The cross-sectional return differences for Dutch equities using the three-factor model and the effect of a sentiment factor on these cross-sectional results.

Master Thesis Financial Economics

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Abstract

I autonomously test both the traditional finance theories and the behavioral finance theories regarding their explanation for the variation in excess returns. To do so, I first test whether the three-factor model of Fama and French is applicable to describe the cross-sectional return differences for Dutch equities. I find that the results contradict the findings of Fama and French, as the market and book-to-market factor loadings show negative risk premiums. Furthermore, I examine the role of five different investor sentiment factors on the explanatory power of the market, size and value premium on the variation in excess returns. I find that, extending the three-factor model with a sentiment factor, weakens the explanatory power of the market and size premium on the variation in excess returns and decreases the possibility of omitted variables. However, the risk-based explanation of the traditional finance theories cannot be rejected as the explanatory power of the value premium on the variation in excess returns becomes stronger. This means that, in the debate between the traditional finance theories and the behavioral finance theories for explaining the variation in excess returns, this thesis provides evidence for both sides. So, the variation in excess returns for Dutch equities can be explained by both risk and mispricing combined.

1. Introduction

In the past, researchers have commonly used traditional finance theories to explain the variation in excess returns. In their explanation, these traditional finance researchers tell that stock investors require compensation for bearing more systematic risk and therefore, a higher excess return is expected. One of the most influential traditional finance theories is the Capital Asset Pricing Model (CAPM) of Sharp (1964) and Lintner (1965). Sharp and Lintner suggest that the variation in excess returns can be explained by a market risk premium. This means that stock investors require an additional compensation for bearing more non-diversifiable individual company risk. In 1993, Fama and French extend the findings of the CAPM with two stock-related common risk factors. These stock-related risk factors are a book-to-market factor and a size factor. Fama and French (1993) find positive and statistically significant loadings on both the factors. This indicates that investors require a positive compensation for bearing more book-to-market risk (value premium) and size risk (size premium), as smaller companies and companies with a high book-to-market ratio are more likely to go bankrupt. The results of Fama and French are, however, according to Bishop, Crapp, Faff and Twite (2000), only applicable for US listed companies. Therefore, it is arguable whether the three-factor model needs more empirical investigation before it can be accepted as a credible theory (Bishop et all, 2000). Besides, upcoming behavioral finance theories created a lot of pressure on this risk-based explanation. For example, de Bondt and Thaler (1985-1987) use momentum effects for explaining the variation in excess returns and Lakonishok, Shleifer and Vishny (1994) find that investment strategies, contrarian to excessive extrapolation[1] strategies, generate higher stock returns. Besides, Daniel and Titman (1997) argue that the findings of Fama and French (1993) are correct but that the positive loadings on both the book-to-market and size factor can be explained by the characteristics of the firms (mispricing) rather than by systematic risk. Furthermore, Baker and Wurgler (2006) challenge the traditional finance theories by adding an investor sentiment index to the three-factor model to study the effects of sentiment on the cross-section of stock returns. Their results show a negative relation between future stock returns and beginning-of-period proxies for sentiment. So

[1] Excessive extrapolation based strategies are: (1) optimism towards growth stocks and pessimism towards value stocks because future growth expectations are tied to past growth, (2) assuming a trend in the stock price, (3) overreacting to good or bad news.

younger, smaller and unprofitable firms tend to have low subsequent returns when the level of sentiment is high.

The research question of this thesis is partially based on the findings Bishop, Crapp, Faff and Twite (2000), as there is not much empirical evidence for the robustness of the three-factor model outside the US. Furthermore, the research question is based on the discussion between the traditional finance (risk-based) theories and the behavioral finance (mispricing) theories regarding their explanation for the variation in excess returns:

Is the three-factor model applicable to describe the cross-sectional return differences for Dutch equities and what effect does an investor sentiment factor have on these cross-sectional results?

The answer to this research question may provide additional empirical evidence of the three-factor model outside the US, making it a more credible theory. However, the value and size premium, and thus the variation in excess returns, are partially based on mispricing, when after adding an investor sentiment factor, the effect of the book-to-market factor or the size factor on the variation in excess returns becomes weaker. This creates new evidence in support of the behavioral finance theories.

To answer the research question, I first construct the book-to-market factor and the size factor in three different ways to create the three-factor model. Thereafter, I extend the three-factor model with four different sentiment factors following the methodology of Ho and Hung (2012). These sentiment factors are defined in five different ways and are constructed after estimating the sentiment betas per individual company and sorting the sentiment betas into deciles and quintiles. I find that the average return difference between the portfolios with the highest positive factual sentiment beta and the portfolios with the lowest positive factual sentiment beta ranges from -0,61% to 0,48% per month. Besides, I find that the average return difference between the portfolios with the most negative factual sentiment beta and the portfolios with the least negative factual sentiment beta ranges from -1,06% to 0,68% per month.

The Fama-MacBeth two-pass regression is used to test whether the loadings on the market, size, book-to-market and sentiment factor command a risk premium.

Furthermore, this two-pass regression is used to test whether the sentiment factor changes the risk premiums of the market, size and book-to-market factor loadings. If so the value and size premium, and thus the variation in excess returns, are partially based on mispricing. As a result of the Fama-MacBeth two-pass regressions, I find that in portfolios consisting of Dutch equities, the market, size and book-to-market factor loadings do not hold a statistically significant positive risk premium in the three-factor model. Besides, I find that investors command a positive risk premium for all the sentiment factors in the extended CAPM. This risk premium is, however, negative when the sentiment factors are added to the three-factor model. Furthermore, when the sentiment factors are added to the three-factor model, I find that the effect of the market, value and size premium on the variation in excess returns changes. First of all, the risk premium on the market factor loading remains constant, but overall less significant, indicating a weaker effect of the market risk premium on the variation in excess returns. Secondly, the risk premium on the book-to-market factor loading also remains constant for all the extended three-factor models. Hence, the significance of the risk premium on the book-to-market factor loading increases for six out of seven sentiment factors, meaning that the effect of the value premium on the variation in excess returns becomes stronger. Lastly, the risk premium on the size factor loading decreases and becomes less significant, meaning that the effect of the size premium on the variation in excess returns becomes weaker. The constant of the extended three-factor model mostly decreases in significance for five out of seven sentiment factors. This means that mostly the extended three-factor models are less likely to have omitted variables. The weaker effect of the market and size premium on the variation in excess returns in the extended three-factor model, combined with the decrease in the possibility of omitted variables in the extended three-factor model might indicate that the variation in excess returns can be partially explained by mispricing. However, the risk-based explanation of the traditional finance theories cannot be rejected as the effect of the value premium on the variation in excess returns becomes stronger.

The structure of this thesis is organized as follows. In chapter two, previous literature about the debate between the traditional finance theories and the behavioral finance theories for explaining the variation in excess returns is covered in more details. Thereafter, in chapter three the chosen time-period, data and methodological approach are explained in order to answer the research question. Moreover, in chapter three, the hypotheses are formulated, the factors for both the three-factor model and the extended three-factor model are constructed, the different ways for defining sentiment are discussed, and the four different Fama-MacBeth regressions are explained. In chapter four, the main results are presented. These results show, first of all, the findings of the three-factor model for a portfolio consisting of Dutch equities. This means that this chapter will explain whether the market, book-to-market and size factor loadings command a statistically significant risk premium. Besides, this chapter explains the regression results for the CAPM and the extended CAPM, meaning that this section will show whether the sentiment factor loadings command a risk premium. Furthermore, chapter four tests whether the risk premiums on the market, book-to-market and size factor loadings change when a sentiment factor is added to the model. Lastly, chapter four shows the results of two robustness checks in order to verify the correctness of the performed tests. The last chapter, chapter five, consists of a conclusion and the implications of the findings.

2. Literature review

Previous literature shows that the variation in excess returns is partly driven by a value premium and a size premium. However, researchers seem to have different explanations for this event to happen. Sharp (1964) and Lintner (1965) explain that the variation in excess returns finds its source in the capital asset pricing model (CAPM). The CAPM is a theoretical model, which explains the relation between the expected stock return and a systematic risk factor (also: non-diversifiable risk):

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \quad (1)$$

The β_i indicates the factor loading of an individual company stock i to the market risk premium. If the factor loading of an individual company stock is high, investors will demand a higher compensation for bearing more systematic risk. This leads to a higher expected return.

In addition to the CAPM, Merton argues in 1973 that the consumption and investment opportunity sets of investors are influenced by non-diversifiable shocks[2]

[2] According to the intertemporal capital asset pricing model (ICAPM) of Merton

(Merton, 1973). Stocks with a high book-to-market ratio are assumed to be correlated with these non-diversifiable shocks and therefore hold a risk premium, which is systematic. Fama and French (1993) build further on this assumption and add two stock-related common risk factors to the CAPM, creating the three-factor model. These stock-related risk factors are a size factor (SMB) and a book-to-market factor (HML). The SMB factor indicates the return difference between small-sized companies and big-sized companies and the HML factor indicates the return difference between companies with a high book-to-market ratio and companies with a low book-to-market ratio. Fama and French (1993) find positive and statistically significant loadings on both the HML and SMB factor, β_i^{HML} and β_i^{SMB}, for portfolios consisting of stocks from the NYSE, NASDAQ and AMEX. These positive factor loadings indicate a compensation for bearing systematic risk. Hence, Fama and French (1993) argue that the loadings on the book-to-market factor (value premium) and the size factor (size premium) are compensations for financial distress risk, as smaller companies and companies with a high book-to-market ratio are more likely to go bankrupt. This risk-based explanation is the first explanation for the variation in excess returns. The results of Fama and French are, however, according to Bishop, Crapp, Faff and Twite (2000), only applicable for US listed companies. Therefore, it is arguable whether the three-factor model needs more empirical investigation before it can be accepted as a credible theory (Bishop et all, 2000).

The second explanation for the variation in excess returns depends on mispricing and finds its source in behavioral finance theories. De Bondt and Thaler (1985-1987) use momentum effects for explaining the variation in excess returns. They find that investors tend to overreact to stocks, as they buy stocks that performed well in the past and they sell stocks that performed badly in the past. This overreaction creates underpriced value stocks and overpriced growth stocks. In addition, Lakonishok, Shleifer and Vishny (1994) (hereafter: LSV) find that investment strategies, contrarian to excessive extrapolation strategies, generate higher stock returns. LSV explain that the value premium depends on an overreaction of investors. This overreaction is due to an undervaluation of the value stocks. Moreover, they find that the value premium is not risk-based, but can be explained by time-dependent and predictable abnormal returns on stocks, which indicates mispricing.

Daniel and Titman (1997) support the evidence of mispricing of LSV (1994). Consistent with Fama and French (1993), Daniel and Titman (1997) find that both the HML and SMB factor are highly correlated with the average stock returns. However, Daniel and Titman (1997) explain that the positive loadings on both the HML and SMB factor, and therefore the variation in excess returns, can be explained by the characteristics of the firms (mispricing) rather than by systematic risk.

Furthermore, to see whether the traditional risk-based theories or the behavioral "mispricing" theories explain the variation in excess returns more conveniently, Baker and Wurgler (2006) add a sentiment factor to the traditional finance theories. Baker and Wurgler predict that stocks, which are most subject to sentiment, have the biggest positive relation between stock price and investor sentiment. Besides, they find a negative relation between future stock returns and beginning-of-period proxies for sentiment. So younger, smaller and unprofitable firms tend to have low subsequent returns when the level of sentiment is high. So, consistently with the behavioral finance theories, Baker and Wurgler (2006) explain that positive factor loadings do not indicate a compensation for bearing more systematic risk but rather provide empirical evidence for mispricing.

My thesis contributes to the previous literature by autonomously test both the traditional finance theories and the behavioral finance theories regarding their explanation for the variation in excess returns. To test the traditional risk-based theories, I will check for the robustness of the three-factor model on the Dutch equity market using the methodology of Fama and French (1993,). The Dutch equity market is used, as there is not much empirical evidence for the robustness of the three-factor model outside the US (Bishop, Crapp, Faff & Twite, 2001). Thereafter, I will test the behavioral finance theories by extending the three-factor model of Fama and French (1993) with a sentiment factor following the methodology of Ho and Hung (2012). This is done to test whether the factor loadings (value and size premium) are based on risk, mispricing or both risk and mispricing.

3. Data and Methodology

This chapter presents the chosen sample period and data, which are used in the research. Thereafter, it shows the methods, which are employed in order to test the hypotheses. The main models in this research are the CAPM of Sharpe (1964) and Lintner (1965), the Fama and French three-factor model and the extended three-factor model (Ho and Hung, 2012). The most important variables in these models are the market factor, the size factor and the book-to-market factor. These factors are constructed using the methodology of Fama and French (1993). The hypotheses are tested by extending the CAPM and the three-factor model with a sentiment factor. This sentiment factor is defined in five different ways and is constructed after estimating the sentiment betas per individual company and sorting the sentiment betas into deciles and quintiles (Ho and Hung, 2012). The Fama-MacBeth two-pass regression methodology is used to test whether the loadings on the market, size, book-to-market and sentiment factor command a risk premium. Furthermore, this two-pass regression methodology is used to test whether the sentiment factor changes the risk premiums of the market, size and book-to-market factor loadings. Lastly, the Fama-MacBeth two-pass regression methodology is used in order to test the correctness of the three-factor model and the extended three-factor model by adding a momentum factor.

3.1 Data

The dataset is constructed using monthly market data and monthly individual company data of all Euronext Amsterdam equities for the period of 2004 to 2014. The reason for this relatively short sample period is that a longer estimation period for beta increases the probability of the true beta to change over time. This results in biased estimations of beta (Bartholdy & Peare, 2004). As in this research individual company betas are estimated twice through a rolling regression, a short sample period is more likely to generate unbiased results. However, this short sample period might cause a survivorship bias to arise because a lot of companies prior to 2004 are left out. Hence, expected is that a short sample period will generate a less biased result (Bartholdy & Peare, 2004). Furthermore, the data of the investor sentiment index of Baker and Wurgler is limited to 2014 and therefore the sample period is bounded to 2004-2014.

The monthly individual company data is obtained using Datastream. For each company, the book value of common equity, share price and common shares outstanding are downloaded. The monthly stock returns are calculated by the monthly percentage change in share price, corrected for stock splits. Furthermore, the market equity of month t is calculated by multiplying the stock price of December of year $t-1$ with the shares outstanding of month t. The last individual company variable is the book-to-market ratio. The book-to-market ratio for July of year t to June of year $t+1$ is calculated by dividing the fiscal year ending book value of common equity of December of year $t-1$ with the market equity of December of year $t-1$ (Fama and French, 1993). The book value of common equity of December of year $t-1$ is used to be confident that investors have knowledge of the book equity in year t.

The monthly market data consists of the market return, risk-free rate, investor sentiment index and the Dutch consumer confidence index. The monthly market return is the average portfolio return of all the individual companies, used in the dataset, on month t. Furthermore, the monthly risk-free rate is calculated using the yield on a ten-year Dutch government bond. Lastly, the monthly investor sentiment index is acquired from the updated[3] dataset of Baker and Wurgler (2006), and the Dutch consumer confidence index is obtained from the OECD (OECD, 2017).

After acquiring all the data for the research, multiple restrictions are used to adjust the dataset. First, all individual company data must be available during the sample period. Secondly, the company needs to be continuously present in the dataset for at least 24 months because of the rolling regressions. This can again lead to a survivorship bias, as companies, which are in the dataset for less than 24 months, are eliminated. Lastly, the monthly individual company data, common shares outstanding, share price and book-to-market ratio need to be positive. These restrictions result in a dataset consisting of 72 companies for a sample period of 2004-2014.

The descriptive statistics of the dataset are shown in table 1. The average book-to-market ratio is 0,747 and the average market equity of the companies is 6,332 billion euro. The average excess return for these companies is 0,10% per month, meaning that on average an individual company outperforms the market with 1,2% per year. The total amount of observations is 7776, as the number of individual companies is 72 and the sample period consists of 108 months after estimating the individual company sentiment betas. A 99% Winsorization is used as the book-to-market ratio showed outliers prior to the estimation of the individual company sentiment betas.

[3] The updated version of March 31, 2016 is used.

3.2 Methodology

This section explains the methods that are employed in order to test the hypotheses. The Fama and French (1993) three-factor model and the extended three-factor model according to the methodology of Ho and Hung (2012), form the main models that are used in this study. First, the monthly market returns are used to construct the market factor. Secondly, the firm-specific characteristics: stock price, common shares outstanding and book value of common equity are used to create a book-to-market and a size factor. To extend the three-factor model, I created a sentiment factor using two different market-based indices. The first market-based index is the investor sentiment index of Baker and Wurgler (2006). This index can be used because the Netherlands consist of an open economy as its import and especially its export form a significant share of the GDP. Besides, in 2014, the Netherlands was one of the biggest foreign investors in the United States, and many major Dutch companies are active in the United States insurance, banking, chemical and oil industries (Government of the Netherlands, 2017). The second market–based index is the Dutch consumer confidence index of the OECD, as this index shows how sensitive Dutch investors are to movements in the market (OECD, 2017). As these two indices are market-based, the sentiment factor is created by estimating individual company sentiment betas and sorting these betas into deciles and quintiles. Lastly, this section explains four different Fama-MacBeth regressions. The first Fama-MacBeth regression is used to test whether the three-factor model factor loadings command a risk premium. Thereafter, in the second Fama-MacBeth regression, the CAPM of Sharp (1964) and Lintner (1965) is extended with a sentiment factor to examine whether this sentiment factor commands a risk premium. In the third Fama-MacBeth regression, the three-factor model is extended with a sentiment factor. This is done to test whether adding a sentiment factor changes the original risk premiums of the three-factor model factor loadings. In the last Fama-MacBeth regression, both the three-factor model and the extended three-factor model are extended with a momentum factor to test the correctness of the models.

3.2.1 Construction of the model

In 1993, Fama and French created the three-factor model and found evidence of positive and statistically significant loadings on both the size factor (SMB) and the book-to-market factor (HML) for portfolios consisting of stocks from the NYSE, NASDAQ and the AMEX. The first objective of this paper is to test whether this three-factor model of Fama and French is also applicable for portfolios consisting of Dutch equities. Therefore, the first model, which is used in this paper, is the three-factor model:

$$R_{it} - R_{ft} = \alpha + \beta_i^{MKT} * MKT_t + \beta_i^{SMB} * SMB_t + \beta_i^{HML} * HML_t + \varepsilon_t \quad (2)$$

The second objective of this paper is to test whether the loadings on the size factor and the book-to-market factor change when a sentiment factor (SMN) is added to the model. Whereas Fama and French (1993) explain that these loadings indicate a compensation for bearing more systematic risk, a change in size or the significance of the loadings on the book-to-market and the size factor when a sentiment factor is added might indicate mispricing. To test the second objective, the size and the significance of the betas of the three-factor model are compared with the size and significance of the betas of the three-factor model where a sentiment factor is added. The model with the sentiment factor included is called the extended three-factor model and is created using the methodology of Ho and Hung (2012). The extended three-factor model:

$$R_{it} - R_{ft} = \alpha + \beta_i^{MKT} * MKT_t + \beta_i^{SMB} * SMB_t + \beta_i^{HML} * HML_t + \beta_i^{SMN} * SMN_t + \varepsilon_t \quad (3)$$

Before these two regressions can be done, the MKT, HML, SMB and the SMN factor need to be constructed using the data of 72 Dutch listed companies.

