in 2015 respectively.

Figure 12: EV/FCFF cumulative return for the value-weighted portfolios



11.9 R-squared

It may also be interesting to examine the r-squared of the different regressions. In the table below, you can see the r-squared for the different portfolios using both the CAPM and the Fama-French model.

Table 32: R-squared

CAPM	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.803	0.756	0.650	0.756	0.656	0.772
Medium	0.806	0.749	0.754	0.781	0.743	0.882
High	0.822	0.771	0.706	0.693	0.650	0.823
Long-short	0.141	0.057	0.000	0.001	0.005	0.053
Fama-French	EV/EBITDA	EV/EBIT	EV/FCFF	P/E	P/FCFE	P/B
Low	0.809	0.768	0.660	0.777	0.670	0.828
Medium	0.807	0.752	0.757	0.789	0.752	0.882
High	0.826	0.772	0.709	0.708	0.660	0.843
Long-short	0.170	0.083	0.025	0.086	0.066	0.308

The regressions $r_t - r_{f,t} = \alpha + \beta_1(R_{m,t} - r_{f,t}) + \beta_2HML_t + \beta_3SMB_t + \epsilon_t$ and $r_i - r_{f,t} = \alpha + \beta_1(r_{m,t} - r_{f,t}) + \epsilon_i$ are run for each portfolio and the r-squared are collected. The R-squared are for the value-weighted portfolios. There are 172 monthly observations between 2000 and 2015.

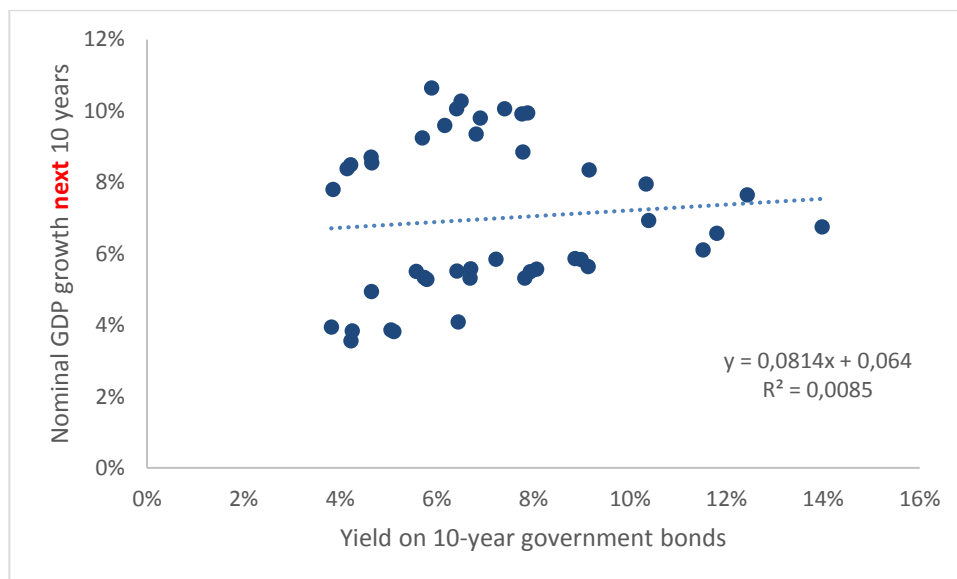
The Fama-French regressions have a slightly higher r-squared. Including more explanatory variables, always make the r-squared higher so that is not surprising. Both the CAPM and Fama-French model seems to explain the returns quite well. For the low, medium and high multiple portfolio, the r-squared varies from 0,650 to 0,882 using the CAPM, and from 0,660 to 0,882 using the Fama-French factors. The results for the equally-weighted portfolios are quite similar.

11.10 Risk-free rate

In this section, we argue that it is reasonable to assume that the that the long-term growth rate and return on new equity investments have stayed constant, while the risk-free rate has decreased in the period after the start of the financial crisis.

