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HANDELSHÖGSKOLAN

# **Mispricing in the Stock Market** -

*an effect of investor sentiment?*

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## Abstract

The purpose of this thesis is to investigate the relationship between mispricing and investor sentiment, on the Swedish and European stock markets. Firstly, it examines whether mispricing is more prominent in periods following high sentiment. Similar studies have been conducted for other markets, such as the US, but, at least to the knowledge of the authors, no corresponding study has been performed on the markets of this thesis, particularly the Swedish. The results of the analysis display that, for the value strategy, there is a positive relation between the level of sentiment, and the subsequent excess returns measured, suggesting that mispricing is more prominent in periods following high sentiment. This relationship does also hold true for the size strategy in the Swedish market, but not in the European. Secondly, the thesis examines whether knowledge about the level of investor sentiment can be used to improve the returns of value- and size strategies. The results from this analysis display that returns of a value strategy can be improved with the use of investor sentiment. This also holds true for the size strategy in the Swedish market, but the average returns are primarily negative. Robustness tests are also conducted, to verify that the results found in this thesis are reliable. The main contribution from this thesis is found in the results corresponding to the value strategy, whilst the size strategy in the European market poses somewhat of a limit.

**Keywords: Behavioral Finance, mispricing, investor sentiment, anomaly, size strategy, value strategy**

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# 1. Introduction

Classical finance theories, such as the Efficient Market Hypothesis, assumes investors to be rational, profit-maximizing individuals and that all prices in markets adequately reflect the underlying value. Theories of Behavioral Finance have emerged and gained popularity in the last few decades, challenging these views that have been considered indisputable for many years. Behavioral Finance theories advocate for the irrationality that exists among investors on the market, and they identify several asset pricing anomalies that stem from irrational investment decisions. Non-rational choices will result in suboptimal market prices that deviate from the efficient prices, which fully reflect the value of the underlying asset, and this will create asset pricing anomalies. Once anomalies are identified in the market, a strategy that attempts to exploit this mispricing can be formed. One attempt at determining how the rationality of investors decisions fluctuates over time, is done through the estimation of investor sentiment. This is an index created as a measure of investors mood on the market, for example, whether there is a general optimism or pessimism (Baker & Wurgler, 2007). These studies have led to a new field of research that has become more prominent as of late, which is to discern what effect the sentiment has on the anomalies resulting from irrational decision making. Stambaugh, Yu and Yuan (2012) examines how restrictions on short selling leads to overpriced assets. This mispricing is hard to eliminate and can, in turn, cause stock prices to reflect the views of those investors who are too optimistic. This should mean that a high level of optimism, and in turn sentiment, should lead to higher amounts of overpricing, since limits to arbitrage restrict the ability to short sell and push the price downward. If such a relation can be found, it further poses the question whether it is possible to use information about the sentiment on the market, to improve the returns of a strategy by capturing the excess returns derived from these anomalies.

One of the main findings from this thesis, is that there is a positive relationship between the level of investor sentiment, and the subsequent excess returns of the value strategy. This holds both in the Swedish and European stock market and indicates that mispricing is more frequently present in periods following high sentiment. This is also supported by findings from an analysis of the size strategy on the Swedish market, but when the European market is examined, the relation does not hold. Another central finding from this thesis, is that returns from a value strategy can be improved when the level of investor sentiment is taken into

account. This finding holds both for the Swedish and the European market. A similar conclusion can be drawn for the size strategy in the Swedish market; however, the analysis finds that the average returns are consistently negative.

### 1.1 Problem Area

Since the emergence of Behavioral Finance, the efficiency of markets has been frequently questioned. Researchers of Behavioral Finance make a distinction between rational and irrational investors and believe that investors are subject to sentiment on the market, which can affect their decision-making process and disrupt rational behavior. One of the main reasons why these theories have gained popularity over the past years, is because they consider a "human" factor in investment decisions, which can lead to an inefficient market with mispriced assets as a result (Baker & Wurgler, 2007). Previous studies by Stambaugh et al. (2012) examine several identified anomalies on the US stock market, that cannot be explained by traditional asset pricing models, and study how these returns are affected by the level of sentiment on the market. They based their studies on the article *Risk, Uncertainty and Divergence of Opinion* by Miller (1977), who found that restrictions on short selling led to limitations for rational investors to exploit arbitrage opportunities with overpriced stocks. If rational investors, who believe that a particular stock has a lower underlying value than the market value, are unable to short sell the stock and push the price downwards, this will lead to an abundance of overpriced stocks. Stambaugh et al. combined this knowledge with Baker and Wurgler's (2006) research on a market-wide investor sentiment, and they discovered a relationship between the level of investor sentiment and subsequent anomaly returns on the US stock market. Because of their research, it would be of interest to see if a similar conclusion could be drawn for a different market. This conclusion also brings interest to the question of whether it is possible to use identified anomaly returns, together with estimates of investor sentiment, to increase yielded returns of a strategy. The study by Stambaugh et al., as aforementioned, placed focus on the US stock market, and this thesis will instead shift focus to study the Swedish and the European stock markets.

An event that can have great impact on the level of mispricing in the market, is a financial crisis. The movement of the economy can generally be categorized into booms and busts, where boom periods are characterized by economic growth, optimism, and high returns on investments, whereas a bust period is a time where the economy is declining and investors and

consumers are more pessimistic (Hayes, 2020). This leads to the conclusion that a major financial crisis, such as the one in 2008-2009, should greatly affect how accurately stocks in the market are priced. Because of this, it is of interest to analyze if this crisis had an effect on the level of mispricing on the Swedish and the European stock markets.

The availability of data differs somewhat between the US and the chosen markets for this thesis, the Swedish and the European. For consistency, the variables to capture anomaly returns will be the size and value premium, since estimates of these are available for both markets of interest. The size and value premium are variables that capture anomalies (Fama & French, 1996) and can therefore be argued to contain mispricing (Lakonishok, Shleifer & Vishny, 1994).