3.2.2 Estimating the individual company sentiment betas

The three-factor model of Fama and French (equation 2) consist of a market factor (MKT), a size factor (SMB) and a book-to-market factor (HML). These three factors are created using the firm-specific characteristics: stock price, common shares outstanding and the book value of common equity. The extended three-factor model (equation 3) also consists of a sentiment factor, which is formed using a market-based investor sentiment index and a market-based consumer confidence index. To get a better comparison between the MKT, SMB, HML and the sentiment factor, the market-based sentiment index and confidence index need to be reformed to firm-specific values. This can be done by estimating the individual company sentiment betas and confidence betas. These betas constitute the sensitivity of an individual company stock to sentiment and consumer confidence. To estimate the individual company sentiment and confidence betas, the following equations are used:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it} \quad (4)$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{CONF} * \Delta CONF_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it} \quad (5)$$

The $\Delta SENT_t$ is the monthly change in the orthogonalized investor sentiment index of Baker and Wurgler (2006) and the $\Delta CONF_t$ is the monthly change in the Dutch consumer confidence index of the OECD. For every individual company stock i the sentiment beta (β_i^{SENT}) and the confidence beta (β_i^{CONF}) are estimated at each month t using a rolling regression. Brown and Cliff (2005) explain that investor sentiment predicts market returns over the next 1-3 years. Based on these findings the β_i^{SENT} and the β_i^{CONF} are created using a rolling forward window of 24 months, meaning that the observations of month $t - 23$ to month t are used to estimate the betas. This rolling forward window is used to make sure that investor sentiment is incorporated in the returns.

3.2.3 defining the monthly change in sentiment and consumer confidence

To test whether the size and the value premium are based on bearing more systematic risk (factor loadings) or on mispricing in the characteristics, investor sentiment betas and consumer confidence betas must be created. To do so, the monthly changes in investor sentiment and consumer confidence are needed (equation 4 and 5). However, in the updated version of the investor sentiment database of Baker and Wurgler (2006), this monthly change in investor sentiment is not provided. Furthermore, it is not possible to re-run the principal component analysis because the sentiment index is calculated differently in the updated version and component data is not published. Therefore, the monthly change in investor sentiment is defined in multiple ways to consider changes in levels of the index as an approximation, whereas the monthly change in Dutch consumer confidence is only defined in one way.

3.2.3a defining the monthly change in sentiment

Method 1:

First of all, the factual orthogonalized investor sentiment index of Baker and Wurgler (2006) is used as the monthly change in investor sentiment. This means that the sentiment factor of equation 3 depends on the factual sentiment index of Baker and Wurgler. So, if the sentiment factor does influence the market, size and value premium, this can directly be assigned to the sentiment index values.

Method 2:

The second way of defining the monthly change in investor sentiment is based on two assumptions. First of all, the sentiment index is estimated through an OLS estimation, and secondly, the factual values of orthogonalized investors sentiment index are an outcome of the following formula (Baker and Wurgler, 2006):

$$Sentiment_t^{\perp} = -0{,}198CEFD_t^{\perp} + 0{,}225TURN_{t-1}^{\perp} + 0{,}234NIPO_t^{\perp} + 0{,}263RIPO_{t-1}^{\perp} + 0{,}211S_t^{\perp} - 0{,}243P_{t-1}^{D-ND,\perp} \quad (6)$$

In this formula, the level of sentiment is calculated using the closed-end fund discount (CEFD), NYSE turnover (TURN), IPO volume (NIPO), first-day return on IPO (RIPO), equity share in new issues (S) and the value-weighted dividend premium (PDND). The monthly change in investor sentiment is then calculated by taking the first difference estimation:

$$\Delta SENT_t = Sentiment_t^{\perp} - Sentiment_{t-1}^{\perp} \quad (7)$$

Method 3:

In the third way of defining the monthly change in investor sentiment, the factual values of the orthogonalized investor sentiment index are again assumed to be outcomes of equation 6. However, instead of taking the first difference of the factual investor sentiment values, the monthly percentage change is calculated using the following formula:

$$\Delta SENT_t = \frac{Sentiment_t^{\perp} - Sentiment_{t-1}^{\perp}}{Sentiment_{t-1}^{\perp}} \quad (8)$$

Baker and Wurgler (2006) explain that this method of calculating the monthly change in investor sentiment should not be used due to lag structures. Nevertheless, as I cannot calculate the monthly change in the first principal components, this method will be used to test whether lag structures do influence the results.

Method 4:

Lastly, the factual orthogonalized sentiment index of a certain base month is used for the calculation of the monthly change in investor sentiment. For this base month, December 2003 will be used. The reason for choosing this month is that over a period of 20 years, the number of countries of the economic and monetary union, showing a neutral consumer confidence index of the OECD, is the most in December 2003 (OECD, 2017). This means that in December 2003 the most countries of the economic and monetary union showed a value of consumer confidence close to 100. So, December 2003 is assumed to be the sentiment-neutral month. All changes in the level of sentiment are relative to the sentiment-neutral month. Therefore, first, the absolute change in investor sentiment of month t compared with the sentiment-neutral month is calculated. Thereafter, a new sentiment index ($NSI_t^{\perp}$) is formed using December 2003 as the base month (index = 100). Finally, the monthly change in investor sentiment for this method is calculated using the following formula:

$$\Delta SENT_t = \frac{NSI_t^{\perp} - NSI_{t-1}^{\perp}}{NSI_{t-1}^{\perp}} \tag{9}$$

3.2.3b defining the monthly change in consumer confidence

Method 5:

As there has rarely been done any research where the Dutch consumer confidence index is used as a proxy for sentiment, it is not yet known if lag structures will also bias the results of the consumer confidence index. Therefore, in this paper, the monthly change in Dutch consumer confidence index will be calculated by using the following formula.

$$\Delta CONF_t = \frac{Consumer\ confidence_t^{\perp} - Consumer\ confidence_{t-1}^{\perp}}{Consumer\ confidence_{t-1}^{\perp}} \tag{10}$$

It must be noted that for simplicity reasons, as the consumer confidence is used as a proxy for sentiment, in the following sections consumer confidence will also be called sentiment.

3.2.4 Sorting the individual company sentiment betas in portfolio deciles and quintiles

Before the individual company sentiment betas can be sorted into portfolio deciles and quintiles, the rolling regressions of equation 4 and 5 need to be applied 7776 times as the sample data consist of 72 companies with a sample period of 108 months (observations per individual stock). Due to the used rolling forward window of 24 months, the first 23 months of data are lost. This means that the sentiment betas are only calculated for month 24 to month 132. Besides, the sentiment betas consist of both positive and negative values. This means that companies with the most negative sentiment betas and the most positive sentiment betas show the biggest sensitivity to sentiment. Hence, to get a better comparison[4] with the HML and the SMB factor, absolute sentiment betas are created. Therefore, in this paper, the portfolios are sorted based on both factual (positive and negative values) and absolute (only positive values) sentiment betas.

First, the factual sentiment betas are sorted in ascending order and are divided into deciles. For each decile, the monthly average excess return, book-to-market ratio and company size are calculated to check whether the sensitivity of an individual company stock to sentiment is related to these factors (table 2a-2e). Expected is a cubic parabola[5] graph of the sentiment beta as the lowest decile (decile L) consists of the most negative sentiment betas and the highest decile (decile H) consists of the most positive sentiment betas. This expectation seems to be justified by the results for each different method used (figure 2a-2e). The monthly average excess return is expected to show a U-shape since stocks in the highest and the lowest decile exhibit the most sensitivity towards waves of sentiment[6]. This makes stocks in these deciles hard to value, easier to arbitrage and therefore often show higher returns, while stocks in the "middle" deciles are seen as bond-like stocks (Baker and Wurgler, 2006). The results of Dutch equities however only show this U-shape in method 2, 3 and 4 for defining sentiment. Besides, all the methods

[4] The HML factor and the SMB factor only consist of positive values.
[5] A curve which is formed by the function $y = x^3$.
[6] Growth and distress firms tend to lie at opposing extremes and the more stable firms tend to lie in the middle deciles (Baker and Wurgler, 2006).

show frequently lower returns for the highest decile (figure 2a-2e). This might indicate that high positive investor sentiment predicts low future returns (Baker, Wurgler and Yuan, 2012).

According to the findings of Frazzini and Lamont (2008), high sentiment stocks tend to have a low book-to-market ratio, as they find a negative HML coefficient. This means that the sensitivity to sentiment changes is higher among glamor stocks (Glushkov, 2006). Therefore, the monthly average book-to-market ratio is expected to show an inverted U-shape. In contrast with these theoretical findings, Dutch equities tend to show a U-shape instead, meaning that high levels of sentiment are associated with higher book-to-market ratios. Besides, the most positive sentiment betas show the highest book-to-market ratios (figure 2a-2e). This can lead to a contradiction of the findings of Fama and French (1993) as in their model a high book-to-market ratio is associated with higher returns, which is not the case in the highest sentiment decile (table 2a-2e).

The monthly average company size is also expected to show an inverted U-shape as small firms tend to be harder to value, easier to arbitrage and therefore react more to movements of sentiment (Baker and Wurgler, 2006). Dutch equities seem to be consistent with this theory, as only one method does not show evidence of an inverted U-shape (method 3). This can be explained by the lag structures within the components of Baker and Wurgler, resulting in biased results (figure 2a-2e).

When looking at the factual sentiment betas sorted into deciles, method 2 and 4 tend to be the most promising considering past literature. However, due to the small sample data, a robustness check has been done. In the robustness check, the factual sentiment betas are sorted in ascending order and are then divided into quintiles instead of deciles. This is done, to have more observations per quintile. Again, for these quintiles, the monthly average excess return, book-to-market ratio and company size are calculated to check whether the sensitivity of an individual company stock to sentiment is related to these factors (table 3a-3e). The results of the robustness check mostly confirm the previous findings. However, regarding the excess returns, only method 2 and 4 seem to show similar results as past literature; namely, higher levels of sentiment show higher excess returns (figure 3a-3e). Furthermore, must be noticed that method 3 does not follow the past literature in any way, this is probably because of the lag structures in the components of Baker and Wurgler (2006), generating biased results.

Additionally, the portfolios are sorted based on the absolute sentiment betas and are divided into quintiles (table 4a-4e). When using absolute sentiment betas, the monthly average excess return theoretically needs to be increasing over sentiment; this is only the case in method 2 (figure 4a-4e). The monthly average book-to-market ratio and company size need to be decreasing with the sentiment beta in order to satisfy the expectations. For Dutch equities, the relation between the book-to-market ratio and the level of sentiment again seems to be contrarian to the theory. A higher sentiment tends to have a higher book-to-market ratio for almost all methods (figure 4a-4e). The company size is only consistent with the theory in method 1,2 and 4, showing a smaller company size when the level of sentiment is higher.

Overall, method 2 and 4 seem to be the two most promising methods to use considering past literature. However, it must be noticed that method 5 has not been used before and thus might show completely different results.

3.2.5 Constructing the sentiment factors

The portfolio deciles and quintiles of individually estimated company sentiment betas are used to construct four different sentiment factors (SMN, sensitive minus non-sensitive). This means that for each method an SMNPlus, SMNMinus, SMNAverage and an SMNAbsolute factor are constructed. First, the SMNPlus factor is created. This factor is the return difference between the portfolio decile or quintile with the highest positive factual sentiment beta and the portfolio decile or quintile with the lowest positive factual sentiment beta. It must be noted that for the portfolio quintiles, the least positive factual sentiment beta quintile differs between the different methods that are being used (table 3a-3e). Therefore, the SMNPlus factor is constructed using quintile five and quintile four for all the methods to remain a balance between the quintiles and the methods. Secondly, the SMNMinus factor is developed. This factor is the return difference between the portfolio decile or quintile with the most negative factual sentiment beta and the portfolio decile or quintile with the least negative factual sentiment beta. Again, for the calculation of the SMNMinus factor based on portfolio quintiles, the least negative factual sentiment beta quintile differs between the different methods being used (table 3a-3e). Therefore, quintile two and quintile one are used in the construction of the SMNMinus factor to remain a balance between the quintiles and the methods. The third constructed SMN factor is the SMNAverage factor. This factor is calculated by taking the average of the SMNPlus and SMNMinus factor. Lastly, the SMNAbsolute factor is constructed, as the HML and the SMB factor also only consist of positive values. The SMNAbsolute factor is the return difference between the portfolio quintile with the highest positive absolute sentiment beta and the portfolio quintile with the lowest positive absolute sentiment beta.

Table 5 shows the monthly average return differences for the SMN factors based on the factual sentiment betas sorted in portfolio deciles and based on the absolute sentiment betas sorted in portfolio quintiles. Overall, the SMNMinus factor has the biggest monthly average return difference coefficient. This implies that the decile with the most negative factual sentiment beta underperforms to the decile with the least negative factual sentiment beta with on average 1,77%[7] per month over the five methods. Furthermore, the most statistically significant SMN factors are created using the consumer confidence index of the OECD (method 5). However, it must be noted that the t-statistics are relatively low due to the low sample data. In table 6 the monthly average return differences for the SMN factors based on the factual sentiment betas sorted in quintiles are displayed. Again, the SMNMinus factor has the biggest monthly average return difference coefficient. Furthermore, in table 7 the SMN factors show an overall moderate positive correlation with the MKT factor, a weak negative correlation with the HML factor and a weak positive correlation with the SMB factor. This means that the SMN factors could influence the effect of these three factors.

3.2.6 Constructing the SMB, HML and MKT factor

In order to form the Fama and French three-factor model of equation 2, the SMB, HML and MKT factor must be constructed. The SMB factor is the spread in average returns between small-sized companies and big-sized companies (Fama and French, 1993). The market equity is used as the measurement for the size of a company. The market equity of month t is calculated by multiplying the stock price of December of year $t-1$ with the shares outstanding of month t. Once the market equity of each month t is calculated, the SMB factor is constructed in three different ways (Table 8). First, each month, three single-sorted portfolios are formed based on the size of the companies in the dataset using three breakpoints: 30% (Small), 40% (Medium) and 30% (Big). The monthly SMB factor is calculated in this method by taking the average return difference

[7] This number is the average return difference for all the five different methods combined.

between the small portfolios and the big portfolios. Secondly, each month, single-sorted deciles are formed based on the size of the companies in the dataset. The monthly SMB factor in this method is calculated by taking the average return difference between decile 1,2 and 3 and decile 8,9 and 10. Lastly, again the single-sorted deciles are used to create the SMB factor. However, in this method, the SMB factor is calculated by taking the average return difference between decile 1 and decile 10. These three different methods result in a monthly average return difference range from -1,34% to -0,20% for the SMB factor (Table 8).

The HML factor is the average return difference between companies with a high book-to-market ratio and companies with a low book-to-market ratio (Fama and French, 1993). The individual company's book-to-market ratio for July of year t to June of year $t+1$ is calculated by dividing the fiscal year ending book value of common equity of December of year $t-1$ with the market equity of December of year $t-1$. This market equity is the same as used in the construction of the SMB factor. The book-to-market ratios of the individual companies are used to develop the HML factor in three different ways (Table 9). First, each month, three single-sorted portfolios are formed based on the book-to-market ratio of the companies using three breakpoints: 30% (Low), 40% (Medium) and 30% (High). The monthly HML factor in this method is calculated by taking the average return difference between the high and low portfolios. For the second and the third method of calculating the HML factor, each month single-sorted deciles are formed based on the book-to-market ratio of the companies. The HML factor for the second method is then constructed by taking the average return difference between portfolio decile 8,9 and 10 and portfolio decile 1,2 and 3. Thereafter, the last HML factor is developed by taking the average return difference between portfolio decile 10 and portfolio decile 1. These three different methods result in a monthly average return difference range from -0,23% to 0,37% for the HML factor (Table 9).

The monthly excess return is used to construct the MKT factor and is obtained by subtracting the monthly risk-free rate from the monthly market return. The monthly risk-free rate is calculated using the yield on a ten-year Dutch government bond. The monthly market return is the average portfolio return of all the individual companies used in the dataset on month t.

3.2.7 Fama-MacBeth two-pass regression for the three-factor model

The first objective of this paper is to test whether a panel dataset consisting of Dutch equities provides similar three-factor model results as the findings of Fama and French in 1993. To test this, the two-pass regression analysis according to the methodology of Fama-MacBeth (1973) is used three times, one for each different way of calculating the HML and SMB factor. The two-pass regression of Fama-MacBeth (1973) examines the risk premiums on the factor loadings and consists of two stages.

First, I performed a rolling regression for the original three-factor model. This is done, to get a better comparison between the results of the three-factor model and the extended three-factor model, as a rolling regression is required for the extended three-factor model. Therefore, using a 24-months rolling forward window, I performed a time-series regression of excess returns on the MKT, HML and SMB factor to estimate the loadings on these factors. This means that for every listed individual company stock i at month t, the β_{it}^{MKT}, $\beta_{it}^{HML}$and β_{it}^{SMB}, are estimated. These betas are estimated using the following formula:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it}^{MKT} * MKT_t + \beta_{it}^{HML} * HML_t + \beta_{it}^{SMB} * SMB_t + \mu_{it} \quad (11)$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

Again, 24 months of data are lost (month 24 to month 47), due to the rolling forward window of 24 months.

Thereafter, the estimated factor loadings, β_{it}^{MKT}, $\beta_{it}^{HML}$and β_{it}^{SMB} are used in a cross-sectional regression on the excess returns for each month t to calculate the risk premiums:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \mu_{it} \quad (12)$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

The cross-sectional regression of equation 12 is performed 85 times, as it calculates the risk premiums of the factor loadings for each month t and there are 85 months left in the dataset after performing two rolling regressions. The lambdas indicate the slope coefficients of the factor loadings. This means that these lambdas point out whether the MKT, HML and SMB factor loadings command a positive or negative risk premium. All lambdas are estimated 85 times, and therefore, the average lambda is calculated using the following formula:

$$\bar{\lambda} = \frac{1}{85} \sum_{t=1}^{T} \hat{\lambda}_t \qquad (13)$$

The average lambda is required in order to test whether the risk premium on the factor loadings significantly differs from zero. To calculate the significance, a t-test is used. The t-statistic is determined by dividing the calculated average lambda with the standard error of the mean of the average lambda:

$$T - statistic = \frac{\bar{\lambda}}{Standard\ error\ of\ the\ mean\ (SE_m)} \qquad (14)$$

In 1993, Fama and French find positive and statistically significant factor loadings for the MKT, HML and SMB factor. They explain that these loadings indicate a compensation for bearing more systematic risk and therefore command a positive risk premium. These findings are used to construct the first hypothesis:

Hypothesis 1: In a portfolio consisting of Dutch equities, the market, size and the book-to-market factor loadings hold a positive risk premium (λ_1, λ_2 and λ_3) in the three-factor model.

3.2.8 Fama-MacBeth two-pass regression for the CAPM

Before I extend the three-factor model with a sentiment factor, I want to test whether the loading on the sentiment factor, β_{it}^{SMN}, commands a risk premium. In order to test this, the traditional CAPM of Sharpe (1964) and Lintner (1965) is extended with a sentiment factor. The two-pass regression of Fama-MacBeth (1973) is used to examine the risk premiums on the MKT and SMN factor loadings. This means that first; a time-series regression of excess returns on the MKT and SMN factor is performed to estimate the factor loadings. Also for this time-series regression, a 24-months rolling forward window is used. This means that the factor loadings β_{it}^{MKT} and β_{it}^{SMN} are estimated for every month t and for each individual company i:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it}^{MKT} * MKT_t + \beta_{it}^{SMN} * SMN_t + \mu_{it} \tag{15}$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

It must be noted that the SMN factor in this time-series regression is defined in multiple ways. Therefore, the regression is performed 35 times, as this is the number of constructed SMN factors.

Thereafter, a cross-sectional regression of excess returns on the estimated factor loadings; β_{it}^{MKT} and β_{it}^{SMN}, is performed for each month t and for each different constructed SMN factor. The following formula is used for this cross-sectional regression:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it} \tag{16}$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

To test whether the SMN factor loading requires a positive or a negative risk premium (λ_2), the average lambda is calculated using equation (13). To calculate the significance, a t-test is used. The t-statistic is again determined by dividing the calculated average lambda with the standard error of the mean of the average lambda (equation 14).