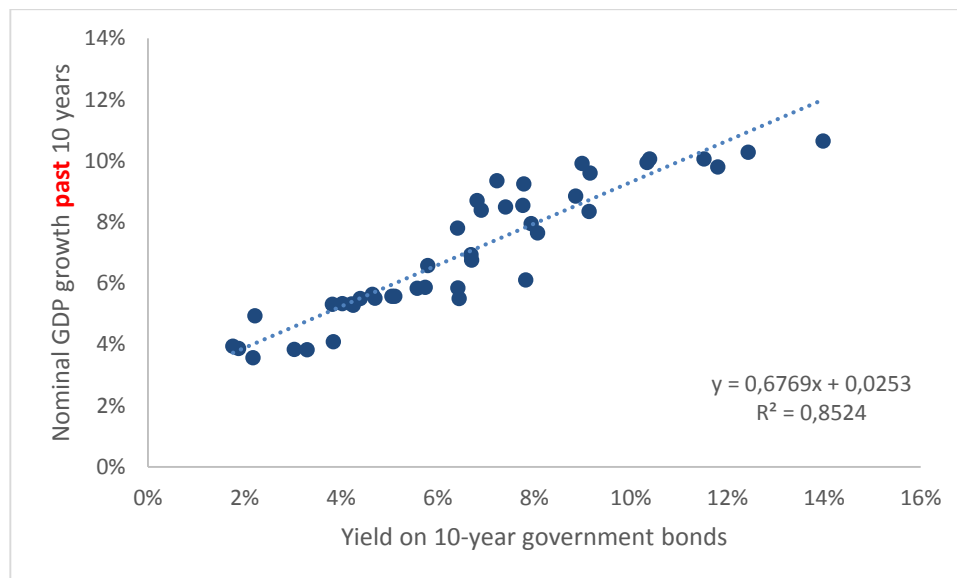
In the long term, the risk-free interest rate should converge on the nominal growth rate of the economy (Damodaran, 2012). Thus, it is inconsistent to assume that a company (*Growth*) will continue to grow at a rate of 4% per year if the risk-free interest rate (and nominal GDP growth) decreases from 5% to 3%. Then, the company (*Growth*) would eventually become larger than the world economy in which it operates. This is obviously not possible. Below, we show the historical relationship between the yield on 10-year US government bonds and 10-year nominal GDP growth in the US. We do not find any relationship between the yield on 10-year government bonds and the *future* 10-year nominal GDP growth:

Figure 13: Yield and future growth



However, we find a very strong relationship between the yield on 10-year government bonds and *past* 10-year nominal GDP growth:

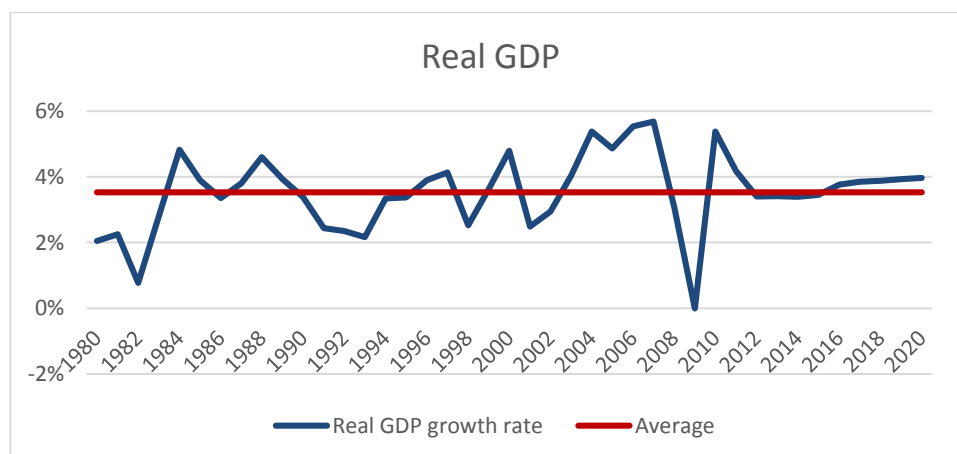
Figure 14: Yield and past growth



In other words, the risk-free rate seems to describe the *past* nominal growth, not the *future* nominal growth. Thus, we cannot use the risk-free rate as a good predictor of *future* economic growth. When the risk-free rate is low (high) it is often because the central banks respond to low (high) economic growth.