### 1.2 Purpose of the Thesis

The purpose of this thesis is to identify mispricing in the size and value premiums on the Swedish stock market, caused by behavioral biases. The Capital Asset Pricing Model will be used as a benchmark measure, and it will in this thesis be assumed to provide accurate stock prices. Thus, it will yield estimates that can be used as a measure of the returns resulting from actions of rational investors. The estimations can then be used as a means of comparison to determine how the excess returns in the size- and value premiums differs from the benchmark, and the discrepancy will be labeled mispricing. Further, investor sentiment will be used as a proxy for the general mood of investors on the market, and thus aims to capture the effect of behavioral biases. Previous studies on the subject of mispricing (Stambaugh et al., 2012) suggest that there is a relation between the level of sentiment and the amount of mispricing in the market, and the aim for this study will be to examine whether this relationship holds for the Swedish and European stock markets. From these investigations, the aim will further be to analyze whether it is possible to capture excess returns using the size- and value strategies and thus, improve the returns when investor sentiment is taken into account.

The following hypotheses will be examined:

1. Mispricing is more prominent in periods following high sentiment.
2. It is possible to improve the returns of value- and size strategies, when investor sentiment is taken into account.

For some parts of the analysis, the sample will be divided into subsamples to study the effect of the financial crisis in 2008-2009. A shift in the economy from a boom to a bust should have significant effect on stock prices, and it is therefore of interest to measure whether this difference is significant.

### 1.3 Limits

This study will examine if the aforementioned anomalies, the size and value premium, contain significant mispricing, and whether the investor sentiment index can explain the irrational movement in the anomaly returns. The size strategy poses a limit for the thesis. The average returns are consistently negative for the Swedish market, suggesting that this strategy is not profitable. It is, however, possible to improve the profitability for this strategy with the use of sentiment, since periods following high sentiment show significantly less negative returns, than those following low sentiment. The size strategy does show unexpected results for the European market as well, where it is profitable, but only following periods of low sentiment, which is opposite to the findings from the value premium.

Another limit can be the use of an US investor sentiment, for returns on the Swedish and European stock markets. The robustness test includes arguments why the US investor sentiment is considered a satisfactory proxy. However, an index based on the Swedish and the European markets, respectively, would be preferable for this kind of analysis, but at this time this is not available.

# 2. Theoretical framework

## 2.1 CAPM and the concept of mispricing

Miller (1977) examined the occurrence of mispricing in the stock market, and he found that it could greatly be explained by restrictions placed on short selling. Short selling limitations lead to diminished opportunities for arbitrage trading and result in overpriced stocks, since investors are unable to lower the market price by trading. Mispricing is identified when there is a discrepancy between the market value and the fundamental value of a stock (Jeon, Kang, Lee & Lee, 2020). There are different approaches to measure the fundamental value of a security, where some focus solely on the information provided by financial statements (Downie, 2015), and others on valuation models, often referred to as the benchmark (Stambaugh et al, 2012). The concept of mispricing can be explained as a relative valuation, since it depends on which benchmark is used for comparison with the market value (Downie, 2015). Since the aim of this thesis is to identify mispriced stocks that arise as a result of high sentiment, the Capital Asset Pricing Model is used as the benchmark, as it builds on the assumptions of rationality and efficient portfolios.

The Capital Asset Pricing Model, henceforth CAPM, explains the relationship between expected return of a risky security and its associated risk. Its introduction in the 1960s had a great impact on the financial sector, due to its innovative way of pricing assets, and it has ever since its debut been persistently used by professionals for asset pricing. The simplicity of the model has further aided its rise in popularity, because of the uncomplicated way it can be implemented and interpreted. The model consists of three different components; the beta, the expected return of the market, and the risk-free rate, where the last two mentioned determines the market risk premium. The main distinction in this model is between idiosyncratic and systematic risk. Idiosyncratic risk is firm-specific and can be diversified away, whereas the systematic risk is caused by general uncertainty in the economy that is not specific for any firm or industry. Since idiosyncratic risk can be diversified away, investors should only be compensated for the market risk premium, and the expected return of an asset will therefore be determined by the risk-free rate, the market risk premium, and its associated beta. The beta is a measure of an individual stock's price fluctuations, compared to the market, and explains how the stock's risk is affected by the market portfolio. If the risk of the individual stock is higher (lower) than that of the market, its beta will be greater (less) than 1 (Sharpe, 1964, Kenton, 2020).

The underlying assumptions of the CAPM are that investors are price takers, and that there are no transaction costs or taxes when buying or selling securities. Further, borrowing and lending is done at the risk-free rate, and there are homogeneous expectations of securities among investors. Lastly, investors only hold efficient portfolios, which means that there are no portfolios that have a higher return with the same level of risk (Berk & DeMarzo, 2013). The CAPM can be problematic as the assumptions do not hold in reality, but this model is still widely accepted and used.

The formula for the Capital Asset Pricing Model is;

$$R_{i,t} = R_f + \beta_i(R_{Mkt} - R_f)_t + \varepsilon_t$$

where

$R_{i,t}$= the portfolio's return in month, t

$R_f$= The risk-free rate

$\beta_i$= the portfolio's beta

$(R_{Mkt} - R_f)_t$= market premium in month, t

$\varepsilon_t$= error term

## 2.2 Behavioral Finance: Bias and Investor Sentiment

The Efficient Market Hypothesis makes an assumption that all existing information is disclosed and reflected in the price of securities in financial markets, and that investors are rational and profit-maximizers. The efficiency of the market should lead to prices adjusting to new information instantaneously, and therefore eliminating any arbitrage opportunities (Malkiel, 2003).