According to the findings of Ho and Hung (2012), the risk premium for the loading on the sentiment factor is positive and statistically significant. The second hypothesis is based on these findings.

Hypothesis 2: In a portfolio consisting of Dutch equities, the sentiment factor loading in the extended CAPM holds a positive risk premium (λ_2).

3.2.9 Fama-MacBeth two-pass regression for the extended three-factor model.

After extending the CAPM, to test whether the loadings on the SMN factors command a risk premium, the same SMN factors are used to extend the three-factor model of Fama and French. This is done, to test whether the SMN factors influence the risk premiums of the MKT, HML and SMB factor loadings, found in equation 12. A change in size or the significance of the MKT, HML and the SMB factor loadings when a sentiment factor is added might indicate mispricing.

First, for the extended three-factor model, the same Fama-MacBeth (1973) time-series regression of equation (11) is used, but now with the SMN factors included in the model. Again, a 24-months rolling forward window is used for this time-series regression, creating the following formula:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it}^{MKT} * MKT_t + \beta_{it}^{HML} * HML_t + \beta_{it}^{SMB} * SMB_t + \beta_{it}^{SMN} * SMN_t + \mu_{it} \quad (17)$$

$i = 1,2 \ldots 72$

$t = 47,48 \ldots 132$

The factor loadings, β_{it}^{mkt}, β_{it}^{HML}, β_{it}^{SMB} and β_{it}^{SMN} are calculated for each month t and for each individual company i, and are used in a cross-sectional regression to estimate the risk premiums on the factor loadings:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it} \quad (18)$$

$i = 1,2 \ldots 72$

$t = 47,48 \ldots 132$

To calculate the significance of the risk premiums on the factor loadings (λ_1, λ_2, λ_3 and λ_4), a t-test is performed in the same way as for the three-factor model. First, the average lambdas are calculated using equation (13). Thereafter, the t-statistic is calculated by dividing the determined average lambda with the standard error of the mean of the average lambda (equation 14).

According to the findings of Fama and French (1993), all original factor loadings of the three-factor model, λ_1, λ_2, λ_3, should take a non-zero value, and therefore, the excess returns should be explained by all the factor loadings together. The third hypothesis is based on this finding of Fama and French:

Hypothesis 3: In a portfolio consisting of Dutch equities, the market, size and the book-to-market factor loadings hold a positive risk premium (λ_1, λ_2 and λ_3) in the extended three-factor model.

Besides, the risk premium on the SMN factor loading is expected to be positive in the extended three-factor model (Ho and Hung, 2012). The fourth hypothesis is based on this expectation.

Hypothesis 4: In a portfolio consisting of Dutch equities, the sentiment factor loading holds a positive risk premium (λ_4) in the extended three-factor model.

As the extended three-factor model includes all factors, the excess returns should be fully explained. Therefore, the extended three-factor model should hold no constant and does not have omitted variables. The fifth hypothesis is based on this assumption:

Hypothesis 5: The extended three-factor model holds no constant.

3.2.10 Constructing the Momentum factor and the Fama-MacBeth two-pass regressions for the Carhart four-factor model and the extended Carhart four-factor model.

In order to verify the correctness of the results of the three-factor model and the extended three-factor model, an additional momentum factor is created and added to the models. This momentum (MOM) factor is constructed using the methodology of Carhart (1997), creating the Carhart four-factor model and the extended Carhart four-factor model (including the SMN factor). To construct the MOM factor, first, a lagged individual company return variable is created to obtain the prior 12-months individual company returns. Thereafter, each month, three single-sorted portfolios are formed based on the prior 12-months individual companies returns using the breakpoints: 30% (Low), 40% (Medium) and 30% (High). Finally, the monthly MOM factor is calculated by taking the average return difference between the high and low portfolios.

Once the MOM factor is constructed, I first performed a Fama-MacBeth time-series regression of excess returns on the MKT, HML, SMB and MOM factor to estimate the loadings on these factors. This means that for every listed individual company stock i at month t, the β_{it}^{MKT}, β_{it}^{HML}, β_{it}^{SMB} and β_{it}^{MOM}, are estimated. These betas are estimated using the following formula:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it}^{MKT} * MKT_t + \beta_{it}^{HML} * HML_t + \beta_{it}^{SMB} * SMB_t + \beta_{it}^{MOM} * MOM_t + \mu_{it} \quad (19)$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

Then, I performed the same Fama-MacBeth time-series regression for the extended Carhart four-factor model, including an SMN factor. This means that for every listed individual company stock i at month t, the β_{it}^{MKT}, β_{it}^{HML}, β_{it}^{SMB}, β_{it}^{MOM} and β_{it}^{SMN}, are estimated, using the following formula:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it}^{MKT} * MKT_t + \beta_{it}^{HML} * HML_t + \beta_{it}^{SMB} * SMB_t + \beta_{it}^{MOM} * MOM_t + \beta_{it}^{SMN} * SMN_t + \mu_{it} \quad (20)$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

After estimating the factor loadings of both the Carhart four-factor model and the extended Carhart four-factor model, a cross-sectional regression of excess returns on the estimated factor loadings for both models is performed for each month t to calculate the risk premiums:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{MOM}} + \mu_{it} \quad (21)$$

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{MOM}} + \lambda_5 * \widehat{\beta_{it}^{SMN}} + \mu_{it} \quad (22)$$

$i = 1,2 \dots 72$

$t = 47,48 \dots 132$

The cross-sectional regression of equation 21 and equation 22 are performed 85 times, as it calculates the risk premiums of the factor loadings for each month t and there are 85 months left in the dataset after performing two rolling regressions. The lambdas indicate the slope coefficients of the factor loadings. This means that these lambdas point out whether the factor loadings command a positive or negative risk premium. To test for the significance of the risk premiums on the factor loadings, again equation 13 and equation 14 are used.

Carhart (1997) confirms the findings of Fama and French (1993) and explains that the common risk factors in stock returns almost completely explain the risk-adjusted returns. However, Carhart mentioned that this result is mostly driven by a momentum factor. The last hypothesis is based on this finding.

Hypothesis 6: The constant in the Carhart four-factor model and the extended four-factor model should be less significant than for the Fama and French three-factor model and the extended three-factor model.

4. Results

This chapter presents the empirical results of the Fama-MacBeth two-pass regressions and is divided into four sections. In the first section, I will explain the findings of the three-factor model for a portfolio consisting of Dutch equities. This means that the first section will explain whether the MKT, HML and SMB factor loadings command a statistically significant risk premium. In the second section, I will explain the regression results for the CAPM and the extended CAPM, meaning that this section will show whether the sentiment factor loadings command a risk premium. In the third section, I extend the three-factor model with a sentiment factor to test whether the risk premium on the MKT, HML and SMB factor loadings change. This is done to see whether the market, size and value premium can be explained by systematic risk, mispricing or both systematic risk and mispricing. Lastly, in section four, I will perform two robustness checks to verify the correctness of the tests.

4.1 Results Fama-MacBeth two-pass regression three-factor model

First, I perform three Fama-MacBeth two-pass regressions using the three-factor model of Fama and French (1993) to estimate the risk premiums on the MKT, HML and SMB factor loadings. This is done to test the robustness of the three-factor model outside of the United States. Besides, the results of the three-factor model are required to test whether the traditional finance theories, based on systematic risk, or the behavioral finance theories, based on mispricing, explain the variation in excess returns more conveniently. The main results of the Fama-MacBeth two-pass regressions using the three-factor model of Fama and French (1993) are presented in table 10.

The results in table 10 show that when the breakpoints: 30% (small/low), 40% (medium) and 30% (big/high) are used, the MKT and HML factor loadings command a negative risk premium, which is not significant. This means that investors require a negative compensation for bearing more market and book-to-market risk. Besides, the SMB factor loading commands a positive risk premium, which is also not significant. This implies that investors command a positive compensation for bearing more risk on smaller companies. So, the results contradict the findings of Fama and French, where the common variation in excess returns is significantly explained by all of the three factors.

In the second Fama-MacBeth two-pass regression on the three-factor model, the HML and SMB factor are constructed using decile 1 and decile 10. The results of this two-pass regression again show a negative, not significant, risk premiums for the MKT and HML factor loadings, implying that investors command a negative compensation for bearing more market and book-to-market risk. Besides, investors again command a positive risk premium on the SMB factor loading, which is not significant.

In the last Fama-MacBeth two-pass regression, the HML and SMB factor are constructed using decile 1,2 & 3 and decile 8,9 & 10. Similar to previous two Fama-MacBeth regressions, the MKT and HML factor loadings command a, not significant, negative risk premium and the SMB factor loading commands a, not significant, positive risk premium. Furthermore, must be noted that, for all three of the Fama-MacBeth two-pass regressions, the constant in the three-factor model does not significantly differ from zero at a 1%, 5% or 10% level. This indicates that the model does not have omitted variables at these levels of significance.

So, in a portfolio consisting of Dutch equities, the MKT, SMB and HML factor loadings do not hold a statistically significant positive risk premium (λ_1, λ_2 and λ_3) in the three-factor model. Therefore, the first hypothesis of the research is rejected.

4.2 Results Fama-MacBeth two-pass regression CAPM and extended CAPM

To test whether investors require a positive or negative compensation for bearing more sentiment risk, the Fama-MacBeth two-pass regression is performed using the CAPM and the extended CAPM. The results of the CAPM are presented in table 11a-11g and show a negative risk premium for the MKT factor loading. This means that investors command a negative compensation for bearing more market risk of 0,22% per month.

In table 11a-11c, I extended the CAPM with the SMN factors constructed by sorting the factual individual company sentiment betas in deciles for each method for defining sentiment. The results show that overall, the SMNplus, SMNminus and SMNaverage factor loadings for each method for defining sentiment, command a positive risk premium (λ_2), which is not significant. This means that stocks with a high sensitivity to the SMN factor earn a compensation for bearing more sentiment risk and varies from 0,04% to 0,63% per month.

To get a better balance between the HML, SMB and SMN factor, I also created a sentiment factor based on absolute individual company sentiment betas sorted in quintiles. The loading on this SMNabsolute factor also commands a, not significant, positive risk premium for four out of five different methods for defining sentiment. The risk premium varies from 0,04% to 0,48% per month (table 11d), meaning that stocks with a high sensitivity to the SMNabsolute factor earn a compensation for bearing more sentiment risk.

For robustness purposes, I also constructed an SMNplus, SMNminus and SMNaverage factor by sorting the factual individual company sentiment betas into quintiles. Table 11e-11g show that the loadings on all three SMN factors command a positive risk premium for three out of five methods for defining sentiment, varying from 0,02% to 0,23% per month. However, these risk premiums are not statistically significant at a 1%, 5% or 10% level.

So, for all seven SMN factor loadings, the extended CAPM commands a positive risk premium. This means that hypothesis 2 can be confirmed, however, must be noted that due to the low sample data the level of significance is rather low. Furthermore, for all the extended CAPM's, the constant does not significantly differ from zero. This means that, at a 1%, 5% and 10% level of significance, the excess return is completely explained by the MKT factor and the SMN factors. Lastly, the MKT factor loading commands a, not significant, negative risk premium in all the extended CAPM's, meaning that investors command a negative compensation for bearing more market risk.

4.3 Results Fama-MacBeth two-pass regression extended three-factor model

In this section, I extend the Fama and French (1993) three-factor model with a sentiment factor to test whether the risk premiums on the MKT, HML and SMB factor loadings change. A change in size or the significance of the risk premiums on the MKT, HML and SMB factor loadings when a sentiment factor is added might indicate mispricing. Furthermore, the change in the significance of the constant will show whether extending the three-factor model with a sentiment factor decreases the possibility of omitted variables. If so, the variation in excess returns can be partially explained by mispricing.

First, I extend the three-factor model with the SMNplus factor constructed by sorting the factual individual company sentiment betas into deciles. The results in table 12a show that the SMNplus factor loading commands a, not significant, negative risk premium for four out of five methods for defining sentiment. In contradiction with the results of the extended CAPM, stocks with a high sensitivity to the SMNplus factor tend to require a negative compensation for bearing more sentiment risk. This negative compensation varies from -0,05% to -0,41% per month. The risk premium on the MKT factor loading does not change. However, the significance of the risk premium on the MKT factor loading decreases, meaning that the effect of the market risk premium on the variation in excess returns becomes weaker. For four out of five methods, the risk premium on the SMB factor loading becomes negative and less significant after adding the sentiment factor. As a result, a weaker effect of the size premium on the variation in excess returns. The risk premium on the HML factor loading does not change but becomes more significant after extending the three-factor model. This means that the effect of the value premium on the variation in excess returns is stronger in the extended three-factor model. The constant in the extended three-factor model is less significant for the first four methods for defining sentiment, indicating that the model is less likely to have omitted variables. This might indicate that the variation in excess returns can be partially explained by mispricing. However, when consumer confidence is used for defining sentiment (method 5), the significance of the constant increases. This means that adding consumer confidence does not decrease the possibility of omitted variables.

Next, I extended the three-factor model with the SMNminus factor constructed by sorting the factual individual company sentiment betas into deciles (table 12b). For method 1 and 5 the risk premium on the SMNminus factor loading is negative, and for method 2,3 and 4 the risk premium on the SMNminus factor loading is positive. Method 1 contains the only SMNminus factor loading that commands a statistically significant risk premium. This indicates that when the factual orthogonalized investor sentiment index of Baker and Wurgler (2006) is used as the monthly change in investor sentiment, investors command a negative sentiment premium of 0,94% per month. Both the significance and the size of the risk premiums on the HML and MKT factor loadings do not change. Furthermore, for four out of five methods, the risk premium on the SMB factor loading again becomes negative and less significant after adding the SMNminus factor. The significance of the constant in the extended three-factor model only decreases for method 1, indicating that the SMNminus factor only decreases the possibility of omitted variables in this method. This means that the variation in excess returns can only be partially explained by mispricing in the first method for defining sentiment.

The third sentiment factor is the SMNaverage factor constructed by sorting the factual individual company sentiment betas into deciles. Method 1, 4 and 5 for defining sentiment show a negative risk premium for the SMNaverage factor loading and method 2 & 3 show a positive risk premium for the SMNaverage factor loading (table 12c). The risk premiums on the MKT, SMB and HML factor loadings show similar results to the results of the SMNplus factor (table 12a). The risk premium on the MKT factor loading does not change. However, the significance of the risk premium on the MKT factor loading decreases. The risk premium on the SMB factor loading becomes negative and less significant after adding the SMNaverage factor, and the risk premium on the HML factor loading does not change but becomes more significant after adding the SMNaverage factor. When looking at the constant of the extended three-factor model, the significance decreases for the first four methods of defining sentiment, indicating that the variation in excess returns might be partially explained by mispricing. The significance of the constant of the fifth method increases and becomes statistically significant at a 20% level. This means that only the extended three-factor model, containing the consumer confidence index as the sentiment factor, is more likely to have omitted variables than the original three-factor model.

The fourth sentiment factor is the SMNabsolute factor and is constructed by sorting the absolute individual company sentiment betas into quintiles. Similar to the results of the SMNaverage factor, method 1, 4 and 5 for defining sentiment show a negative risk premium for the SMNabsolute factor loading and method 2 & 3 show a positive risk premium for the SMNabsolute factor loading (table 12d). Besides, the risk premiums on the MKT and HML factor loadings do not change after extending the three-factor model. However, the significance of the risk premium on the MKT factor loading decreases and the significance of the risk premium on the HML factor loading increases, indicating a weaker effect of the market risk premium and a stronger effect of the value premium on the variation in excess returns. Furthermore, the risk premium on the SMB factor loading becomes negative and less significant, meaning that the effect of the size premium on the variation in excess returns becomes weaker. Lastly, the constant of the extended three-factor model is less significant for the first four methods for defining sentiment. This means that only for the first four methods, the extended three-factor model is less likely to have omitted variables than the original three-factor model. As a result, the variation in excess returns can partially be explained by mispricing for the first four methods.

For robustness purposes, I also constructed an SMNplus, SMNminus and SMNaverage factor by sorting the factual individual company sentiment betas into quintiles. The results of the extended three-factor model using these SMN factors mostly confirm the previous findings (table 12e-12g). For each SMN factor, the risk premium on the sentiment factor loadings is still negative and not significant. Besides, the risk premium on the MKT factor loading does not change compared with previous findings.

However, where the significance of the risk premium on the MKT factor loading decreased for the SMNplus and SMNaverage factor in previous results, this risk premium remains constant in the robustness check. Furthermore, the results of the risk premiums on the SMB and HML factor loadings for the robustness check are the same as for the previous findings. Namely, the risk premium on the SMB factor loading becomes negative and less significant, and the risk premium on the HML factor loading remains the same but more significant. Lastly, regarding the SMNplus and SMNaverage results, for three out of five methods for defining sentiment, the constant is less significant in the extended three-factor model. This again indicates that, for these methods, the extended three-factor model is less likely to have omitted variables. For the SMNminus factor, the constant is mostly more significant for the extended three-factor model. This means that the SMNminus factor has the weakest explanatory power for the variation in excess returns.

To summarize, six out of seven constructed SMN factor loadings command a negative, not significant, risk premium. This indicates that stocks with a high sensitivity to the SMN factors require a negative compensation for bearing more sentiment risk. This contradicts the findings of the positive risk premium on the SMN factor loadings in the extended CAPM. The only SMN factor loading, which requires a positive risk premium, is the SMNminus factor. However, after testing for robustness, this SMNminus factor loading also requires a negative risk premium. This means that we can reject the fourth hypothesis, as in a portfolio consisting of Dutch equities, the sentiment factor loading does not hold a positive risk premium in the extended three-factor model. The risk premium on the MKT factor loading remains constant but overall less significant. This indicates that in the extended three-factor model the effect of the market risk premium on the variation in excess returns becomes weaker. The risk premium on the HML factor loading also remains constant for all the extended three-factor models. Hence, the significance of the risk premium on the HML factor loading increases for six out of seven SMN factors. As a result, a stronger effect of the value premium on the variation in excess returns. This provides evidence for the traditional risk-based explanation. Furthermore, for all extended three-factor models the risk premium on the SMB factor loading decreases and becomes less significant, meaning that the effect of the size premium on the variation in excess returns becomes weaker. So, in a portfolio consisting of Dutch equities, the MKT, HML and SMB factor loadings do not hold a positive risk premium. Therefore, we can reject the third hypothesis. Lastly, the constant mostly decreases in significance for five out of seven SMN factors. This means that mostly the extended three-factor models are less likely to have omitted variables than the original three-factor models. Hence, for the SMNminus factor and the factors using the consumer confidence index for defining sentiment (method 5), the constant becomes more significant. This means that these factors do not decrease the possibility of omitted variables and therefore are less likely to explain the variation in excess returns. So, apart from the SMNminus factor and the method using the consumer confidence index for defining sentiment, the fifth hypothesis can be confirmed, as the extended three-factor model holds no constant.

The market risk premium and the size premium show a weaker effect on the variation in excess returns. This effect can be transferred to SMN factors as these factors provide evidence for explaining the variation in excess returns through a negative sentiment premium. Besides, the decrease in the significance of the constant indicates that extending the three-factor model with a sentiment factor decreases the possibility of omitted variables. These two findings together indicate that the variation in excess returns can partially be explained by mispricing.

4.4 Robustness checks

In this section, I perform two different robustness checks in order to test the correctness of the findings. For the first robustness check, I will execute a sample breakdown, meaning that I use two subsamples for the three-factor model and the extended three-factor model. By this way, I can test whether the results vary between the used subsamples and therefore, I can explain the results with more details. The first subsample is January 2008 to June 2011 and the second subsample is July 2011 to December 2014. In the second robustness check, I added an additional momentum factor to the three-factor model and the extended three-factor model using the methodology of Carhart (1997). By this way, I create the Carhart four-factor model and the extended Carhart four-factor model. I have two reasons for doing this. First, by adding an additional momentum factor I can test whether the previous results remain the same. Secondly, I can test whether adding an additional momentum factor lowers the significance of the constant. If so, the momentum factor decreases the possibility of omitted variables. If not, the results for the three-factor model and the extended three-factor model are more convenient.