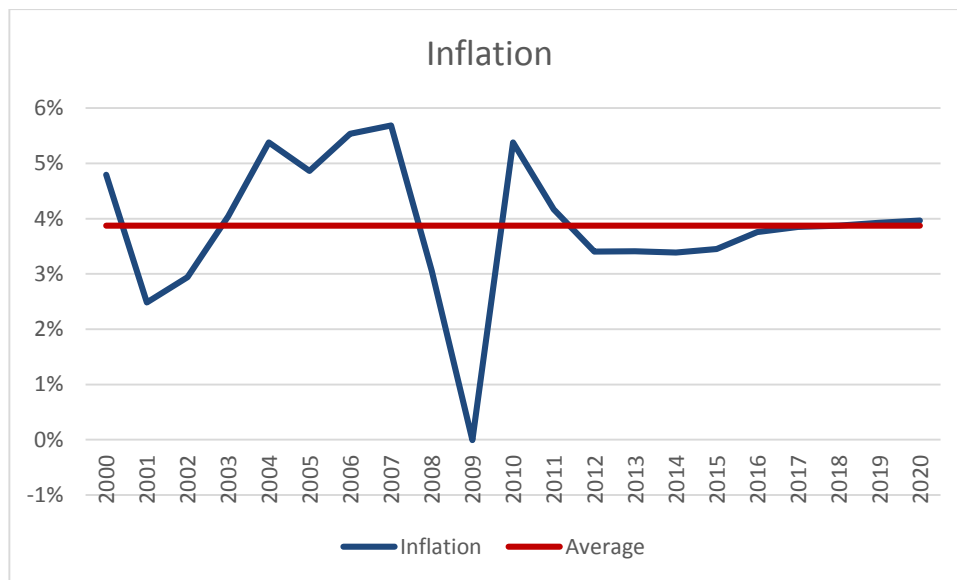
IMF does not seem to believe in a very low nominal growth rate over the next couple of years. In the graph below, we show IMF's estimate of the historical and future real GDP growth rate for the world economy. As we can see from the graph, IMF seem to believe in a real growth rate slightly higher than the historical average.

Figure 15: IMF real growth



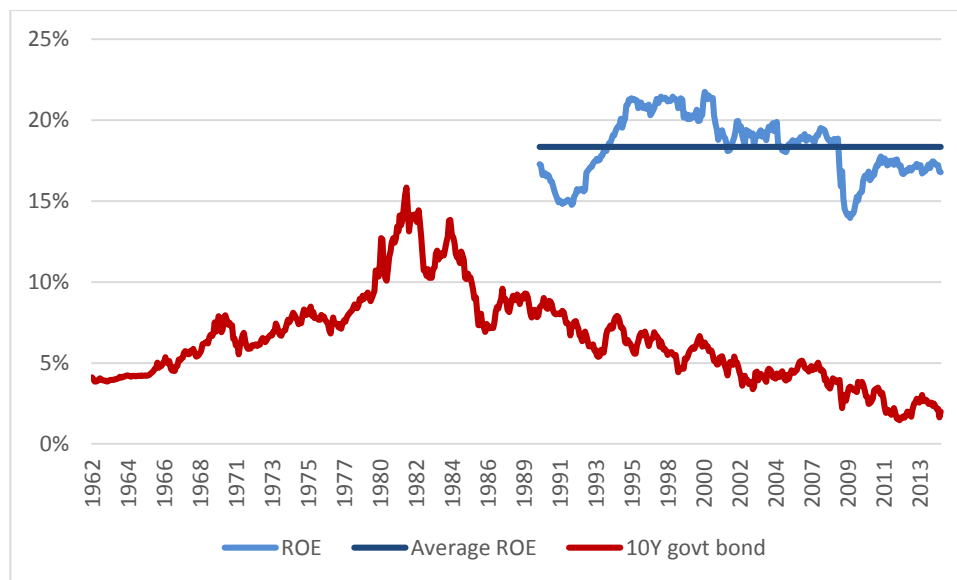
In the table below, we show IMF's estimate of the historical and future inflation rate for the world economy. As we can see from the graph, IMF seem to believe in an inflation rate close to the historical average. As the nominal GDP growth is the sum of the real growth rate and the inflation rate, IMF seem to predict a nominal growth rate slightly higher than the historical average. Thus, we believe that it is reasonable to assume that the long-term growth rate has stayed constant in the period after the start of the financial crisis, even though the risk-free rate has decreased.