One theory that challenges the assumptions of the Efficient Market Hypothesis is Behavioral Finance, which assumes irrationality in the behavior of the investors since they are subject to different biases. The Efficient Market Hypothesis describes how investors should make decisions, whereas Behavioral Finance describes how investors actually make decisions (Barberis & Thaler, 2002). Behavioral Finance studies how investors' choices are affected by different behavioral biases, such as overconfidence, loss aversion, and herd instinct, that are effects of sociological and psychological factors. When investors are subject to different

biases, it affects their decision-making process and ,in turn, their investment decisions, which creates anomalies in the market (López-Cabarcos, Pérez-Pico,Vázquez-Rodrígues & López-Pérez, 2019). Researchers of Behavioral Finance have worked on different methods to adjust classic financial models, that assume rationality, to also include factors that capture anomalies, which in turn has led to a large focus on the investor sentiment index (Baker & Wurgler, 2007).

The definition of investor sentiment, sometimes referred to as market sentiment, is not unanimous. Most commonly, it can be described as the general mood or attitude of the investors on the market. It can most prominently be indicated through the overall price movements on the market (Smith, 2019). Researchers that define investor sentiment as simply periods of optimism and pessimism about investments, also believe that during periods of optimism, there is a greater effect on small, growth stocks, and distressed stocks. This is because there is a big collection of research that concludes that the cost and risk of arbitrage for these types of assets are higher compared to other assets (Baker & Wurgler, 2007).

Another accepted definition of investor sentiment is the expectations of cash flows in the future, and abnormally high levels of risks that cannot be explained. Baker and Wurgler (2007) also mention that sentiment can be viewed as a measure of investors' proneness to speculate. This raises the demand for speculative stocks that will have high returns in periods of high sentiment, since these assets are a part of the extreme and sensitive portfolios.

Zhang (2008) places a more distinct definition of the term. She describes investor sentiment as the belief of the market participants about the future cash flow, relative to the true fundamental value of the asset. In other words, sentiment corresponds to investors erroneous beliefs, compared to a benchmark. She further explains that there are two ways for erroneous beliefs to occur; investors correctly use incorrect information, or they incorrectly use correct information.

A combination of investor sentiment, short-selling restrictions, and the concept of mispricing results in an interesting relationship to study. General pessimism and optimism among investors results in irrational choices, which causes the market value of stocks to differ from their fundamental value. This discrepancy is in some cases hard to neutralize since there are

limitations on arbitrage trading. This results in higher levels of anomaly returns and mispricing (Stambaugh et al., 2012).

## 2.3 Value- & Size strategy

### *2.3.1 Value Strategy*

In the late 1920s, Benjamin Graham, also referred to as the father of value investing, was the first person to introduce an investment strategy with a goal of identifying underpriced assets through a fundamental analysis (Norris, 2020). This is the foundation for many of the researches that were conducted on value investing in the following years.

High book-to-market stocks have been found to outperform stocks with a low book-to-market value by several researchers (Lakonishok et al., 1994, Fama & French, 1992), and the aim of value investing is to exploit this pattern in the hopes of obtaining increased returns. This strategy relies heavily on the information provided by financial statements, and it is conducted by identifying stocks that have a low market value compared to their fundamental value (Piotroski, 2000). Whilst there seems to be consensus in regard to the existence of this anomalous pattern, the interpretation is not unanimous. Fama and French (1992) argue that the outperformance of undervalued stocks is compensation for a fundamentally riskier investment, whereas Lakonishok et al. (1994) interpret this pattern as mispricing in stocks, that occurs as a result of the momentum effect. This effect can be explained by a behavioral bias, where investors believe that the recent performance of stocks can predict future returns (Stambaugh, Yu, & Yuan, 2012). Lakonishok et al. (1994) further argue that a contrarian strategy, such as value investing, yields higher returns because this strategy profits from this mispricing. Since this thesis examines mispricing in the value premium, the interpretation of Lakonishok et al., where this anomaly can be found due to mispricing, will be the main standpoint when further analyses are conducted.

A value strategy involves the exploitation of anomaly returns by taking a short position in stocks with low book-to-market ratios and a long position in stocks with high book-to-market ratios (Cooper, Gulen & Vassalou, 2001). The value premium, HML, is defined as the difference in returns between a portfolio containing stocks with high book-to market ratios, and a portfolio containing stocks with low ratios. The purpose of this variable is to capture

the pattern that undervalued stocks outperforms overvalued stocks. The value premium is therefore used as a variable that explains anomaly returns (Fama, French, 1996).

### *2.3.2. Size Strategy*

In 1981 Rolf Banz found a relationship on the New York Stock Exchange, that small stocks displayed higher risk-adjusted returns than larger stocks, on average. Whilst he was unable to conclude that the higher returns were solely resulting from this size effect, it lay ground for the many studies conducted to further analyze this relationship since.

One such study, was executed by Eugene Fama and Kenneth French (1996), where they identified this size effect, and incorporated it into a valuation model. They described how this effect had been labeled an anomaly, because the returns could not be explained by the CAPM. They called this effect the size premium, SMB, and the aim of the introduction of this variable was to capture the pattern that smaller firms, measured by market capitalization, displays higher returns than larger firms. This excess return was measured by a long-short strategy of a portfolio, where the companies with the smallest market capitalization were held long, and the companies with the largest market capitalization were sold short.

A size strategy would exploit this anomaly return by going long in small cap stocks, and short in large cap stocks (Cooper, Gulen & Vassalou, 2001).