4.4.1 Subsamples

In the first robustness check, I executed a sample breakdown for the three-factor model and the extended three-factor model. The two created subsamples are January 2008 to June 2011 and July 2011 to December 2014. By this way, I can examine the difference in the effect of the risk premiums on the variation in excess returns between the period directly after the financial crisis of 2008 and the period of economic recovery. Expected is that stock investors command a higher excess return in the direct aftermath of the financial crisis of 2008 due to the increase in uncertainty and the loss of confidence. Therefore, the risk premiums on the factor loadings should be more positive and statistically significant in the first subsample.

The results of this robustness check are displayed in table 13 and 14. Table 13 shows the subsamples for the Fama and French three-factor model based on three single-sorted portfolios using the breakpoints: 30% (Small), 40% (Medium) and 30% (Big). It appears that the results of both subsamples are not completely the same. In the first subsample, the risk premium on the HML factor loading is positive and in the second subsample, the risk premium on the HML factor loading is negative. This can be explained by the higher uncertainty and the loss of confidence in the aftermath of the financial crisis. However, the risk premium on the HML factor loading in the first subsample seems to be less significant compared with the risk premium on the HML factor loading for the whole dataset (Table 10). This indicates that in the first subsample, the effect of the value premium on the variation in excess returns is weaker. Besides, the risk premium on the SMB factor loading differs between the two subsamples. In the first subsample, this risk premium is negative, and in the second subsample, this risk premium is positive. This finding contradicts the expectations as investors command a higher size premium in the second subsample. Meanwhile, the significance of the risk premium on the SMB factor seems to be constant for both subsamples.

Table 14 contains the results of the subsamples for the three-factor model, extended by the SMNaverage factor for each method for defining sentiment. It appears that the results of the two subsamples show three major differences. First of all, in the first subsample, the risk premium on the SMB factor loading seems to be negative whereas, in the second subsample this risk premium is positive. Secondly, the risk premium on the SMNaverage factor loading seems to be negative in the first subsample and positive in the second subsample. This means that investors command a higher compensation for bearing more sentiment risk in the period after July 2011. Lastly, the significance of the constant is substantially higher in the second subsample, meaning that the first subsample is less likely to obtain omitted variables.

Overall, when comparing the robustness results of table 14 with the original extended three-factor model results of table 12c, the first subsample mostly seems to confirm the previous finding whereas, the second subsample only confirms the results of the risk premium on the HML and MKT factor loadings.

4.4.2 Carhart four-factor model and the extended Carhart four-factor model

The second robustness check is performed by extending the three-factor model and the extended three-factor model with a momentum factor, following the methodology of Carhart (1997). By this way, I can test whether the previous results remain the same and whether adding a momentum factor lowers the significance of the constant. Table 15 shows the results of the Carhart four-factor model based on three single-sorted portfolios using the breakpoints: 30% (Small), 40% (Medium) and 30% (Big). It appears that the results of this Carhart four-factor model mostly confirm the findings of the three-factor model (Table 10). The risk premiums on the MKT and HML factor loadings remain constant after adding the MOM factor (Table 15). However, the significance of the risk premium on the MKT factor loading increases and the significance of the risk premium on HML factor loading decreases. This indicates a stronger effect of market risk premium and a weaker effect of the value premium on the variation in excess returns, in the Carhart four-factor model. Furthermore, the risk premium on the SMB factor becomes negative and less significant after adding the MOM factor. This means that the effect of the size premium on the variation in excess returns becomes weaker and that in the Carhart four-factor model, investors command a negative risk premium for bearing more size risk. Lastly, the constant in the Carhart four-factor model is less significant than the constant in the three-factor model. This indicates that adding a momentum factor decreases the possibility of omitted variables. Therefore, it appears that the Carhart four-factor model is a better model for explaining the variation in excess returns than the Fama and French (1993) three-factor model. However, must be noted that the risk premium on the MOM factor loading is not economically nor statistically significant.

Table 16 contains the results of the extended three-factor model, using the SMNaverage factor for each method for defining sentiment, with an additional MOM factor. The results of this extended Carhart four-factor model are based on three single-sorted portfolios using the breakpoints: 30% (Small), 40% (Medium) and 30% (Big). It appears that the results of the risk premiums on the MKT, SMB and HML factor loadings are consistent with the findings of the extended three-factor model (Table 12c). However, the risk premium on the SMNaverage factor in the extended Carhart four-factor model is positive. This means that in the extended Carhart four-factor model, investors command a positive risk premium for bearing more sentiment risk. Furthermore, the risk premium on the MOM factor loading is positive for three out of five methods for defining sentiment. This indicates that well-performing stocks continue to outperform the bad stocks in the future. Lastly, for three out of five methods for defining sentiment, the significance of the constant increases. This means that adding a MOM factor to the extended three-factor model increases the possibility of omitted variables. Therefore, it appears that the extended Carhart four-factor model is not a better model for explaining the variation in excess returns than the extended three-factor model. This means that hypothesis six can be rejected.

5. Conclusion

In 1993, Fama and French find positive and statistically significant loadings on both the HML and the SMB factor. Fama and French explain that these positive factor loadings indicate that investors require a positive compensation for bearing more systematic risk. However, according to Bishop, Crapp, Faff and Twite (2000), the results of Fama and French are only applicable for US listed companies. Therefore, for the first objective in this thesis, I tested whether the three-factor model of Fama and French (1993) is also suitable for portfolios consisting of Dutch equities. The results show that investors require a negative compensation for bearing more market and book-to-market risk, and investors require a positive compensation for bearing more size risk. So, in a portfolio consisting of Dutch equities, the MKT, SMB and HML factor loadings do not hold a statistically significant positive risk premium in the three-factor model. This means that the results contradict the findings of Fama and French where the common variation in excess returns is significantly explained by all of the three factors.

The second objective of this paper is to test whether the sentiment factors affect the explanatory power of the market, value and size premium on excess returns. This is done to contribute to the debate between traditional finance theories and behavioral finance theories for explaining the variation in excess returns. To contribute to this debate, the investor sentiment index of Baker and Wurgler (2006) and the consumer confidence index of the OECD (2017) are used to construct the sentiment factors. As it is not possible to re-run the principal component analysis of Baker and Wurgler (2006), the monthly change in investor sentiment is defined in five different ways to consider changes in levels of the index as an approximation. For each way of defining sentiment, four different sentiment factors are constructed. Besides, for robustness purposes, I constructed three additional sentiment factors by sorting the factual individual company sentiment betas into quintiles. I find that the average return difference between the portfolios with the highest positive factual sentiment beta and the portfolios with the lowest positive factual sentiment beta ranges from -0,61% to 0,48% per month. These SMN factors show an overall moderate positive correlation with the MKT factor, a weak negative correlation with the HML factor and a weak positive correlation with the SMB factor. This means that the SMN factors could influence the explanatory power of these three factors on the excess returns. Furthermore, in the extended CAPM, all SMN factor loadings command a positive risk premium, indicating that investors require a positive compensation for bearing more sentiment risk. This risk premium is, however, negative when the sentiment factors are added to the three-factor model. Thereby, when the sentiment factors are added to the three-factor model, I find that the explanatory power of the market, value and size premium on excess returns changes. First of all, in the extended three-factor model the risk premium on the MKT factor loading remains the same, but overall less significant. This indicates a weaker explanatory power of the market risk premium on the variation in excess returns. Secondly, the risk premium on the SMB factor loading decreases and becomes less significant, meaning that the explanatory power of the size premium on the variation in excess returns becomes weaker. Lastly, the risk premium on the book-to-market factor loading also remains the same for all the extended three-factor models. Hence, the significance of the risk premium on the book-to-market factor loading increases for six out of seven sentiment factors, meaning that the explanatory power of the value premium on the variation in excess returns becomes stronger. Furthermore, the constant of the extended three-factor model mostly decreases in significance for five out of seven sentiment factors. This means that mostly the extended three-factor models are less likely to have omitted variables.

Thus, the weaker explanatory power of the market and size premium on the variation in excess returns in the extended three-factor model combined with the decrease in the possibility of omitted variables in the extended three-factor model might indicate that the variation in excess returns can be partially explained by mispricing. However, the risk-based explanation of the traditional finance theories cannot be rejected as the explanatory power of the value premium on the variation in excess returns becomes stronger. This means that, in the debate between the traditional finance theories and the behavioral finance theories for explaining the variation in excess returns, this thesis provides evidence for both sides. So, the variation in excess returns for Dutch equities can be explained by both risk and mispricing combined.

Lastly, I performed two different robustness checks in order to test the correctness of the results. In the first robustness check, I executed a sample breakdown for the three-factor model and the three-factor model extended with the SMNaverage factor. The two created subsamples are January 2008 to June 2011 and July 2011 to December 2014. For the three-factor model, only the second subsample seems to confirm previous findings, and for the extended three-factor model, the first subsample mostly seems to confirm the previous finding whereas, the second subsample only confirms the results of the risk premium on the HML and MKT factor loadings. The second robustness check is performed by extending the three-factor model and the extended three-factor model with a momentum factor, following the methodology of Carhart (1997). By this way, I created the Carhart four-factor model and the extended Carhart four-factor model. It appears that the results of the Carhart four-factor model mostly confirm the findings of the three-factor model (Table 10), as only the risk premium on the SMB factor loading switches sign. For the extended Carhart four-factor model, it appears that the results of the risk premiums on the MKT, SMB and HML factor loadings are consistent with the findings of the extended three-factor model. However, the risk premium on the SMNaverage factor in the extended Carhart four-factor model is positive. This means that in the extended Carhart four-factor model, investors command a positive risk premium for bearing more sentiment risk. Thus, overall the robustness checks confirm the previous finding that the variation in excess returns for Dutch equities can be explained by both risk and mispricing combined.

There are some limitations in my study that need to be mentioned. First of all, as in this research individual company betas are estimated twice through a rolling regression, a short sample period is used to decrease the likeliness of biased results. However, this short sample period might cause a survivorship bias to arise because a lot of companies prior to 2004 are left out. Secondly, my findings might be biased due to the rolling window of 24 months, as I remove the companies with less than 24 observations or with missing observations during their listed period. So, in further research, a larger sample period and a smaller rolling window can be used in order to decrease the survivorship bias. Lastly, in my thesis, I used the investor sentiment index and the consumer confidence index as proxies for sentiment. In further research, other indices can be used as a proxy for sentiment to confirm or reject the finding that variation in excess returns is related to mispricing.

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7. Appendix

Table 1 : Descriptive statistics

This table provides the monthly summary of the descriptive statistics of 72 Dutch listed equities for a sample period from 2006 to 2014.

	Mean	Std. dev.	Minimum	Maximum
Excess Return (%)	0,100	10,433	-59,658	188,756
Book-to-Market	0,747	0,530	0,0232	6,445
Size ($ Billions)	6,332	20,120	0,0016	167,50
Market Premium (%)	0,0953	4,863	-16,007	14,143
Risk-free Rate (%)	0,252	0,0885	0,0568	0,401
Companies	72			
Observations	7776			

Table & Figure 2a : Portfolio deciles by factual sentiment beta values (Method 1)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based decile. The portfolio deciles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly raw orthogonalized sentiment index from Baker and Wurgler (2006) (Method 1). Companies with the lowest sentiment beta are sorted in decile L and companies with the highest sentiment beta are sorted in decile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Deciles	L	2	3	4	5	6	7	8	9	H
Sentiment Beta	-0,168	-0,0772	-0,0478	-0,0261	-0,0062	0,0134	0,0336	0,0562	0,0862	0,160
Excess Return (%)	-0,143	0,0540	-0,109	0,503	-0,137	0,172	0,472	-0,0900	0,581	-0,278
Book-to-Market	0,777	0,769	0,751	0,727	0,702	0,729	0,750	0,755	0,767	0,739
Size ($ Billions)	2,649	5,094	8,274	7,576	10,13	8,667	6,540	8,186	4,772	1,627

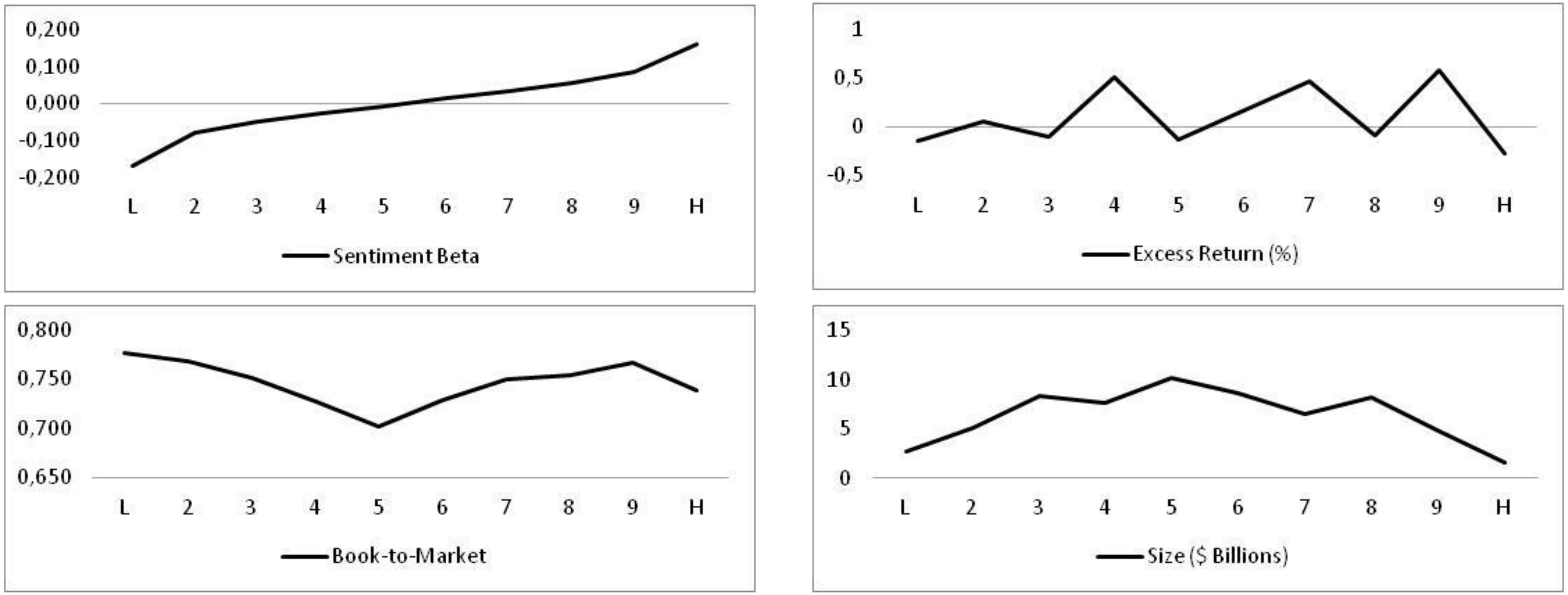


Table & Figure 2b : Portfolio deciles by factual sentiment beta values (Method 2)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based decile. The portfolio deciles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly first difference in sentiment index from Baker and Wurgler (2006) (Method 2). Companies with the lowest sentiment beta are sorted in decile L and companies with the highest sentiment beta are sorted in decile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Deciles	L	2	3	4	5	6	7	8	9	H
Sentiment Beta	-0,273	-0,138	-0,0890	-0,0519	-0,0181	0,0167	0,0529	0,0946	0,152	0,291
Excess Return (%)	0,740	0,0320	0,186	-0,172	0,0652	0,128	-0,155	-0,185	0,477	-0,213
Book-to-Market	0,701	0,766	0,718	0,678	0,719	0,742	0,706	0,762	0,778	0,905
Size ($ Billions)	6,007	6,221	8,814	9,202	10,33	8,685	5,873	3,853	1,933	2,113

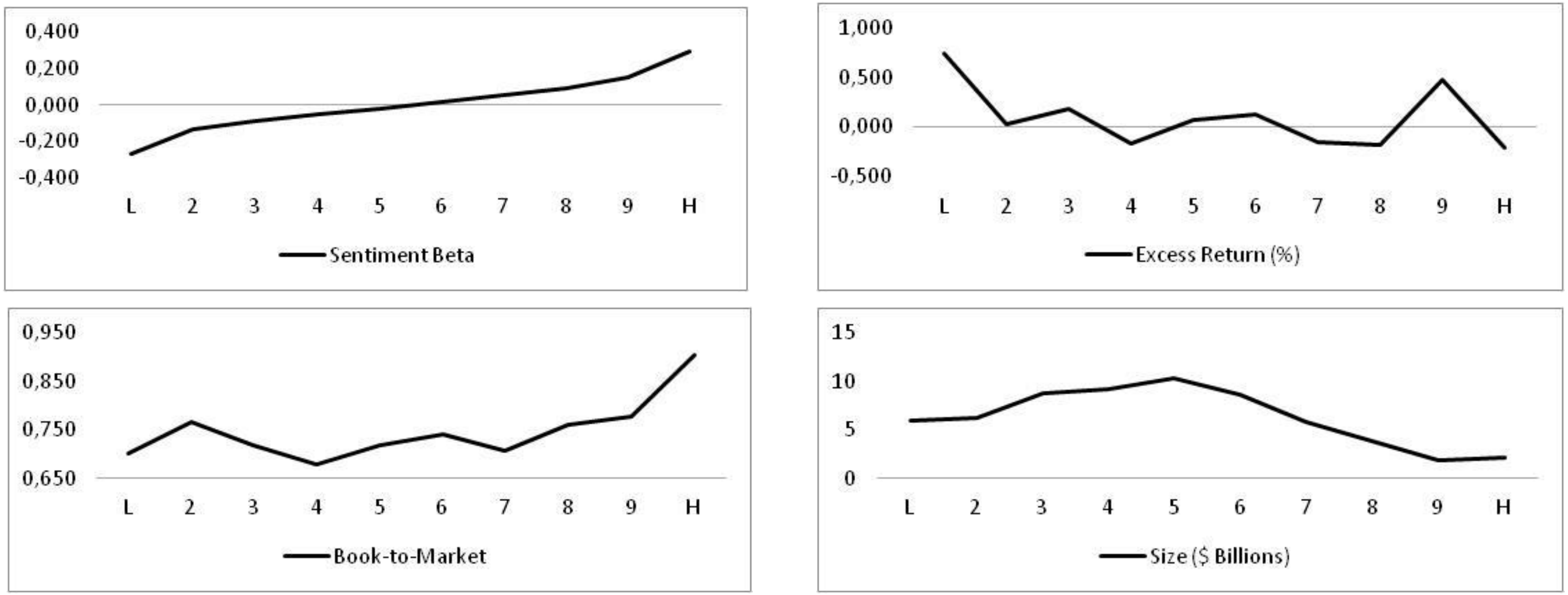


Table & Figure 2c : Portfolio deciles by factual sentiment beta values (Method 3)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based decile. The portfolio deciles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) (Method 3). Companies with the lowest sentiment beta are sorted in decile L and companies with the highest sentiment beta are sorted in decile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Deciles	L	2	3	4	5	6	7	8	9	H
Sentiment Beta	-0,0372	-0,0195	-0,0128	-0,0074	-0,0030	0,0019	0,0074	0,0132	0,0214	0,0410
Excess Return (%)	0,946	-0,342	-0,274	0,454	0,348	-0,321	-0,0872	0,765	-0,705	0,155
Book-to-Market	0,665	0,699	0,719	0,724	0,783	0,787	0,777	0,709	0,735	0,876
Size ($ Billions)	8,466	8,306	7,964	8,120	7,532	6,439	6,661	3,897	3,772	1,843