Figure 16: IMF inflation



It is natural to assume that the return on new equity investments will decrease when the cost of equity decreases. Consider a company with an investment opportunity generating a return on equity of 10%. The company should not make the investment if the cost of equity is 15%. However, it should make the investment if the cost of equity is 5%. Below, we show that the continuous decrease in the yield on 10-year US government bonds since the early 1980s has not affected the return on equity for companies included in the S&P 500 index:

Figure 17: Return on equity



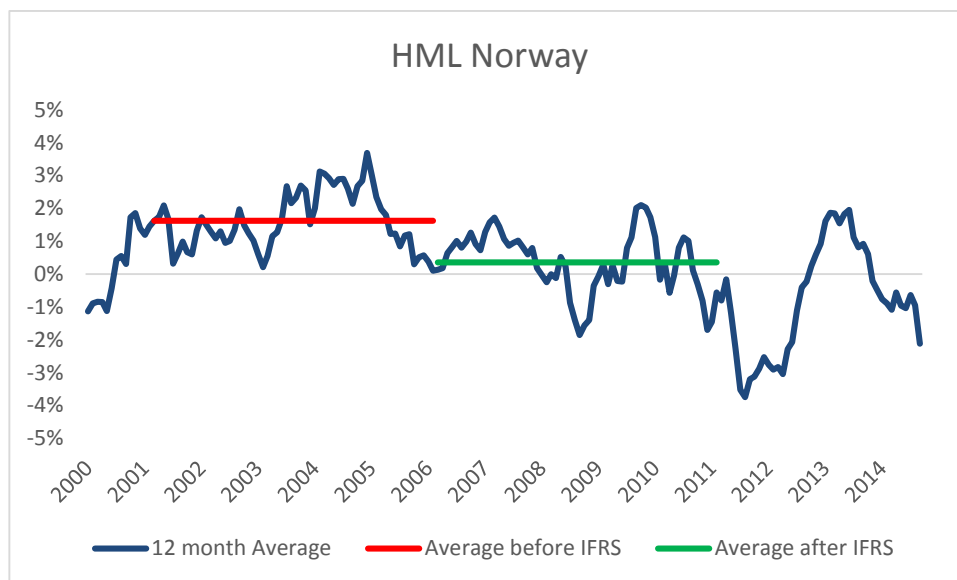
The return on equity should only gradually converge to the return on new equity investments. However, we believe that we should be able to observe a decline in the return on equity after 35 years of decline in the risk free rate if the return on new equity investments decreases when the interest rate decreases. Thus, we believe that it is reasonable to assume that the return on new equity investments have stayed constant in the period after the start of the financial crisis, even though the risk-free rate has decreased.

11.11 IFRS

In 2002, The European Union decided that all companies listed on a stock exchange should follow the IFRS standard for financial reporting from 2005 (ICAEW, 2015). The main difference between IFRS (International Financial Reporting Standard) and the previously used NGAAP (Norwegian Generally Accepted Accounting Principles) is that IFRS values debt and assets to “fair value”, while NGAAP use historical cost. Beisland & Knivslå (2015) find that the transition to IFRS decreases the gap between market values and book values. When it comes to earnings, their conclusion is not that clear, but they expect that the use of IFRS will result in a weaker relationship between returns and earnings.

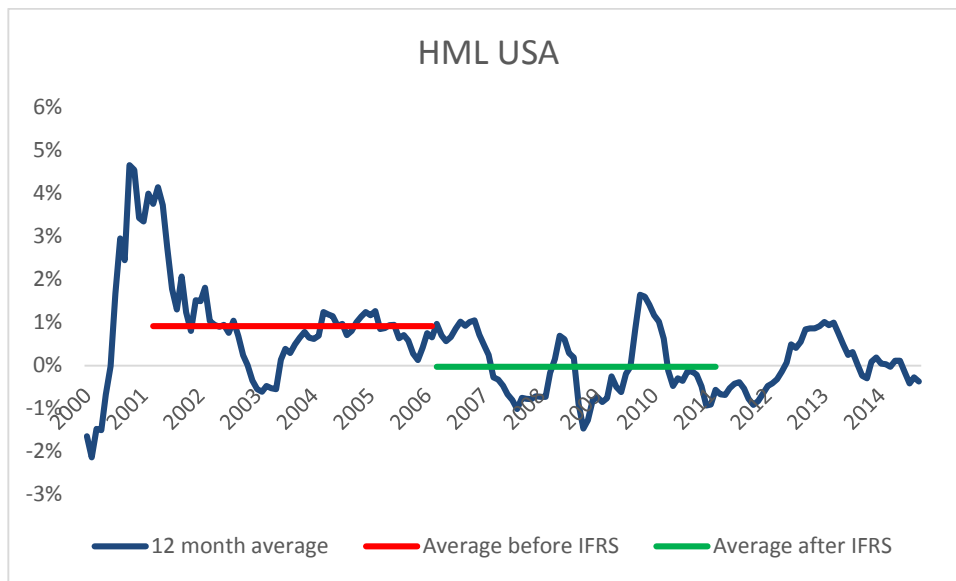
Even though Beisland & Knivslå argues that the introduction of IFRS have changed the relationship between accounting variables and the return on stocks, their study does not outline the consequences for value (growth) strategies. The change in the accounting rules in 2005 would first affect the value (growth) portfolios from July 2006. If the introduction of IFRS is the reason for the change in the return of value stocks compared to growth stocks, the change must have come in July 2006 and not after the financial crisis as first suggested.