# 3. Data collection

## 3.1 Swedish Fama and French factors

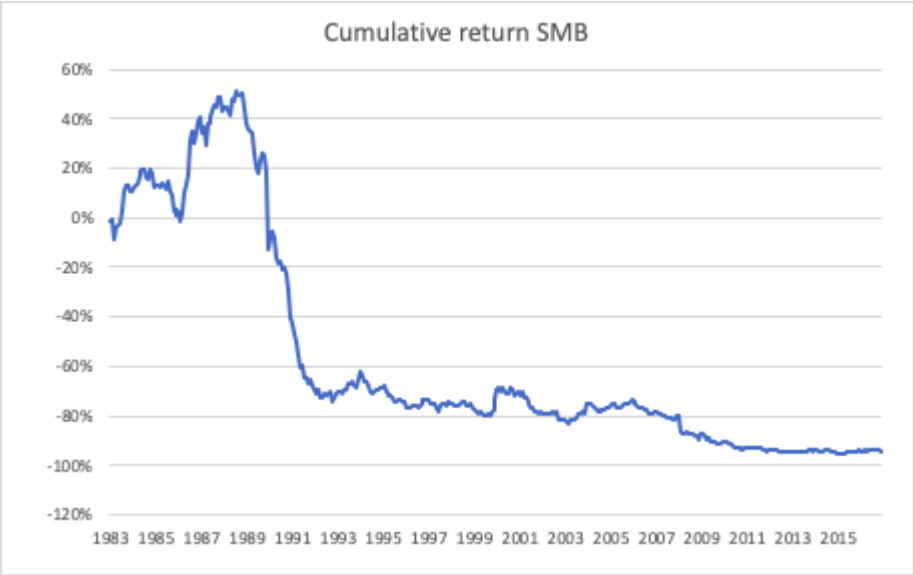
The variables of interest are the Fama and French factors. The data for the Swedish stock market has been obtained from The Swedish House of Finance, which is Sweden's national research center in financial economics. The data includes estimates of the size and value premiums, as well as the market premium, from February 1983 to January 2017. This report uses value weighted portfolios for the size and value premiums since it gives a better representation of the market. Additionally, value-weighted portfolios can eliminate extreme values in anomalies that can arise when using equally-weighted portfolios, due to small-cap companies being combined with larger weights (Fama & French, 2008).

**Figure 1**

Graph over the cumulative return of the value premium, from 1983:2 to 2017:1, based on the dataset from The Swedish House of finance (2020).

**Figure 2**

Graph over the cumulative return of the size premium, from 1983:2 to 2017:1, based on the dataset from The Swedish House of finance (2020).




## 3.2 European Fama and French factors

The Fama and French factors for the European market have been obtained from Kenneth French's own website (2019). The construction of the size- and value premium factors are done by sorting stocks into three book-market equity (B/M), and two market capitalization groups. The size premium uses stocks in the top 90% decile and the bottom 10%, and the B/M groups are divided by the 30th and 70th decile. The size- and value premiums are then calculated as;

$$SMB = 1/3(Small\ Value\ + Small\ Neutral\ + Small\ Growth) - 1/3\ (Big\ Value\ + Big\ Neutral + Big\ Growth)$$

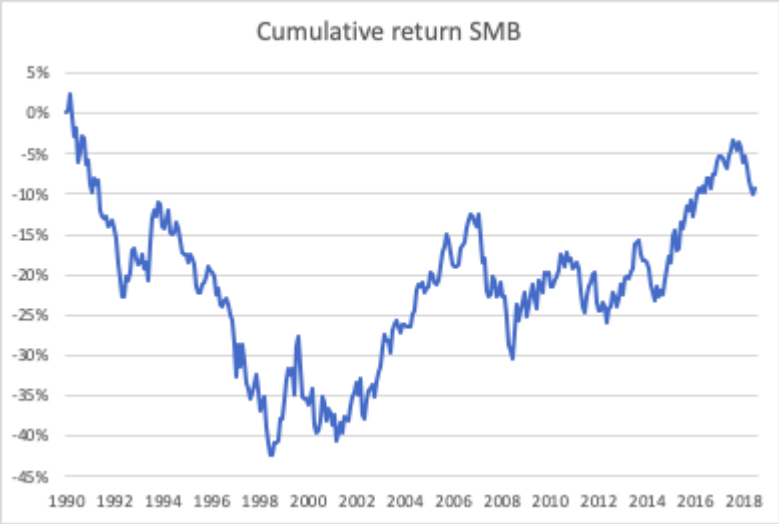
$$HML = 1/2\ (Small\ Value\ + Big\ Value)\ - 1/2\ (Small\ Growth\ + Big\ Growth)$$

**Figure 3**

Graph over the cumulative return of the value premium, from 1990:7 to 2019:1, based on the dataset from Kenneth French (2019).


**Figure 4**

Graph over the cumulative return of the size premium, from 1990:7 to 2019:1, based on the dataset from Kenneth French (2019).