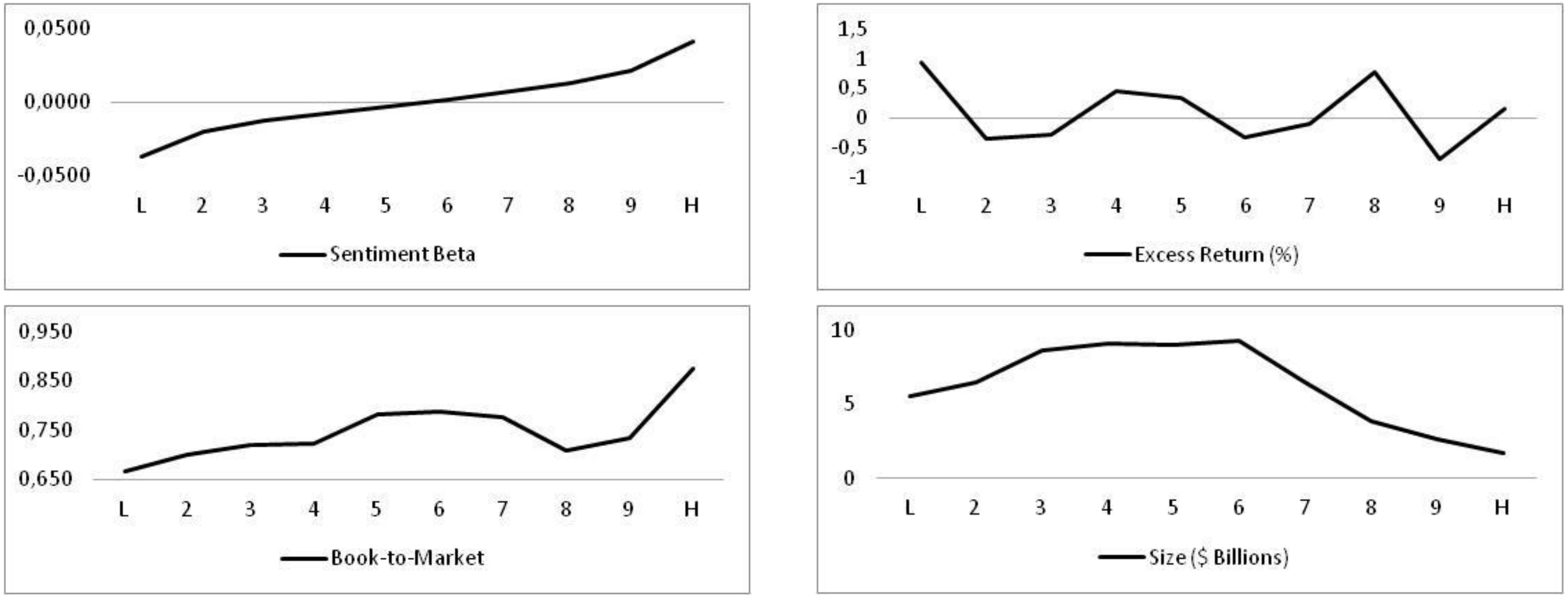
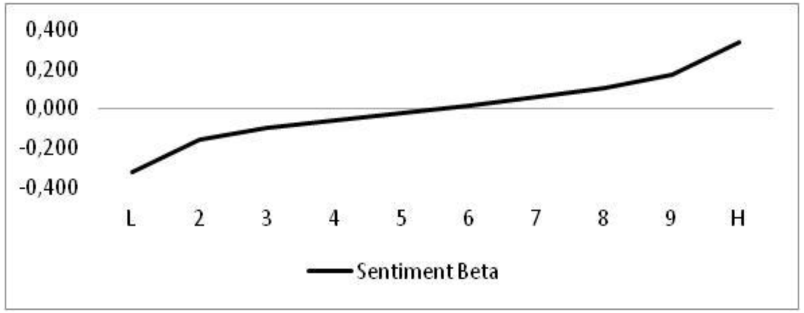


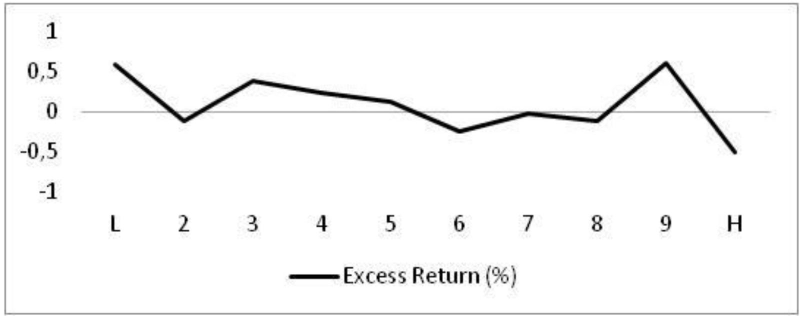
Table & Figure 2d : Portfolio deciles by factual sentiment beta values (Method 4)

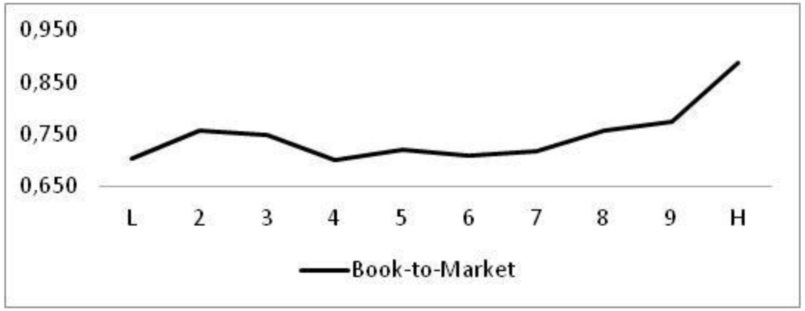
This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based decile. The portfolio deciles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) relative to the sentiment-neutral month December 2003 (Method 4). Companies with the lowest sentiment beta are sorted in decile L and companies with the highest sentiment beta are sorted in decile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Deciles	L	2	3	4	5	6	7	8	9	H
Sentiment Beta	-0,320	-0,158	-0,1000	-0,0593	-0,0221	0,0177	0,0623	0,109	0,177	0,337
Excess Return (%)	0,591	-0,108	0,387	0,243	0,127	-0,235	-0,0152	-0,111	0,608	-0,508
Book-to-Market	0,705	0,756	0,750	0,702	0,721	0,709	0,719	0,758	0,773	0,887
Size ($ Billions)	5,546	6,483	8,688	9,133	9,088	9,305	6,513	3,915	2,613	1,724







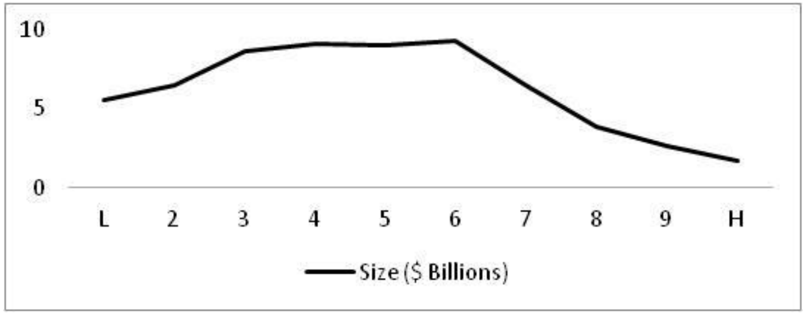


Table & Figure 2e : Portfolio deciles by factual confidence beta values (Method 5)

This table provides the monthly average of the factual confidence betas (both positive and negative values), excess return, book-to-market ratio and company size for each confidence-based decile. The portfolio deciles are formed by the factual value of the confidence beta. In this table the confidence betas are estimated by the monthly percentage change in consumer confidence index from the OECD (Method 5). Companies with the lowest confidence beta are sorted in decile L and companies with the highest confidence beta are sorted in decile H. The factual confidence beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta CONF_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Deciles	L	2	3	4	5	6	7	8	9	H
Dutch Confidence Beta	-0,215	-0,102	-0,0672	-0,0394	-0,0147	0,0103	0,0370	0,0665	0,112	0,242
Excess Return (%)	-0,366	0,0066	-0,299	0,0468	0,695	0,163	0,248	-0,0056	0,421	0,149
Book-to-Market	0,771	0,701	0,731	0,737	0,752	0,737	0,758	0,706	0,768	0,803
Size ($ Billions)	2,944	8,262	12,28	10,24	6,192	6,085	5,842	6,816	3,411	1,231

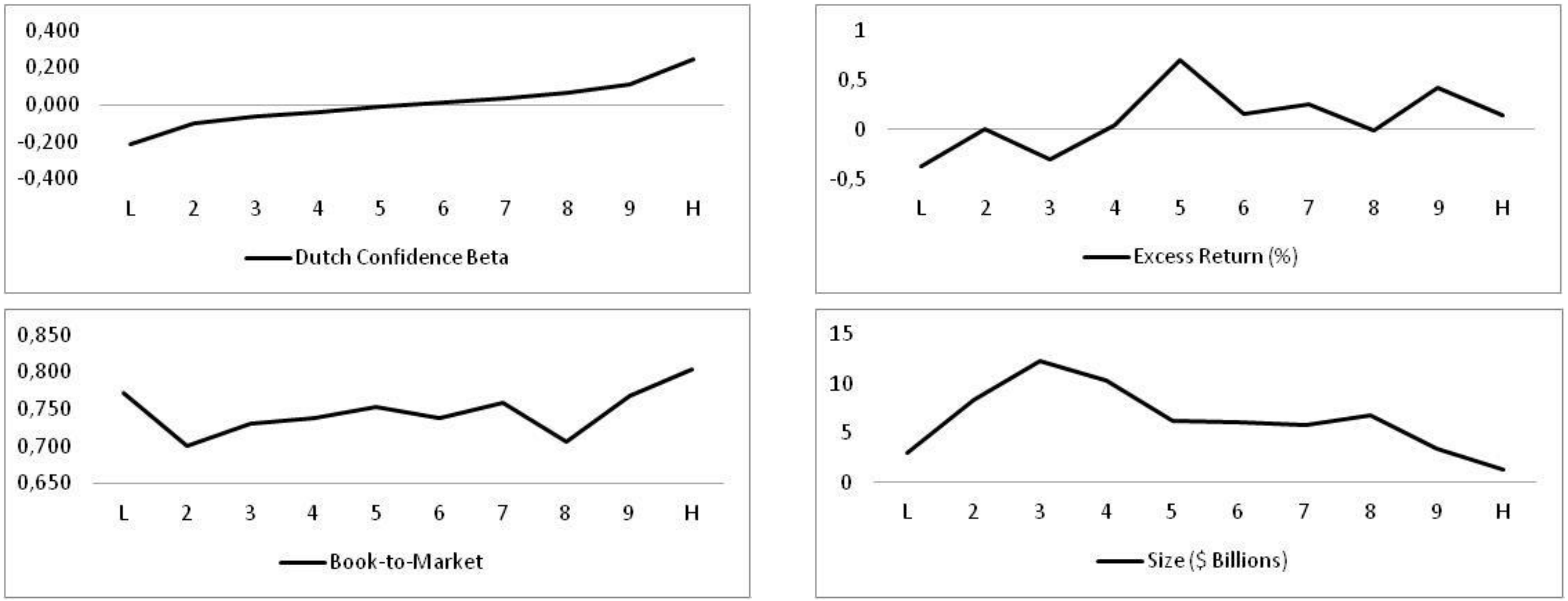


Table & Figure 3a: Portfolio quintiles by factual sentiment beta values (Method 1)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly raw orthogonalized sentiment index from Baker and Wurgler (2006) (Method 1). Companies with the lowest sentiment beta are sorted in quintile L and companies with the highest sentiment beta are sorted in quintile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	-0,126	-0,037	0,0043	0,045	0,123
Excess Return (%)	-0,051	0,197	0,028	0,191	0,151
Book-to-Market	0,773	0,739	0,716	0,752	0,753
Size ($ Billions)	3,790	7,925	9,348	7,363	3,199

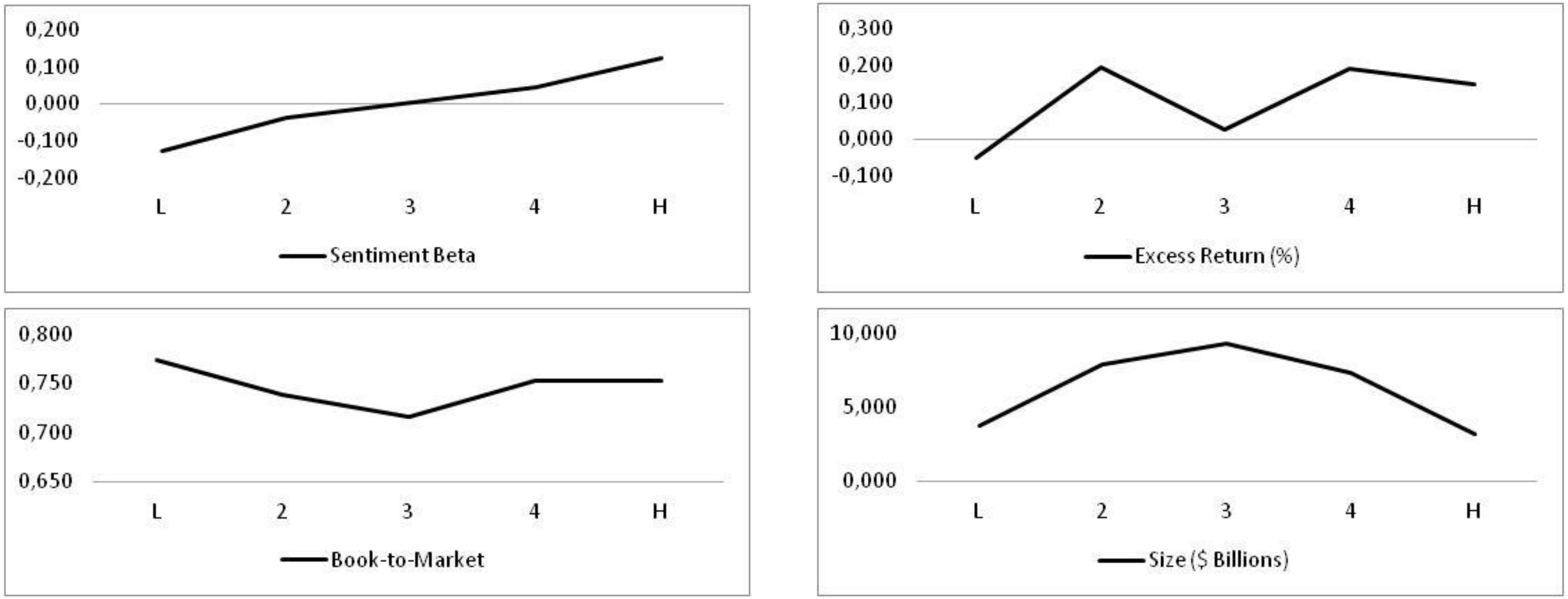


Table & Figure 3b: Portfolio quintiles by factual sentiment beta values (Method 2)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly first difference in sentiment index from Baker and Wurgler (2006) (Method 2). Companies with the lowest sentiment beta are sorted in quintile L and companies with the highest sentiment beta are sorted in quintile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	-0,210	-0,071	0,0005	0,074	0,222
Excess Return (%)	0,410	0,007	0,099	-0,170	0,133
Book-to-Market	0,732	0,700	0,731	0,734	0,842
Size ($ Billions)	6,107	9,008	9,452	4,863	2,023

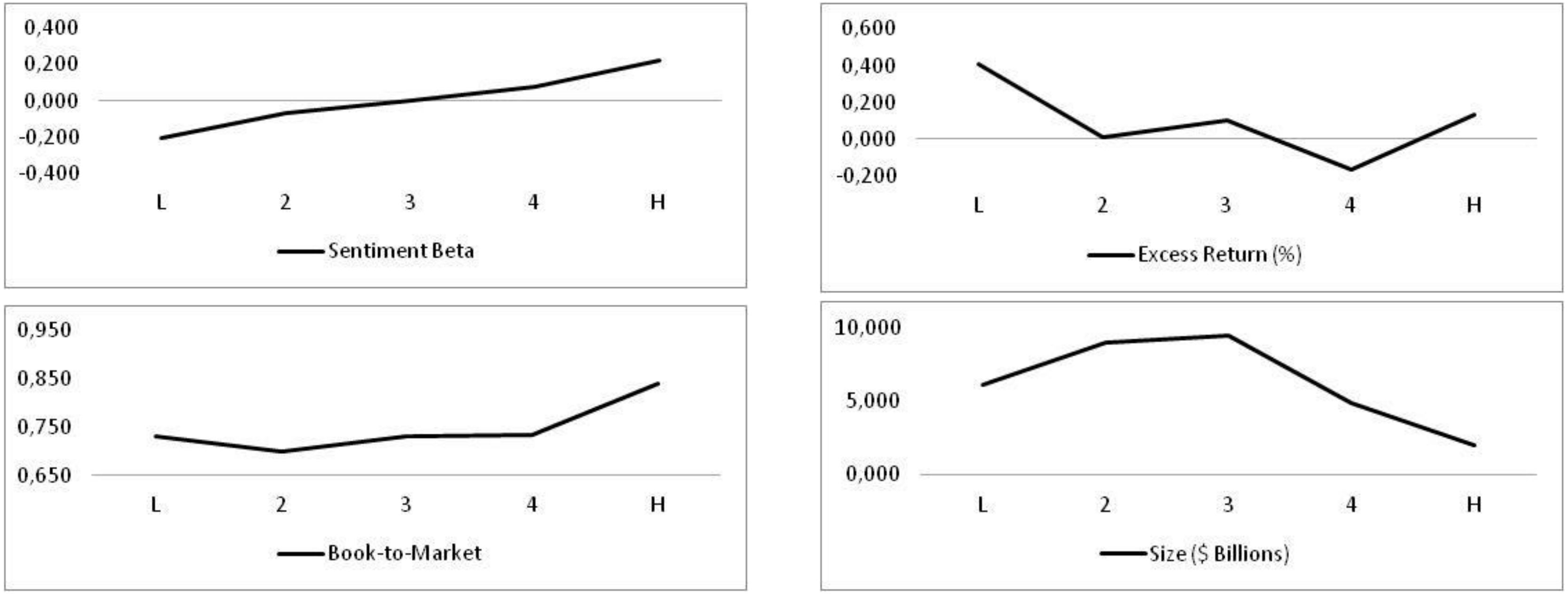


Table & Figure 3c: Portfolio quintiles by factual sentiment beta values (Method 3)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) (Method 3). Companies with the lowest sentiment beta are sorted in quintile L and companies with the highest sentiment beta are sorted in quintile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	-0,029	-0,010	-0,0004	0,010	0,031
Excess Return (%)	0,345	0,090	-0,009	0,339	-0,275
Book-to-Market	0,681	0,722	0,785	0,743	0,806
Size ($ Billions)	8,391	8,042	6,949	5,279	2,807