Figure 18: HML Norway



The figure above shows the 12 months rolling average of the HML factor for the Norwegian market. The figure indicates a structural shift in the HML factor after the introduction of the IFRS. However, if we do the same analysis for the US market, which did not change to IFRS, we see the same structural shift, indicating that the picture is more complex.

Figure 19: HML USA



To analyse the effect of IFRS on value strategies more carefully, we have downloaded HML factors from Kenneth French's data library for 14 countries²⁷ that changed the accounting rules to IFRS in 2005, and 6 countries²⁸ that did not change their rules. Using a difference-in-difference approach, we analyse the returns for the 12 months before and after the introduction of IFRS.

²⁷ Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, UK.

²⁸ USA, Japan, Singapore, Canada, Hong Kong and Switzerland

We do the following regression: $r_i = \alpha + \beta_1 Time + \beta_2 Treatment + \beta_3 Treatment \times Time + \epsilon_i$, where β_3 shows the average effect of introducing IFRS. Below, you can see the regression results.

Table 33: Difference-in-difference IFRS

	(1) HML
Time	0.0469 (0.453)
Treatment	-0.0664 (0.459)
TreatmentxTime	-0.171 (0.612)
Constant	0.461 (0.361)
Observations	456
R^2	0.001

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The regression $r_i = \alpha + \beta_1 Time + \beta_2 Treatment + \beta_3 Treatment \times Time + \epsilon_i$ is run. The β_3 shows the treatment effect. HML is measured in percentage terms.

The coefficient of TreatmentxTime is not significant. Thus, we cannot explain the outperformance of growth stocks relatively to value stocks using IFRS even though the coefficient is negative. We do not find evidence for that the introduction of IFRS has affected the relationship between P/B and future returns.

Our analysis is simple and small and assumes that there are no changes other than the introduction of IFRS around the cut-off date in 2006 – which is quite strict. In addition, we only look at one multiple. Use of more countries and a narrower period would make the results less affected by potential bias. A more detailed analysis of the IFRS effect lies beyond the scope of this thesis.

11.12 Abbreviations

B = Book value of equity per share

CAPE = Capital adjusted price to earnings ratio

Capex = Capital expenditure

CAPM = The Capital Asset Pricing Model

DA = Depreciation and amortization

DCF = Discounted cash flow

CF = Cash flow

E = Earnings per share = EPS

EBIT = Earnings before interest and taxes

EBITDA = Earnings before interest taxes depreciation and amortization

EV = Enterprise value

EV/EBIT = Enterprise value to earnings before interest rate and taxes.

EV/EBITDA = Enterprise value to earnings before interest rate, taxes, depreciation and amortization.

EV/FCFF = Enterprise value to free cash flow to firm

FCFE = Free cash flow to equity per share

FCFF = Free cash flow to firm

g = Long-term growth

Growth portfolio = *High* multiple portfolio

Growth stocks = Stocks with a high value of a pricing multiple

HML = The return of low P/B firms minus high P/B firms

IR = Net investment rate.

k = cost of equity

Market cap = Market capitalization

NOPLAT = Net operating profit less adjusted taxes

OpWC = Operating working capital

P = Value per share

P/B = Price to book value per share

P/E = Price to earnings per share

P/FCFE = Market capitalization to free cash flow to equity

ROE = Return on equity

ROIC = Return on invested capital

RONE = Return on new equity investment

RONIC = Return on new invested capital

SMB = The return of small firms minus the return of big firms

Value portfolio = *Low* multiple portfolio

Value stocks = Stocks with a low value of a pricing multiple

WACC = Weighted average cost of capital

WML = The return of last period winners minus the return of the losers