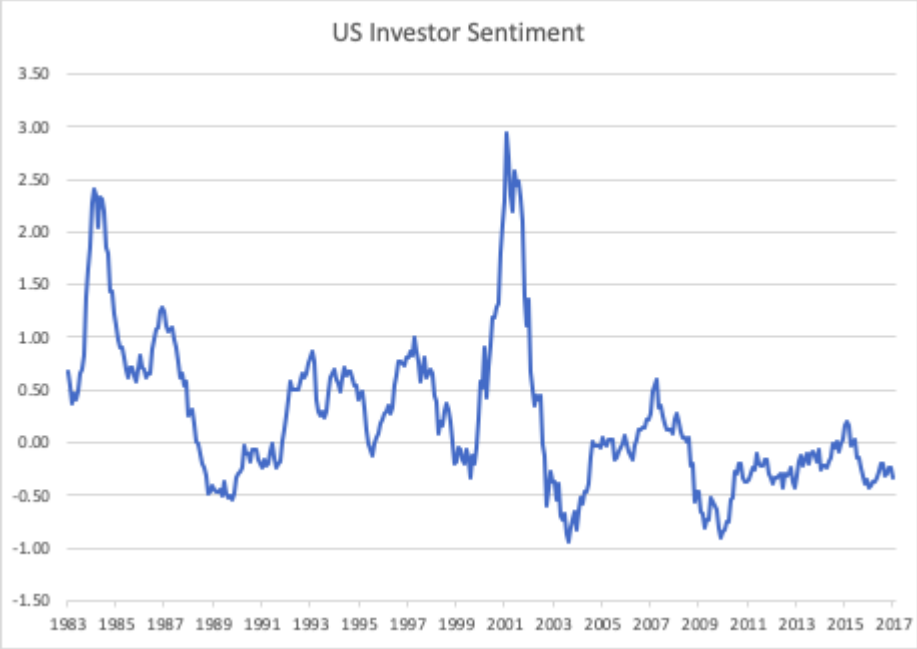


### 3.3 Investor sentiment

The sentiment index chosen is produced by Malcolm Baker and Jeffrey Wurgler and is an index over investor sentiment in the US stock market (2006). The index is a composite index that is formed based on the variation of six other proxies for investor sentiment. These are NYSE share turnover, the equity shares in new issues, the number and average first-day returns on IPOs, the closed-end fund discount, and the dividend premium. Baker, Wurgler and Yuan (2012) found that the US investor sentiment can be viewed as a satisfactory proxy for a global sentiment, with a correlation of 0.88. Because of the unavailability of a Swedish investor sentiment, the US sentiment is believed to be an acceptable proxy to use for the Swedish and the European market.

**Figure 5**

Plot over investor sentiment between 1983:1 and 2016:12 for the US, based on the dataset from Malcolm Baker and Jeffrey Wurgler.




### 3.4 GDP growth

For the robustness test, data over GDP growth is used as a control variable. The data available for the Swedish GDP growth is sorted at quarterly intervals and is obtained from the

OECD's data website. The OECD is a large and widespread organization, with a substantial number of member countries, and thus the data obtained is viewed as reliable (2020).

The data of GDP growth in Europe is obtained at annual intervals, and is collected from the International Monetary Fund's, IMF, website. This is, much like the OECD, a well renowned organization, and the data is therefore assumed to be trustworthy (2020).

### 3.5 Consumer Confidence Index

Data over the consumer sentiment in Sweden is used in the robustness test, to determine if this could be a sufficient explanatory variable for the excess returns examined, rather than the US investor sentiment. The data is collected from Statistics Sweden, which is the governmental authority responsible for creating the official statistics of Sweden (SCB, 2020), and because of this, it is deemed a reliable source.

**Figure 6**

Plot over Consumer Confidence Index in Sweden, between 1993:3 and 2016:12, based on the dataset from Statistics Sweden.

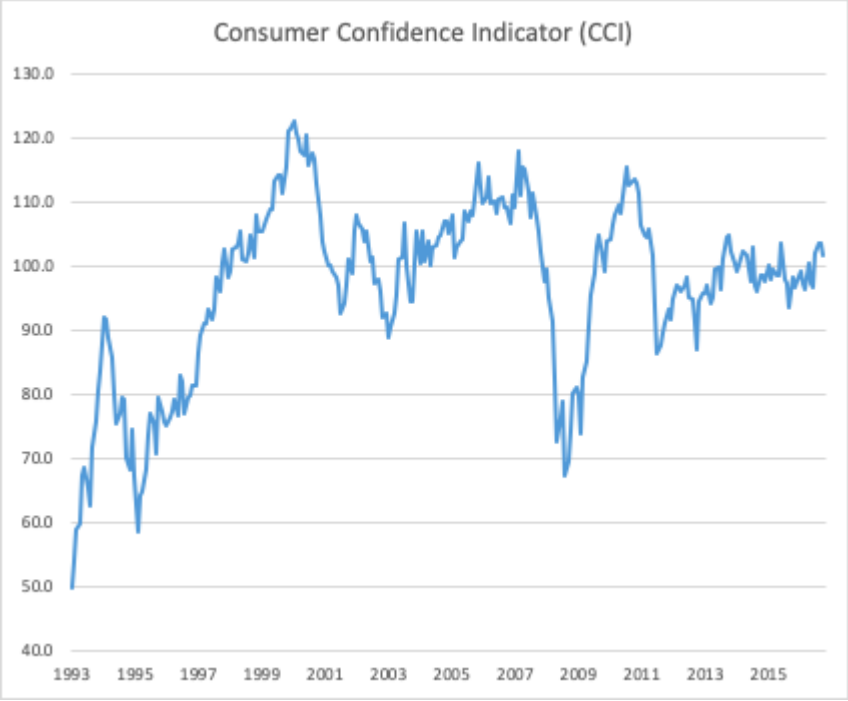


**Table 1**

Descriptive statistics over the datasets used in this thesis. The data over the Swedish Fama and French factors refers to the sample period 1983:2 to 2017:1, and it is based on the dataset from The Swedish House of Finance (2020). The European Fama and French factors has a sample period between 1990:7 and 2019:1, and it is based on the dataset from Kenneth French (2019). The data over US investor sentiment is between 1983:1 and 2016:12, and it is based on the dataset from Malcolm Baker and Jeffrey Wurgler (2018). Swedish GDP growth is measured between 1983:Q1 to 2016:Q4, and it is based on quarterly data from OECD (2020). European GDP growth is measured between 1991 to 2018, and it is based on annual data from IMF (2020). The data of Consumer Confidence Index is between 1993:3 and 2016:12, and it based on the dataset from Statistics Sweden (2020).