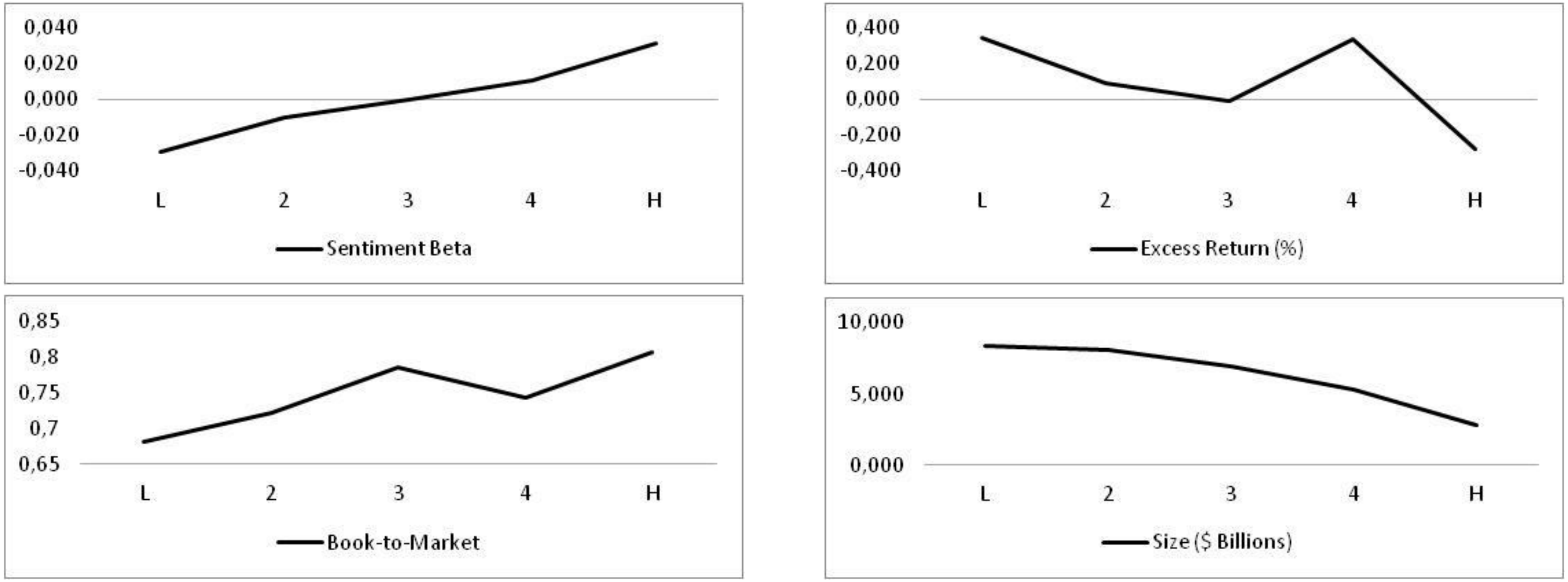


Table & Figure 3d: Portfolio quintiles by factual sentiment beta values (Method 4)

This table provides the monthly average of the factual sentiment betas (both positive and negative values), excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the factual value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) relative to the sentiment-neutral month December 2003 (Method 4). Companies with the lowest sentiment beta are sorted in quintile L and companies with the highest sentiment beta are sorted in quintile H. The factual sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	-0,245	-0,080	-0,001	0,086	0,257
Excess Return (%)	0,265	0,315	-0,066	-0,063	0,050
Book-to-Market	0,729	0,726	0,715	0,739	0,830
Size ($ Billions)	5,983	8,911	9,204	5,214	2,168

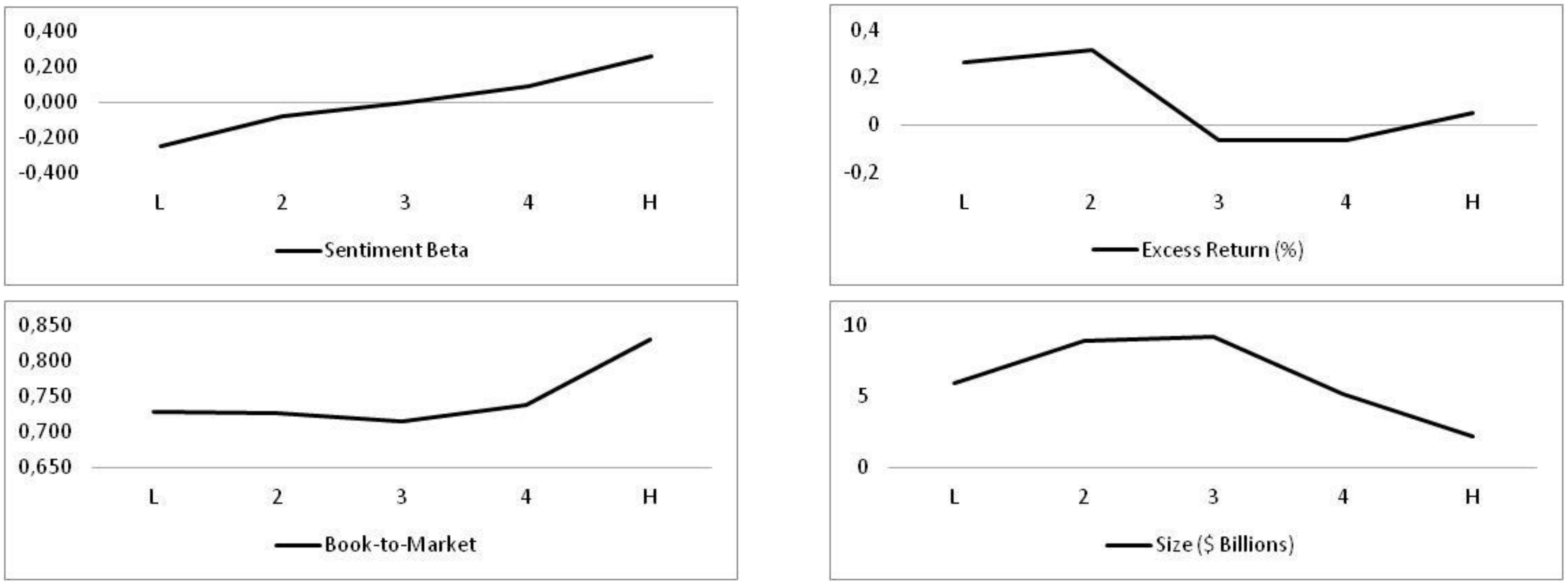


Table & Figure 3e: Portfolio quintiles by factual confidence beta values (Method 5)

This table provides the monthly average of the factual confidence betas (both positive and negative values), excess return, book-to-market ratio and company size for each confidence-based quintile. The portfolio quintiles are formed by the factual value of the confidence beta. In this table the confidence betas are estimated by the monthly percentage change in consumer confidence index from the OECD (Method 5). Companies with the lowest confidence beta are sorted in quintile L and companies with the highest confidence beta are sorted in quintile H. The factual confidence beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta CONF_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Dutch Confidence Beta	-0,162	-0,053	-0,001	0,052	0,177
Excess Return (%)	-0,192	-0,126	0,411	0,121	0,285
Book-to-Market	0,738	0,734	0,744	0,732	0,786
Size ($ Billions)	5,426	11,53	6,135	6,329	2,321

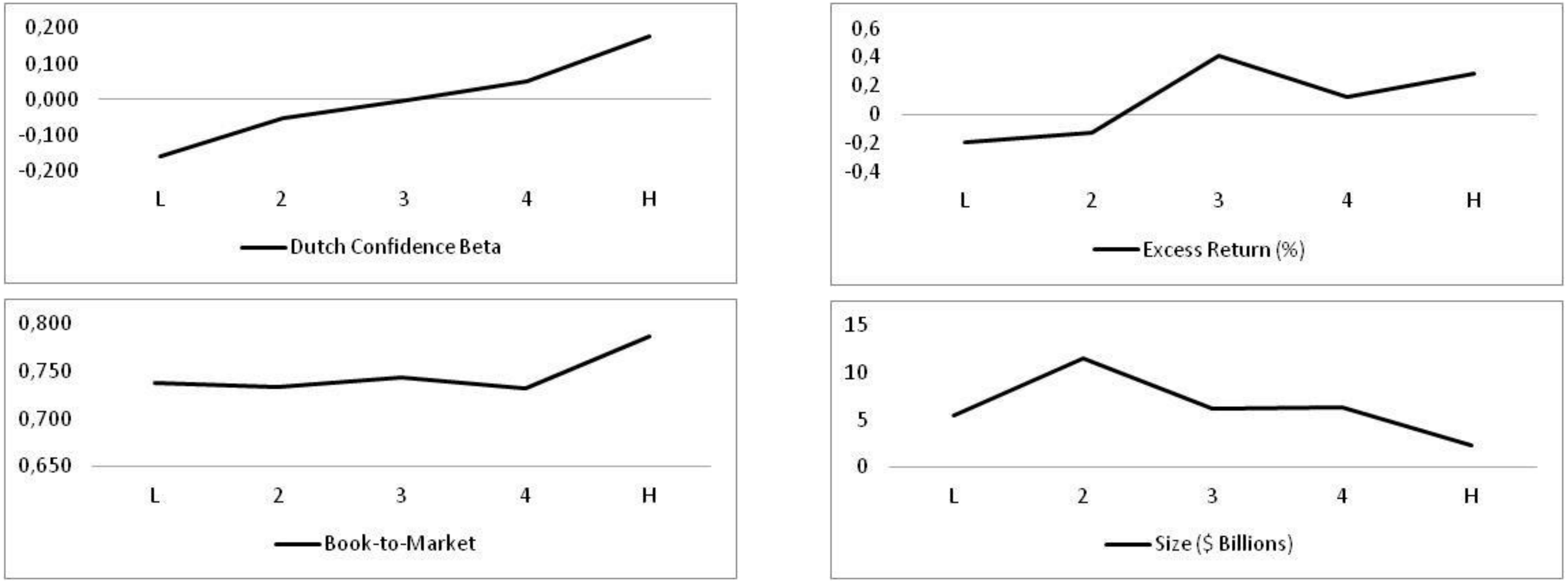


Table & Figure 4a: Portfolio quintiles by absolute sentiment beta values (Method 1)

This table provides the monthly average of the absolute sentiment betas, excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the absolute value of the sentiment beta. In this table the sentiment betas are estimated by the monthly raw orthogonalized sentiment index from Baker and Wurgler (2006) (Method 1). Companies with the least positive sentiment beta are sorted in quintile L and companies with the most positive sentiment beta are sorted in quintile H. The absolute sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	0,0102	0,0303	0,0530	0,0847	0,170
Excess Return (%)	-0,0165	0,467	0,0367	0,183	-0,157
Book-to-Market	0,718	0,731	0,762	0,769	0,755
Size ($ Billions)	9,177	7,746	7,349	5,258	1,854

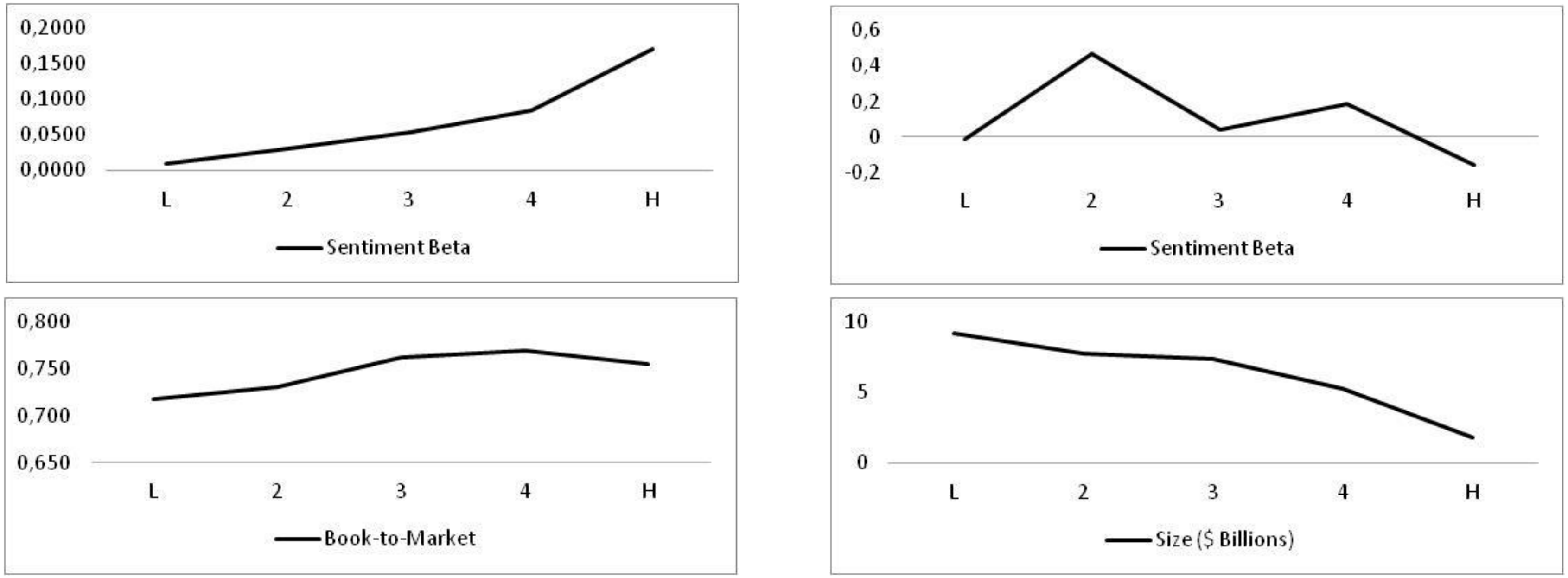


Table & Figure 4b: Portfolio quintiles by absolute sentiment beta values (Method 2)

This table provides the monthly average of the absolute sentiment betas, excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the absolute value of the sentiment beta. In this table the sentiment betas are estimated by the monthly first difference in sentiment index from Baker and Wurgler (2006) (Method 2). Companies with the least positive sentiment beta are sorted in quintile L and companies with the most positive sentiment beta are sorted in quintile H. The absolute sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	0,0178	0,0523	0,0932	0,150	0,290
Excess Return (%)	0,0739	-0,0897	0,0261	0,273	0,224
Book-to-Market	0,727	0,712	0,723	0,777	0,798
Size ($ Billions)	9,330	7,770	6,097	4,326	3,940

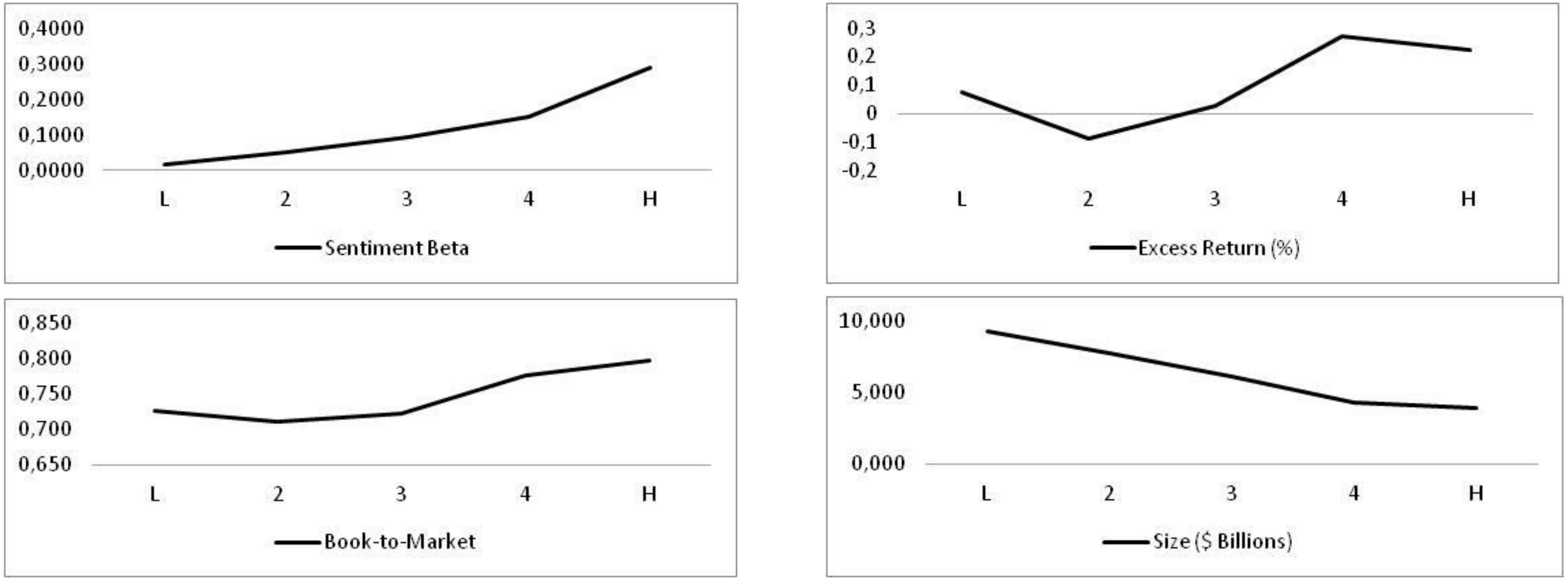


Table & Figure 4c: Portfolio quintiles by absolute sentiment beta values (Method 3)

This table provides the monthly average of the absolute sentiment betas, excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the absolute value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) (Method 3). Companies with the least positive sentiment beta are sorted in quintile L and companies with the most positive sentiment beta are sorted in quintile H. The absolute sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	0,0025	0,0075	0,0133	0,0210	0,0401
Excess Return (%)	0,0940	0,137	0,139	-0,180	0,307
Book-to-Market	0,783	0,753	0,715	0,698	0,784
Size ($ Billions)	6,979	7,844	5,327	7,223	4,313

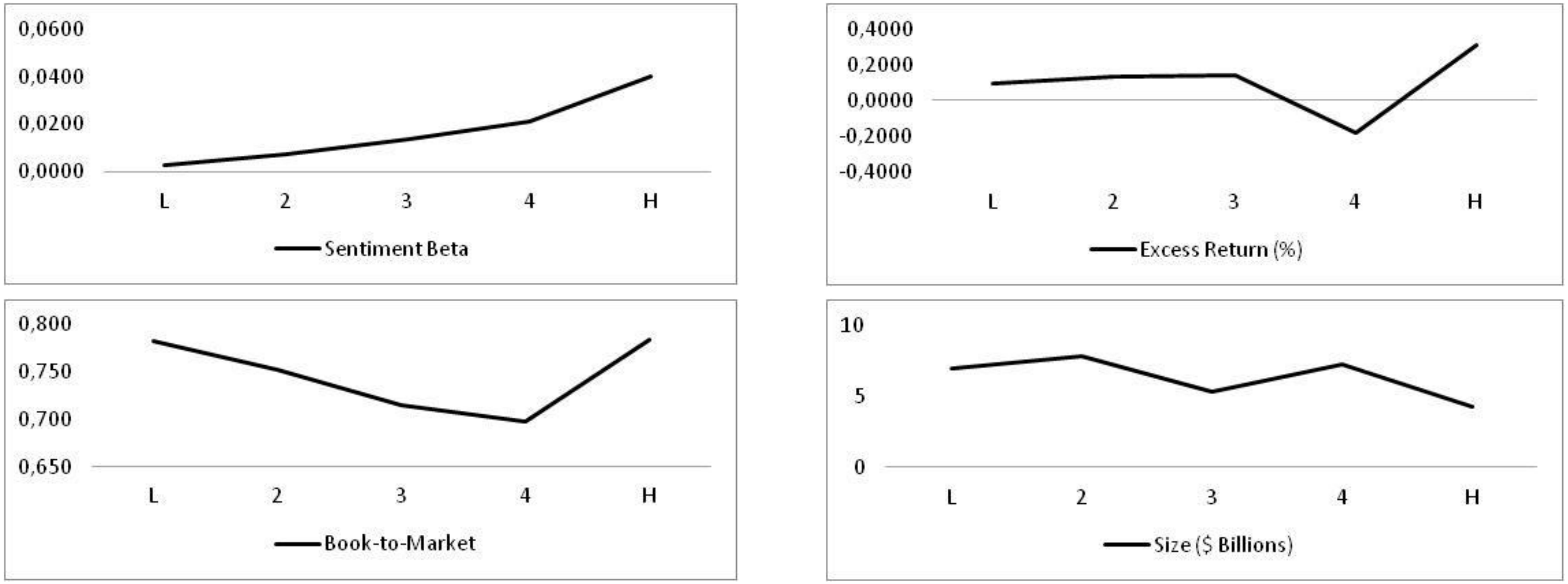


Table & Figure 4d: Portfolio quintiles by absolute sentiment beta values (Method 4)