| | **Mean** | **Median** | **Std. dev.** | **Min** | **Max** | **Nr. obs.** |
|---|---|---|---|---|---|---|
| **F&F Sweden** | | | | | | |
| $R_{Mkt} - R_f$ | 0.0077402 | 0.0114415 | 0.0603932 | -0.2259306 | 0.2646255 | 408 |
| SMB | -0.0056578 | -0.0050764 | 0.0502445 | -0.3284087 | 0.2439903 | 408 |
| HML | 0.0053807 | 0.0029828 | 0.0520284 | -0.3611723 | 0.2418848 | 408 |
| **F&F Europe** | | | | | | |
| $R_{Mkt} - R_f$ | 0.0046507 | 0.0068 | 0.0487413 | -0.2203 | 0.1367 | 343 |
| SMB | -0.0000496 | 0.0007 | 0.0218204 | -0.0689 | 0.0935 | 343 |
| HML | 0.003107 | 0.0034 | 0.0238842 | -0.0945 | 0.1115 | 343 |
| **US Investor Sentiment** | 0.2385022 | 0.0366 | 0.7015044 | -0.9417 | 2.9387 | 408 |
| **GDP growth Sweden** | 0.0056648 | 0.0067608 | 0.009197 | -0.038124 | 0.0352633 | 136 |
| **GDP growth Europe** | 0.0168571 | 0.02 | 0.0200032 | -0.048 | 0.046 | 28 |
| **CCI Sweden** | 96.78636 | 99.4 | 13.80189 | 50 | 122.7 | 286 |

# 4. Method

The main methodology will entail several regressions to determine the relationship between the variables of interest. The two markets examined will be the Swedish and the European stock markets. In the first part of the analysis, the focus will be placed on the value strategy, and in the second part, the same analysis will be executed for the size strategy.

## 4.1 Benchmark adjusted average returns

For the first part of the analysis, the dependent variables will be the size premium (SMB) and the value premium (HML). The regressions will be done with the market premium ($R_{mkt} - R_f$) as the independent variable. In these regressions, an assumption is made that the CAPM-model is a good predictor for estimating returns, thus, the aim will be to determine if the excess returns that can be found in the size and value premium, can be derived from mispricing. The first formula regressed will be;

$$R_{i,t} = a_i + b_i(R_{Mkt} - R_f)_t + u_t$$

where

$R_{i,t}$= the strategy's excess return in month, t

$a_i$= benchmark adjusted average returns

$b_i$= the strategy's beta

$(R_{Mkt} - R_f)_t$= market premium in month, t

$u_t$= error term

First, the value premium is regressed on the market premium. The purpose of this is to determine how much of the value premium that can be derived from the market premium, and further, how well the CAPM explains the excess return due to high or low B/M-ratios. If the regression determines that the market premium is not statistically significant, and that the residual (in this case the alpha) is significant, this will show that CAPM is not a satisfactory predictor of the excess return and that some of the excess return is due to mispricing. Second, the size premium is regressed on the market premium. The aim of this regression is similar to that of the first one, but a different relationship is examined.

To further develop the depth of the study, the sample is divided into two subsamples. The subsamples are 1983:2 to 2008:12, and 2009:1 to 2017:1 for the Swedish market, and 1990:7

to 2008:12, and 2009:1 to 2019:1 for the European. The discrepancy in the subsamples for the different markets are due to data availability. The subsamples are chosen to examine how the results from the regressions are affected by the financial crisis.

### 4.2 High/low investor sentiment

The second part of the analysis entails the implementation of investor sentiment. The calculations are done by sorting monthly returns as having either high or low sentiment. The distinction between high and low sentiment is done by determining the median value of the investor sentiment data. Then, all months with a sentiment value higher than the median will be determined high sentiment months, and all months with a lower value will be determined low sentiment months. The sentiment values are lagged one period (t-1), to be able to determine how the level of sentiment in the previous month relates to the following months return. Average excess returns are then decided by regressing the value premium, and afterwards the size premium, on the intercept, both for high sentiment months and low sentiment months. The aim of this analysis is to examine whether the average excess return is higher in periods following high sentiment.

### 4.3 Benchmark-adjusted returns during high and low investor sentiment

The third regression is used as a measure to determine how much of the excess returns during different levels of sentiment that can be explained by CAPM. This is a benchmark-adjusted model that will give an estimate of how much the level of mispricing differs during high and low sentiment. To obtain these results, the formula chosen is;

$$R_{i,t} = a_H d_{H,t} + a_L d_{L,t} + b_i(R_{Mkt,t} - R_{f,t}) + u_{i,t}$$

where

$R_{i,t}$= the strategy's excess return in month, t

$a_H$and $a_L$= the average return in periods following high- and low investor sentiment

$d_{H,t}$and $d_{L,t}$= dummy variables indicating high- and low sentiment periods

$b_i$= the strategy's beta

$R_{Mkt,t} - R_{f,t}$= the market premium in month, t

$u_{i,t}$= the error term

### 4.4 Predictive regressions using investor sentiment

To see how excess returns are affected by the level of investor sentiment, two regressions are conducted, one on the value premium on investor sentiment, and one on the size premium on investor sentiment. The sentiment variable is standardized to have a mean of zero and a unit standard deviation. Further, the investor sentiment is lagged one period to give an estimation of whether the level of sentiment in the previous time period has an effect on the occurrence of mispricing. The formula regressed in this part is;

$$R_{i,t} = a + bSent_{t-1} + u_t.$$

where

$R_{i,t}$= the strategy's excess return in month, t

$a$ = the intercept

$b$ = the effect of the level of sentiment on the strategy's excess return

$Sent_{t-1}$= investor sentiment in month, t-1

$u_t$= the error term

# 5. Results

## 5.1 Value strategy

The first regression is done by regressing the value premium, on the market premium. The purpose of this is to see how much of the excess return, in a value strategy, that can be explained by the CAPM. The purpose is further, to examine if there is significant mispricing present in the value premium. When analyzing the full sample for the Swedish market, the p-value of the market premium can be concluded to be close to one (0.993) and thus, it is not significant at a very high level. This can be interpreted as an indication that the CAPM is not a good predictor of the value premium. The alpha, on the other hand, is significant at a 5% level and a conclusion that can be drawn is that there is significant mispricing in the value premium. Shifting view to the European market, the results conclude that the CAPM is, in fact, a good predictor of the excess return in the value premium, since the beta is significant at a 1% level. The significance of the alpha does, however, still indicate that there is significant mispricing in the European market, similarly to the Swedish.

The subsequent regressions are done by dividing the sample period into two subsamples, 1983-2008 and 2009-2017 for the Swedish market, and 1990-2008 and 2009-2019 for the European, with the aim of studying the effects of the crisis. By first studying the results from the first period, it can be concluded that the alpha is significant for the Swedish market, whereas the beta is not. This can be interpreted as the CAPM not being a desirable explanatory variable for the value premium, and that this does contain significant mispricing, a conclusion analogous to the one drawn for the full sample period. The results from the European market show many similarities for the first period. The alpha is significant, whilst the beta is insignificant, much like the findings from the Swedish market. Further, the sign of the beta is negative, both for the Swedish and the European market, which suggest that an increase in the market premium led to a decrease in the return from a value strategy before the financial crisis.

For the second period, one noticeable difference is that the alpha is no longer significant for the Swedish market. This would suggest that there is no significant mispricing in the Swedish market after the financial crisis. The alpha for the European market remains significant after the crisis, but only at a 10% level. Another noteworthy difference in the period following the

financial crisis is that the beta coefficients, for both markets, have become significant and shifted signs. Whereas the CAPM was concluded an inadequate explanatory variable for the value premium in the first period, it can be concluded that the CAPM is a satisfactory predictor in the period following the financial crisis. Further, what is apparent, is that the magnitude of how changes in the market premium returns affects the value premium differs substantially before and after the crisis. The amount by which the market premium affects the excess return changes from a decrease of about 3% to an increase of almost 25%. This implies that the value premium slightly moved in the opposite direction of the market in the first period, whereas it more strongly moved in the same direction as the market in the second period. What should further be made notice of, are the large values for the beta coefficients in the post-crisis period. Since they are monthly returns, a 25% increase can seem unreasonable, but it is of importance to keep in mind that a scenario where the market premium increases by an entire percent, is a highly unlikely occurrence, especially in the period after the crisis.

**Table 2a**

The table reports estimates of a and b using the following regression, $R_{i,t} = a_i + b_i(R_{Mkt,t} - R_{f,t}\ ) + u_t$, where $R_{i,t}$are excess returns and $R_{Mkt} - R_f$is the market premium. The full sample for the Swedish data is 1983:2 to 2017:1, and the subsamples are 1983:2 to 2008:12, and 2009:1 to 2017:1. The full sample for the European data is 1990:7 to 2019:1, and the subsamples are 1990:7 to 2008:12, and 2009:1 to 2019:1. The p-values of the coefficients are reported in parenthesis. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | Full Sample | | Period 1 | | Period 2 | |
|---|---|---|---|---|---|---|
| | $\hat{a}$ | $\hat{b}$ | $\hat{a}$ | $\hat{b}$ | $\hat{a}$ | $\hat{b}$ |
| Sweden | 0.538%<br>(0.035) | 0.059%<br>(0.993) | 0.648%<br>(0.041) | -3.462%<br>(0.662) | -0.081%<br>(0.811) | 24.946%<br>(0.011) |
| Europe | 0.268%<br>(0.040) | 9.164%<br>(0.003) | 0.560%<br>(0.000) | -1.887%<br>(0.663) | -0.328%<br>(0.086) | 26.212%<br>(0.000) |

For the next regression, investor sentiment is introduced into the analysis. The data is sorted, based on whether it is associated with a period following high, or low sentiment. A column displaying the average return, without any consideration to investor sentiment, is also included. What is of interest in this calculation, is to find whether it is possible to improve the returns of the chosen strategy, when taking the level of investor sentiment into account. The results obtained show consistency for both markets, and they conclude that there is a possibility of improving the returns of a value strategy, when considering investor sentiment. This is shown, in the table below, by the fact that the average returns during periods following high sentiment, exceeds the ones found when investor sentiment was not taken into consideration. This does support the hypothesis that returns from a value strategy can be improved with the use of investor sentiment. An additional finding from this analysis is further, that there is a great discrepancy between the average return during high sentiment, and the average return during low sentiment, where the former is significantly higher than the latter. Since this thesis argues that mispricing is contained in the chosen strategies, the hypothesis that mispricing is more prominent in periods following high sentiment is supported by this finding.

**Table 2b**

The table reports average returns in months following high and low levels of sentiment. The sample for the Swedish data is between the period 1983:2 to 2017:1. The sample for the European data is between the period 1990:7 to 2019:1. P-values of the coefficients are reported in parenthesis.

| | **High** | **Low** | **Average** |
|---|---|---|---|
| **Sweden** | 0.986% | 0.095% | 0.541% |
| | (0.014) | (0.771) | |
| **Europe** | 0.718% | -0.094% | 0.312% |
| | (0.000) | (0.604) | |

For further depth, an analysis where the average returns for periods following high and low sentiment are benchmark-adjusted is executed. The results show many similarities to the returns that have not been adjusted to the benchmark, both in terms of the size, and the significance of the coefficients. The fact that the regressions show analogous results, whether

or not the excess returns are adjusted to the benchmark, propose the conclusion that the excess returns found in regard to investor sentiment, cannot be explained by the benchmark model CAPM. Due to the similarities with the previous regression, the results from this analysis does also support the aforementioned hypotheses.