This table provides the monthly average of the absolute sentiment betas, excess return, book-to-market ratio and company size for each sentiment-based quintile. The portfolio quintiles are formed by the absolute value of the sentiment beta. In this table the sentiment betas are estimated by the monthly percentage change in sentiment index from Baker and Wurgler (2006) relative to the sentiment-neutral month December 2003 (Method 4). Companies with the least positive sentiment beta are sorted in quintile L and companies with the most positive sentiment beta are sorted in quintile H. The absolute sentiment beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta SENT_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Sentiment Beta	0,0207	0,0608	0,106	0,173	0,340
Excess Return (%)	0,0619	-0,0409	-0,0895	0,627	-0,0420
Book-to-Market	0,714	0,719	0,753	0,751	0,800
Size ($ Billions)	9,252	8,171	6,144	4,959	2,939

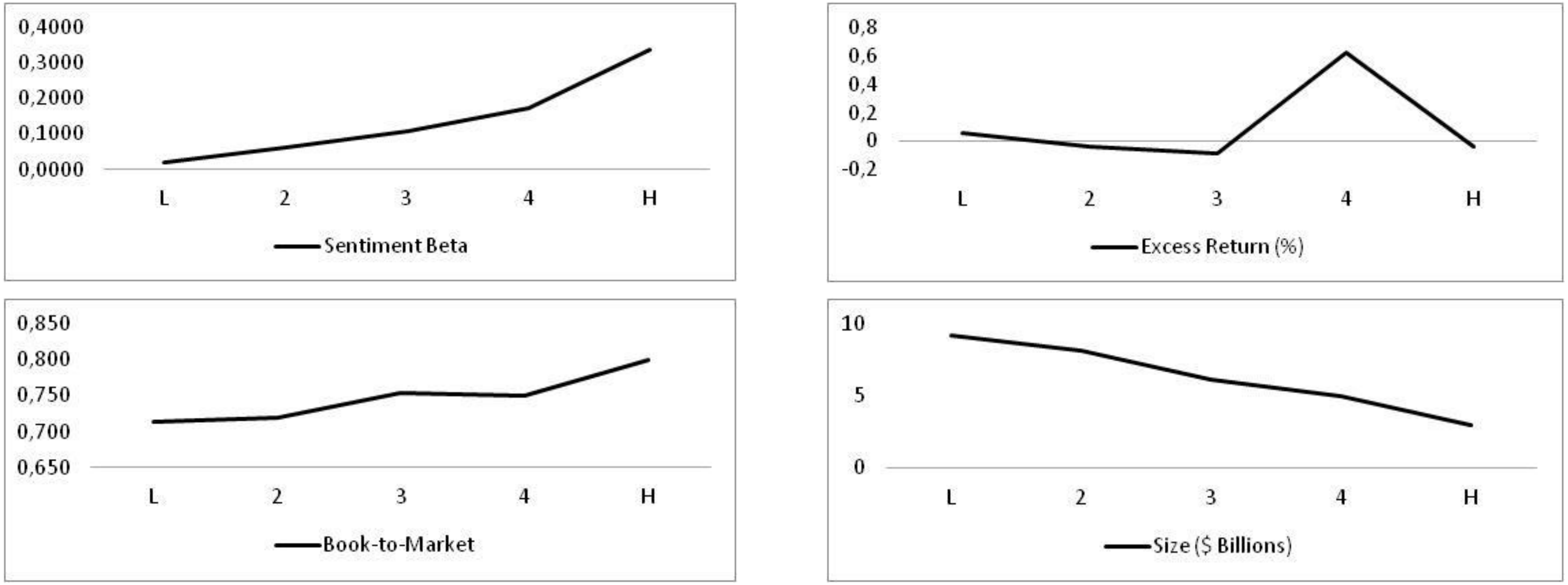


Table & Figure 4e: Portfolio quintiles by absolute sentiment beta values (Method 5)

This table provides the monthly average of the absolute confidence betas, excess return, book-to-market ratio and company size for each confidence-based quintile. The portfolio quintiles are formed by the absolute value of the confidence beta. In this table the confidence betas are estimated by the monthly percentage change in consumer confidence index from the OECD (Method 5). Companies with the least positive confidence beta are sorted in quintile L and companies with the most positive confidence beta are sorted in quintile H. The absolute confidence beta coefficients are estimated for each individual company using a rolling forward window of 24 months and are calculated using the following formula:

$$R_{it} - R_{ft} = \alpha_i + \beta_i^{SENT} * \Delta CONF_t + \beta_i^{MKT} * MKT_t + \varepsilon_{it}$$

Quintiles	L	2	3	4	H
Dutch Confidence Beta	0,0134	0,0381	0,0683	0,110	0,235
Excess Return (%)	0,387	0,220	-0,258	0,331	-0,174
Book-to-Market	0,745	0,744	0,715	0,749	0,783
Size ($ Billions)	6,464	8,128	9,188	5,84	1,826

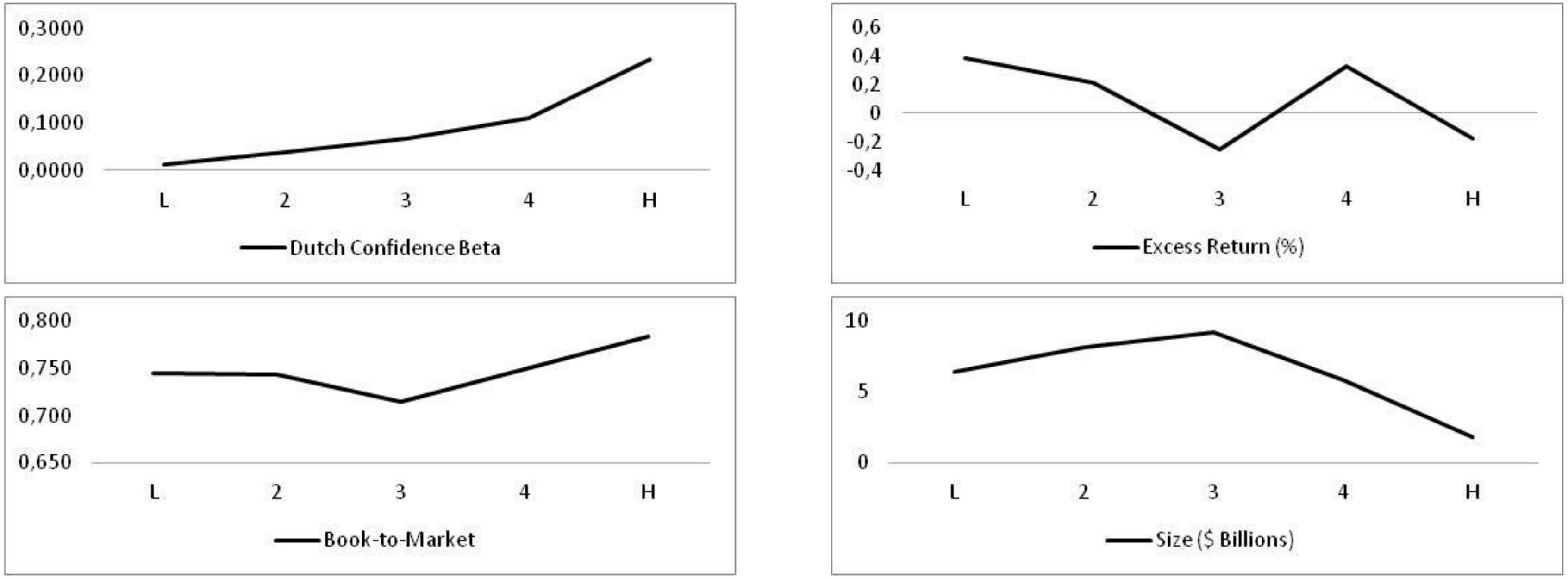


Table 5: Average return of the sentiment factors

This table shows the monthly average return of the sentiment factors for the whole portfolio, calculated for each of the five methods. The SMNPlus, SMNMinus and SMNAverage here are calculated using the factual sentiment betas sorted in deciles, while the SMNAbsolute is calculated using the absolute sentiment betas. Besides, this table shows whether the four different sentiment factors significantly differ from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively.

	Sentiment Factor	Average Return	t-statistic	Std. Dev	Observations	95% Confidence Interval	
Method 1	SMN*Plus*	-0,0045	-0,938	0,0499	108	-0,0140	0,0050
	SMN*Minus*	-0,00006	-0,012	0,0524	108	-0,0101	0,0099
	SMN*Average*	-0,0023	-0,612	0,0387	108	-0,0097	0,0051
	SMN*Absolute*	-0,0014	-0,364	0,0401	108	-0,0091	0,0062
Method 2	SMN*Plus*	-0,0034	-0,629	0,0563	108	-0,0141	0,0073
	SMN*Minus*	0,0068	1,242	0,0565	108	-0,0040	0,0175
	SMN*Average*	0,0017	0,449	0,0388	108	-0,0057	0,0091
	SMN*Absolute*	0,0015	0,400	0,0390	108	-0,0059	0,0089
Method 3	SMN*Plus*	0,0048	0,962	0,0514	108	-0,0051	0,0146
	SMN*Minus*	0,0060	1,136	0,0547	108	-0,0045	0,0161
	SMN*Average*	0,0054*	1,419	0,0393	108	-0,0021	0,0129
	SMN*Absolute*	0,0021	0,530	0,0418	108	-0,0058	0,0101
Method 4	SMN*Plus*	-0,0027	-0,497	0,0567	108	-0,0136	0,00815
	SMN*Minus*	0,0046	0,848	0,0569	108	-0,0062	0,0155
	SMN*Average*	0,0010	0,257	0,0387	108	-0,0064	0,0083
	SMN*Absolute*	-0,0010	-0,285	0,0378	108	-0,0082	0,0062
Method 5	SMN*Plus*	-0,0001	-0,028	0,0536	108	-0,0108	0,0099
	SMN*Minus*	-0,106****	-2,364	0,0466	108	-0,0195	-0,0017
	SMN*Average*	-0,0054**	-1,553	0,0360	108	-0,0122	0,0015
	SMN*Absolute*	-0,0056**	-1,589	0,0367	108	-0,0126	0,0014

Table 6: Average return of the sentiment factors

This table shows the monthly average return of the sentiment factors for the whole portfolio, calculated for each of the five methods. The SMNPlus, SMNMinus and SMNAverage here are calculated using the factual sentiment betas sorted in quintiles. Besides, this table shows whether the three different sentiment factors significantly differ from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively.

	Sentiment Factor	Average Return	t-statistic	Std. Dev	Observations	95% Confidence Interval	
Method 1	SMN*Plus*	-0,0004	-0,126	0,0329	108	-0,0067	0,0059
	SMN*Minus*	-0,0025	-0,733	0,0351	108	-0,0091	0,0042
	SMN*Average*	-0,0014	-0,556	0,0268	108	-0,0066	0,0037
Method 2	SMN*Plus*	0,0030	0,782	0,0402	108	-0,0046	0,0107
	SMN*Minus*	0,0040	1,096	0,0382	108	-0,0032	0,0113
	SMN*Average*	0,0035*	1,325	0,0276	108	-0,0017	0,0088
Method 3	SMN*Plus*	-0,0061**	-1,600	0,0399	108	-0,0140	0,0015
	SMN*Minus*	0,0026	0,772	0,0343	108	-0,0040	0,0091
	SMN*Average*	-0,0018	-0,704	0,0265	108	-0,0068	0,0033
Method 4	SMN*Plus*	0,0011	0,321	0,0366	108	-0,0058	0,0081
	SMN*Minus*	-0,0005	-0,131	0,0401	108	-0,0081	0,0071
	SMN*Average*	0,0003	0,124	0,0263	108	-0,0047	0,0053
Method 5	SMN*Plus*	0,0016	0,441	0,0386	108	-0,0057	0,0090
	SMN*Minus*	-0,0007	-0,200	0,0345	108	-0,0072	0,0059
	SMN*Average*	0,0005	0,174	0,0292	108	-0,0051	0,0061

Table 7: Correlation matrix of the risk factors

This table shows the correlation between the MKT, HML, SMB and SMN factor.

		Market Premium	Company Size	Book-to-Market
	Market Premium (MKT)	1		
	Company Size (SMB)	-0,184	1	
	Book-to-Market (HML)	-0,217	0,085	1
Deciles (factual)	SMNPlusM1	0,042	0,25	-0,239
	SMNPlusM2	0,402	-0,034	-0,06
	SMNPlusM3	0,301	0,012	-0,066
	SMNPlusM4	0,289	-0,005	-0,054
	SMNPlusM5	0,229	0,03	-0,235
	SMNMinusM1	-0,066	0,328	-0,004
	SMNMinusM2	0,29	0,146	-0,233
	SMNMinusM3	0,293	0,121	-0,225
	SMNMinusM4	0,273	0,183	-0,203
	SMNMinusM5	0,149	0,151	0,119
	SMNAvgM1	-0,018	0,383	-0,156
	SMNAvgM2	0,503	0,082	-0,213
	SMNAvgM3	0,401	0,092	-0,2
	SMNAvgM4	0,414	0,131	-0,189
	SMNAvgM5	0,264	0,119	-0,094
Quintiles (Absolute)	SMNAbsM1	-0,065	0,367	-0,155
	SMNAbsM2	0,494	0,091	-0,162
	SMNAbsM3	0,45	0,09	-0,188
	SMNAbsM4	0,359	0,089	-0,165
	SMNAbsM5	0,202	0,093	-0,082
Quintiles (factual)	SMNPlusM1	0,232	0,236	-0,2
	SMNPlusM2	0,104	-0,043	0,037
	SMNPlusM3	0,352	-0,057	-0,169
	SMNPlusM4	0,201	0,004	0,021
	SMNPlusM5	0,093	0,19	-0,105
	SMNMinusM1	0,206	0,329	-0,116
	SMNMinusM2	0,334	0,1	-0,202
	SMNMinusM3	0,181	0,062	-0,1
	SMNMinusM4	0,177	0,144	-0,044
	SMNMinusM5	0,093	0,018	-0,067
	SMNAvgM1	0,277	0,36	-0,199
	SMNAvgM2	0,307	0,036	-0,113
	SMNAvgM3	0,382	-0,005	-0,192
	SMNAvgM4	0,275	0,113	-0,02
	SMNAvgM5	0,116	0,136	-0,109

Table 8: Average return difference of the SMB factor

This table shows the monthly average return difference of the size factor for the whole portfolio, calculated in three different ways. First, using the methodology of Fama and French the monthly average return difference between the smallest 30% companies and the biggest 30% companies is calculated, based on three single-sorted portfolios. Secondly, the monthly average return difference between the smallest three portfolio deciles and the biggest three portfolios deciles is calculated. Lastly, the monthly average return difference between the smallest portfolio decile and the biggest portfolio decile is calculated. Besides, this table shows whether the three different sentiment factors significantly differ from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively.

SMB factor	Average return difference	t-statistic	Std. Dev	Observations
(Smallest 30%) - (Biggest 30%)	-0,0045	-1,049	0,0442	108
(Decile 1+2+3) - (Decile 8+9+10)	-0,0134	-1,054	0,1321	108
(Decile 1) - (Decile 10)	-0,0020	-0,365	0,0558	108

Table 9: Average return difference of the HML factor

This table shows the monthly average return difference of the book-to-market factor for the whole portfolio, calculated in three different ways. First, using the methodology of Fama and French the monthly average return difference between the 30% companies with the highest book-to-market ratio and the 30% companies with the lowest book-to-market ratio is calculated, based on three single-sorted portfolios. Secondly, the monthly average return difference between the three portfolio deciles with the highest book-to-market ratio and the three portfolios deciles with the lowest book-to-market ratio is calculated. Lastly, the monthly average return difference between the portfolio decile with the highest book-to-market ratio and the portfolio decile with the lowest book-to-market ratio is calculated. Besides, this table shows whether the three different sentiment factors significantly differ from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively.

HML factor	Average return difference	t-statistic	Std. Dev	Observations
(Highest 30%) - (Lowest 30%)	-0,0006	-0,1872	0,034	108
(Decile 8+9+10) - (Decile 1+2+3)	-0,0023	-0,2403	0,101	108
(Decile 10) - (Decile 1)	0,0037	0,6695	0,058	108

Table 10: Fama-MacBeth regression on the CAPM and the three-factor model

This table shows the lambdas of the MKT, HML and SMB factor. These lambdas indicate first of all whether the factor loadings command a risk premium and second of all whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	Three-factor model (decile 1 & 10)	Three-factor model (decile 1,2,3 and 8,9,10)
Constant	0,0033	0,0007	0,0034
	(1,115)	(0,236)	(1,141)
Market premium (MKT)	-0,0051	-0,0018	-0,0052
	(-0,727)	(-0,251)	(-0,734)
Book-to-market (HML)	-0,0018	-0,0058	-0,0048
	(-0,392)	(-0,677)	(-0,354)
Company size (SMB)	0,0036	0,0036	0,0058
	(0,640)	(0,485)	(0,348)

Table 11a: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNplus/deciles)

This table shows the lambdas of the MKT and the SMNplus factor for all five different ways of defining sentiment. The SMNplus factors are calculated using the estimated individual factual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNPlusM1	SMNPlusM2	SMNPlusM3	SMNPlusM4	SMNPlusM5
Constant	0,0035	0,0027	0,0022	-0,0008	0,0007	0,0004
	(0,945)	(0,873)	(0,697)	(-0,239)	(0,183)	(0,140)
Market premium (MKT)	-0,0022	-0,0019	-0,0021	-0,0011	-0,0025	-0,0023
	(-0,237)	(-0,263)	(-0,277)	(-0,148)	(-0,323)	(-0,315)
SMNPlusM1		0,0017				
		(0,218)				
SMNPlusM2			0,0016			
			(0,187)			
SMNPlusM3				0,0063		
				(0,792)		
SMNPlusM4					0,0022	
					(0,253)	
SMNPlusM5						-0,0006
						(-0,101)

Table 11b: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNminus/deciles)

This table shows the lambdas of the MKT and the SMNminus factor for all five different ways of defining sentiment. The SMNminus factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNMinusM1	SMNMinusM2	SMNMinusM3	SMNMinusM4	SMNMinusM5
Constant	0,0035	0,0046*	0,0011	0,0023	0,0013	0,0015
	(0,945)	(1,353)	(0,330)	(0,662)	(0,380)	(0,444)
Market premium (MKT)	-0,0022	-0,0023	-0,0029	-0,0041	-0,0031	-0,0033
	(-0,237)	(-0,310)	(-0,410)	(-0,551)	(-0,435)	(-0,449)
SMNMinusM1		-0,0047				
		(-0,642)				
SMNMinusM2			0,0042			
			(0,554)			
SMNMinusM3				0,0043		
				(0,513)		
SMNMinusM4					0,0045	
					(0,563)	
SMNMinusM5						0,0005
						(0,100)

Table 11c: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNaverage/deciles)

This table shows the lambdas of the MKT and the SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNAvgM1	SMNAvgM2	SMNAvgM3	SMNAvgM4	SMNAvgM5
Constant	0,0035	0,0012	0,0022	0,0010	0,0010	0,0015
	(0,945)	(0,374)	(0,683)	(0,318)	(0,312)	(0,464)
Market premium (MKT)	-0,0022	-0,0020	-0,0019	-0,0028	-0,0019	-0,0033
	(-0,237)	(-0,273)	(-0,261)	(-0,386)	(-0,265)	(-0,460)
SMNAvgM1		-0,0034				
		(-0,599)				
SMNAvgM2			0,0022			
			(0,400)			
SMNAvgM3				0,0053		
				(0,882)		
SMNAvgM4					0,0023	
					(0,408)	
SMNAvgM5						0,0004
						(0,080)

Table 11d: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNabsolute/quintiles)

This table shows the lambdas of the MKT and the SMNabsolute factor for all five different ways of defining sentiment. The SMNabsolute factors are calculated using the estimated absolute individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNAbsM1	SMNAbsM2	SMNAbsM3	SMNAbsM4	SMNAbsM5
Constant	0,0035	-0,0028	-0,0022	0,0004	0,0013	0,0011
	(0,945)	(-0,873)	(-0,689)	(0,144)	(0,378)	(0,343)
Market premium (MKT)	-0,0022	-0,0016	-0,0016	-0,0023	-0,0031	-0,0029
	(-0,237)	(-0,216)	(-0,229)	(-0,312)	(-0,427)	(-0,406)
SMNAbsM1		-0,0008				
		(-0,141)				
SMNAbsM2			0,0020			
			(0,348)			
SMNAbsM3				0,0048		
				(0,768)		
SMNAbsM4					0,0006	
					(0,110)	
SMNAbsM5						0,0004
						(0,081)

Table 11e: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNplus/quintiles)

This table shows the lambdas of the MKT and the SMNplus factor for all five different ways of defining sentiment. The SMNplus factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNPlusM1q	SMNPlusM2q	SMNPlusM3q	SMNPlusM4q	SMNPlusM5q
Constant	0,0035	0,0008	-0,0005	0,0005	-0,0006	0,0010
	(0,945)	(0,235)	(-0,140)	(0,174)	(-0,171)	(0,302)
Market premium (MKT)	-0,0022	-0,0026	-0,0013	-0,0023	-0,0012	-0,0028
	(-0,237)	(-0,371)	(-0,174)	(-0,326)	(-0,161)	(-0,386)
SMNPlusM1q		0,0023				
		(0,464)				
SMNPlusM2q			-0,0018			
			(-0,359)			
SMNPlusM3q				0,0010		
				(0,159)		
SMNPlusM4q					-0,0026	
					(-0,494)	
SMNPlusM5q						0,0002
						(0,046)

Table 11f: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNminus/quintiles)

This table shows the lambdas of the MKT and the SMNminus factor for all five different ways of defining sentiment. The SMNminus factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium “lambda” coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNMinusM1q	SMNMinusM2q	SMNMinusM3q	SMNMinusM4q	SMNMinusM5q
Constant	0,0035	0,0008	0,0005	0,0020	0,0009	0,0011
	(0,945)	(0,263)	(0,152)	(0,593)	(0,276)	(0,384)
Market premium (MKT)	-0,0022	-0,0026	-0,0019	-0,0038	-0,0028	-0,0030
	(-0,237)	(-0,368)	(-0,265)	(-0,515)	(-0,374)	(-0,421)
SMNMinusM1q		0,0014				
		(0,259)				
SMNMinusM2q			0,0017			
			(0,326)			
SMNMinusM3q				-0,0002		
				(-0,050)		
SMNMinusM4q					0,0021	
					(0,383)	
SMNMinusM5q						-0,0037
						(-0,745)

Table 11g: Fama-MacBeth regression on the CAPM and the extended CAPM (SMNaverage/quintiles)

This table shows the lambdas of the MKT and the SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	CAPM	SMNAvgM1q	SMNAvgM2q	SMNAvgM3q	SMNAvgM4q	SMNAvgM5q
Constant	0,0035	0,0007	-0,0003	-0,0002	0,0011	0,0010
	(0,945)	(0,222)	(-0,100)	(-0,079)	(0,290)	(0,330)
Market premium (MKT)	-0,0022	-0,0025	-0,0016	-0,0016	-0,0029	-0,0029
	(-0,237)	(-0,359)	(-0,218)	(-0,224)	(-0,387)	(-0,399)
SMNAvgM1q		0,0015				
		(0,408)				
SMNAvgM2q			0,0017			
			(0,444)			
SMNAvgM3q				0,0005		
				(0,125)		
SMNAvgM4q					-0,0007	
					(-0,185)	
SMNAvgM5q						-0,0011
						(-0,258)

Table 12a: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNplus/deciles)

This table shows the lambdas of the MKT, SMB, HML and SMNplus factor for all five different ways of defining sentiment. The SMNplus factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNPlusM1	SMNPlusM2	SMNPlusM3	SMNPlusM4	SMNPlusM5
Constant	0,0033	0,0020	0,0027	0,0024	0,0024	0,0032
	(1,115)	(0,709)	(0,952)	(0,843)	(0,813)	(1,169)
Market premium (MKT)	-0,0051	-0,0039	-0,0045	-0,0042	-0,0042	-0,0050
	(-0,727)	(-0,552)	(-0,628)	(-0,580)	(-0,582)	(-0,717)
Size (SMB)	0,0036	0,0032	-0,0027	-0,0006	-0,0005	-0,0007
	(0,640)	(0,573)	(-0,498)	(-0,111)	(-0,091)	(-0,132)
Book-To-Market (HML)	-0,0018	-0,0022	-0,0020	-0,0031	-0,0029	-0,0020
	(-0,392)	(-0,494)	(-0,426)	(-0,654)	(-0,646)	(-0,444)
SMNPlusM1		-0,0016				
		(-0,225)				
SMNPlusM2			-0,0041			
			(-0,529)			
SMNPlusM3				0,0041		
				(0,539)		
SMNPlusM4					-0,0019	
					(-0,238)	
SMNPlusM5						-0,0005
						(-0,078)

Table 12b: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNminus/deciles)

This table shows the lambdas of the MKT, SMB, HML and SMNminus factor for all five different ways of defining sentiment. The SMNminus factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNMinusM1	SMNMinusM2	SMNMinusM3	SMNMinusM4	SMNMinusM5
Constant	0,0033	0,0026	0,0040*	0,0037*	0,0036	0,0043**
	(1,115)	(0,912)	(1,367)	(1,323)	(1,244)	(1,516)
Market premium (MKT)	-0,0051	-0,0044	-0,0058	-0,055	-0,0054	-0,0060
	(-0,727)	(-0,632)	(-0,842)	(-0,801)	(-0,790)	(-0,848)
Size (SMB)	0,0036	0,0015	-0,0015	-0,0005	-0,0006	-0,0001
	(0,640)	(0,262)	(-0,266)	(-0,091)	(-0,108)	(-0,019)
Book-To-Market (HML)	-0,0018	-0,0018	-0,0017	-0,0010	-0,0013	-0,0017
	(-0,392)	(-0,378)	(-0,372)	(-0,229)	(-0,296)	(-0,378)
SMNMinusM1		-0,0094*				
		(-1,360)				
SMNMinusM2			0,0049			
			(0,731)			
SMNMinusM3				0,0009		
				(0,124)		
SMNMinusM4					0,0024	
					(0,335)	
SMNMinusM5						-0,0005
						(-0,076)

Table 12c: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNaverage/deciles)

This table shows the lambdas of the MKT, SMB, HML and SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNAvgM1	SMNAvgM2	SMNAvgM3	SMNAvgM4	SMNAvgM5
Constant	0,0033	0,0023	0,0016	0,0023	0,0015	0,0039*
	(1,115)	(0,799)	(0,549)	(0,832)	(0,540)	(1,394)
Market premium (MKT)	-0,0051	-0,0041	-0,0035	-0,0041	-0,0033	-0,0057
	(-0,727)	(-0,583)	(-0,490)	(-0,579)	(-0,472)	(-0,815)
Size (SMB)	0,0036	0,0005	-0,0006	-0,0011	-0,0006	-0,0003
	(0,640)	(0,081)	(-0,116)	(-0,194)	(-0,109)	(-0,054)
Book-To-Market (HML)	-0,0018	-0,0013	-0,0029	-0,0024	-0,0028	-0,0013
	(-0,392)	(-0,277)	(-0,645)	(-0,532)	(-0,625)	(-0,299)
SMNAvgM1		-0,0054				
		(-1,020)				
SMNAvgM2			0,0010			
			(0,201)			
SMNAvgM3				0,0027		
				(0,495)		
SMNAvgM4					-0,0004	
					(-0,082)	
SMNAvgM5						-0,0002
						(-0,042)

Table 12d: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNabsolute/quintiles)

This table shows the lambdas of the MKT, SMB, HML and SMNabsolute factor for all five different ways of defining sentiment. The SMNabsolute factors are calculated using the estimated absolute individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNAbsM1	SMNAbsM2	SMNAbsM3	SMNAbsM4	SMNAbsM5
Constant	0,0033	0,0026	0,0014	0,0023	0,0029	0,0035
	(1,115)	(0,920)	(0,481)	(0,843)	(0,992)	(1,264)
Market premium (MKT)	-0,0051	-0,0044	-0,0032	-0,0041	-0,0047	-0,0053
	(-0,727)	(-0,634)	(-0,458)	(-0,577)	(-0,680)	(-0,765)
Size (SMB)	0,0036	0,0005	-0,0010	-0,0007	-0,0003	0,0005
	(0,640)	(0,095)	(-0,176)	(-0,120)	(-0,057)	(0,090)
Book-To-Market (HML)	-0,0018	-0,0016	-0,0030	-0,0021	-0,0028	-0,0020
	(-0,392)	(-0,358)	(-0,665)	(-0,469)	(-0,620)	(-0,445)
SMNAbsM1		-0,0042				
		(-0,762)				
SMNAbsM2			0,0015			
			(0,299)			
SMNAbsM3				0,0027		
				(0,469)		
SMNAbsM4					-0,0025	
					(-0,510)	
SMNAbsM5						-0,0002
						(-0,048)

Table 12e: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNplus/quintiles)

This table shows the lambdas of the MKT, SMB, HML and SMNplus factor for all five different ways of defining sentiment. The SMNplus factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNPlusM1q	SMNPlusM2q	SMNPlusM3q	SMNPlusM4q	SMNPlusM5q
Constant	0,0033	0,0031	0,0024	0,0025	0,0025	0,0038*
	(1,115)	(1,126)	(0,813)	(0,919)	(0,900)	(1,294)
Market premium (MKT)	-0,0051	-0,0049	-0,0042	-0,0043	-0,0043	-0,0055
	(-0,727)	(-0,731)	(-0,615)	(-0,606)	(-0,633)	(-0,782)
Size (SMB)	0,0036	0,0004	0,0003	-0,0010	0,0006	-0,0015
	(0,640)	(0,072)	(0,055)	(-0,183)	(0,114)	(-0,273)
Book-To-Market (HML)	-0,0018	-0,0019	-0,0019	-0,0031	-0,0015	-0,0019
	(-0,392)	(-0,430)	(-0,434)	(-0,679)	(-0338)	(-0,419)
SMNPlusM1q		0,0010				
		(0,214)				
SMNPlusM2q			-0,0021			
			(-0,428)			
SMNPlusM3q				-0,0024		
				(-0,410)		
SMNPlusM4q					-0,0009	
					(-0,173)	
SMNPlusM5q						0,0025
						(0,473)

Table 12f: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNminus/quintiles)

This table shows the lambdas of the MKT, SMB, HML and SMNminus factor for all five different ways of defining sentiment. The SMNminus factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNMinusM1q	SMNMinusM2q	SMNMinusM3q	SMNMinusM4q	SMNMinusM5q
Constant	0,0033	0,0034	0,0025	0,0042**	0,0036	0,0037*
	(1,115)	(1,200)	(0,863)	(1,474)	(1,251)	(1,371)
Market premium (MKT)	-0,0051	-0,0052	-0,0043	-0,0060	-0,0054	-0,0055
	(-0,727)	(-0,735)	(-0,641)	(-0,853)	(-0,785)	(-0,789)
Size (SMB)	0,0036	-0,0010	-0,0006	-0,0011	-0,0012	-0,0003
	(0,640)	(-0,181)	(-0,105)	(-0,201)	(-0,223)	(-0,057)
Book-To-Market (HML)	-0,0018	-0,0021	-0,0018	-0,0006	-0,0023	-0,0017
	(-0,392)	(-0,462)	(-0,402)	(-0,135)	(-0,502)	(-0,374)
SMNMinusM1q		-0,0001				
		(-0,023)				
SMNMinusM2q			-0,0010			
			(-0,206)			
SMNMinusM3q				0,0004		
				(0,833)		
SMNMinusM4q					0,0003	
					(0,057)	
SMNMinusM5q						-0,0028
						(-0,607)

Table 12g: Fama-MacBeth regression on the three-factor model and the extended three-factor model (SMNaverage/quintiles)

This table shows the lambdas of the MKT, SMB, HML and SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in quintiles. These lambdas indicate whether the factor loadings command a risk premium and whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

λ	Three-factor model (30/40/30)	SMNAvgM1q	SMNAvgM2q	SMNAvgM3q	SMNAvgM4q	SMNAvgM5q
Constant	0,0033	0,0030	0,0019	0,0016	0,0032	0,0034
	(1,115)	(1,110)	(0,687)	(0,588)	(1,037)	(1,207)
Market premium (MKT)	-0,0051	-0,0048	-0,0037	-0,0034	-0,0050	-0,0052
	(-0,727)	(-0,703)	(-0,547)	(-0,490)	(-0,742)	(-0,743)
Size (SMB)	0,0036	-0,0003	0,0006	-0,0009	-0,0005	-0,0014
	(0,640)	(-0,057)	(0,109)	(-0,161)	(-0,093)	(-0,257)
Book-To-Market (HML)	-0,0018	-0,0029	-0,0015	-0,0026	-0,0020	-0,0012
	(-0,392)	(-0,636)	(-0,336)	(-0,580)	(-0,432)	(-0,267)
SMNAvgM1q		0,0007				
		(0,198)				
SMNAvgM2q			0,0005			
			(0,158)			
SMNAvgM3q				-0,0008		
				(-0,237)		
SMNAvgM4q					-0,0008	
					(-0,224)	
SMNAvgM5q						0,0004
						(0,093)

Table 13: Subsamples Fama-MacBeth regression three-factor model

The results in this table serve as a robustness check on the results of table 10 and show the lambdas of the MKT, HML and SMB factor for two different subsamples. These lambdas indicate first of all whether the factor loadings command a risk premium and second of all whether this risk premium significantly differs from zero. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \mu_{it}$$

	Three-factor model (30/40/30)	
λ	January 2008 to June 2011	July 2011 to December 2014
Constant	0,0004	0,0063***
	(0,091)	(1,859)
Market premium (MKT)	-0,0061	-0,0042
	(-0,497)	(-0,589)
Book-to-market (HML)	0,0016	-0,0053
	(0,272)	(-0,766)
Company size (SMB)	-0,0040	0,0041
	(-0,505)	(0,515)

Table 14: Subsamples Fama-MacBeth regression on the extended three-factor model (SMNaverage/deciles)

The results in this table serve as a robustness check on the results of table 12c. It represents two subsamples and shows the lambdas of the MKT, SMB, HML and SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

Three-factor model (30/40/30)

λ	January 2008 to June 2011					July 2011 to December 2014				
	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5
Constant	-0,0028	-0,0037	-0,0011	-0,004	0,0012	0,0069****	0,0071****	0,0057***	0,0071****	0,0067****
	(-0,469)	(-0,783)	(-0,240)	(-0,888)	(0,265)	(2,072)	(2,053)	(1,909)	(2,248)	(2,110)
Market premium (MKT)	-0,0035	-0,0020	-0,0046	-0,0017	-0,0068	-0,0047	-0,0050	-0,0035	-0,0050	-0,0045
	(-0,285)	(-0,161)	(-0,374)	(-0,138)	(-0,561)	(-0,670)	(-0,703)	(-0,512)	(-0,724)	(-0,660)
Book-to-market (HML)	0,0007	-0,0007	-0,0009	-0,0006	0,0019	-0,0033	-0,0052	-0,0040	-0,0051	-0,0047
	(0,119)	(-0,118)	(-0,145)	(-0,100)	(0,310)	(-0,480)	(-0,766)	(-0,580)	(-0,770)	(-0,718)
Company size (SMB)	-0,0032	-0,0035	-0,0039	-0,0038	-0,0038	0,0042	0,0023	0,0037	0,0027	0,0039
	(-0,404)	(-0,451)	(-0,497)	(-0,482)	(-0,486)	(0,528)	(0,292)	(0,452)	(0,338)	(0,495)
SMNAvgM1	-0,0132***					0,0026				
	(-1,825)					(0,333)				
SMNAvgM2		-0,0007					0,0027			
		(-0,100)					(0,402)			
SMNAvgM3			-0,0039					0,0095*		
			(-0,462)					(1,345)		
SMNAvgM4				-0,0045					0,0045	
				(-0,628)					(0,671)	
SMNAvgM5					-0,0023					0,0020
					(-0,316)					(0,311)

Table 15: Fama-MacBeth regression on the Carhart four-factor model

The results in this table serve as a robustness check on the results of table 10. It represents an extension of the Fama and French three-factor model with an additional momentum factor, creating the Carhart four-factor model. This means that the table shows the lambdas of the MKT, SMB, HML and MOM factor. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{MOM}} + \mu_{it}$$

λ	Carhart four-factor model (30/40/30)
Constant	0,0025
	(0,919)
Market premium (MKT)	-0,0043
	(-0,611)
Book-to-market (HML)	-0,0024
	(-0,541)
Company size (SMB)	-0,0006
	(-0,112)
Momentum (MOM)	-0,0001
	(-0,020)

Table 16: Fama-MacBeth regression on the extended Carhart four-factor model (SMNaverage/deciles)

The results in this table serve as a robustness check on the results of table 12c. It represents an extension of the extended Fama and French three-factor model with an additional momentum factor, creating the extended Carhart four-factor model. This means that the table shows the lambdas of the MKT, SMB, HML, MOM and the SMNaverage factor for all five different ways of defining sentiment. The SMNaverage factors are calculated using the estimated factual individual company sentiment betas sorted in deciles. *,**,***,****,***** indicate the significance at 20%, 15%, 10%, 5% and 1% respectively. The risk premium "lambda" coefficients are estimated using a rolling forward window of 24 months and are calculated by following formula:

$$R_{it} - R_{ft} = \lambda_0 + \lambda_1 * \widehat{\beta_{it}^{MKT}} + \lambda_2 * \widehat{\beta_{it}^{HML}} + \lambda_3 * \widehat{\beta_{it}^{SMB}} + \lambda_4 * \widehat{\beta_{it}^{MOM}} + \lambda_5 * \widehat{\beta_{it}^{SMN}} + \mu_{it}$$

	Carhart four-factor model (30/40/30)				
λ	M1	M2	M3	M4	M5
Constant	0,0023	0,0022	0,0020	0,0015	0,0033
	(0,831)	(0,767)	(0,760)	(0,593)	(1,178)
Market premium (MKT)	-0,0041	-0,0040	-0,0038	-0,0033	-0,0050
	(-0,582)	(-0,568)	(-0,544)	(-0,479)	(-0,714)
Book-to-market (HML)	-0,0017	-0,0026	-0,0025	-0,0030	-0,0016
	(-0,378)	(-0,588)	(-0,565)	(-0,700)	(-0,355)
Company size (SMB)	-0,0005	-0,0006	-0,0004	-0,0008	-0,0009
	(-0,086)	(-0,110)	(-0,071)	(-0,147)	(-0,170)
Momentum (MOM)	0,0002	0,0004	-0,0001	0,0022	-0,0013
	(0,046)	(0,079)	(-0,019)	(0,421)	(-0,249)
SMNAvgM1	-0,0034				
	(-0,683)				
SMNAvgM2		0,0019			
		(0,374)			
SMNAvgM3			0,0046		
			(0,809)		
SMNAvgM4				0,0008	
				(0,156)	
SMNAvgM5					0,0011
					(0,238)