**Table 2c**

Average benchmark-adjusted returns in periods following high or low sentiment. Average returns are estimates of $a_H$and $a_L$in the regression; $R_{i,t} = a_H d_{H,t} + a_L d_{L,t} + b_i(R_{Mkt,t} - R_{f,t}) + u_{i,t}$

where $d_{H,t}$and $d_{L,t}$are dummy variables for either high or low sentiment, $R_{i,t}$is the excess return, and $R_{Mkt} - R_f$is the market premium. The sample period for the Swedish data is from 1983:2 to 2017:1. The sample for the European data is from 1990:7 to 2019:1. P-values of the coefficients are reported in parenthesis. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | **High** | **Low** | **Average** |
|---|---|---|---|
| **Sweden** | 0.999% | 0.037% | 0.518% |
| | (0.012) | (0.911) | |
| **Europe** | 0.717% | -0.176% | 0.271% |
| | (0.00) | (0.273) | |

For the next part of the analysis, predictive regressions are conducted, with the aim of examining whether the investor sentiment can predict returns. In the table below, excess returns on the lagged investor sentiment are reported. The hypothesis that mispricing is more prominent following high sentiment periods, suggests that there should be a positive relation between the excess returns and the sentiment index. This hypothesis can be confirmed by the results from both markets, since both beta coefficients are positive. Additionally, both coefficients are significant at a 5% level, and this suggests that investor sentiment is a fair explanatory variable for the excess return in the value premium, both in Sweden and Europe.

**Table 2d**

Predictive regressions for excess returns on investor sentiment. Estimates for b are reported in the table, using the following regression, $R_{i,t} = a_i + b_i Sent_{t-1} + u_t$, where $R_{i,t}$is the excess return in month t, and $Sent_{t-1}$is the lagged investor sentiment from the index of Baker and Wurgler (2006). The sample for the Swedish data is between 1983:2 and 2017:1, and 1990:7 to 2019:1 for the European data. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | $\hat{b}$ | P-value |
|---|---|---|
| Sweden | 0.838% | 0.031 |
| Europe | 0.994% | 0.001 |

## 5.2 Size strategy

The same set of regressions are also applied to a size strategy, to examine how this performs in the Swedish and European markets. When first examining the full sample, the significance of the beta estimates indicates that the CAPM is a satisfactory model for estimating the excess return contained in the size premium. The intercept for the Swedish market is significant at a 10% level and suggests that there should be some mispricing present, whereas the insignificance of the European alpha implies that there is no mispricing in the size premium on the European market.

When dividing the sample into two subsamples, and examining the period before the financial crisis, CAPM still seems to be a good predictor for the size premium in Sweden, but there is still mispricing present. For the European market, however, CAPM is no longer a suitable model, and there is no significant mispricing either. When shifting view to the post-crisis period, the results change. CAPM is still a good model for estimating the size premium on the Swedish market, but the insignificance of the intercept leads to the conclusion that there is not significant mispricing in this period. The results for the European market have also changed, and they now display significance in both the intercept and the beta coefficient, at a 10% level. In this period, the CAPM is a good model, and there is also mispricing present.

**Table 3a**

The table reports estimates of a and b using the following regression, $R_{i,t} = a_i + b_i(R_{Mkt,t} - R_{f,t}\ ) + u_t$, where $R_{i,t}$are excess returns and $R_{Mkt} - R_f$is the market premium. The full sample for the Swedish data is 1983:2 to 2017:1, and the subsamples are 1983:2 to 2008:12, and 2009:1 to 2017:1. The full sample for the European data is 1990:7 to 2019:1, and the subsamples are 1990:7 to 2008:12, and 2009:1 to 2019:1. The p-values of the coefficients are reported in parenthesis. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | Full Sample | | Period 1 | | Period 2 | |
|---|---|---|---|---|---|---|
| | $\hat{a}$ | $\hat{b}$ | $\hat{a}$ | $\hat{b}$ | $\hat{a}$ | $\hat{b}$ |
| Sweden | -0.444%<br>(0.069) | -15.770%<br>(0.001) | -0.520%<br>(0.068) | -10.339%<br>(0.036) | 0.196%<br>(0.693) | -53.025%<br>(0.000) |
| Europe | 0.029%<br>(0.810) | -7.264%<br>(0.031) | -0.111%<br>(0.493) | -7.656%<br>(0.123) | 0.287%<br>(0.079) | -7.081%<br>(0.063) |

When using investor sentiment to sort the data in regard to whether there is a high or low level of sentiment, the output shows some inconclusive results for the size strategy. For the Swedish market, it is clear that it is possible to improve the return from a size strategy, when taking investor sentiment into account. What should be made notice of is that the average returns are always negative, no matter the level of sentiment, and this might imply that the size strategy is not necessarily suitable for the Swedish market. The data from the European market show even more surprising results, as the figures in the table below indicate that a size strategy performs best in periods following low sentiment. This is a complete opposite conclusion to the one drawn for the value strategy earlier in this thesis. The relation suggests that an investment strategy using investor sentiment can still be successful, but an opposite procedure would have to be executed.

**Table 3b**

The table reports average returns in months following high and low levels of sentiment. The sample for the Swedish data is between the period 1983:2 to 2017:1. The sample for the European data is between the period 1990:7 to 2019:1. P-values of the coefficients are reported in parenthesis.

| | **High** | **Low** | **Average** |
|---|---|---|---|
| **Sweden** | -0.090% | -1.037% | -0.563% |
| | (0.793) | (0.004) | |
| **Europe** | -0.257% | 0.246% | -0.006% |
| | (0.156) | (0.104) | |

For the benchmark-adjusted average returns, there are similarities to the returns obtained from the previous analysis with the unadjusted returns. The resemblance of the results, both in terms of size and significance, suggests that the introduction of CAPM does not give much further information in this regression. For the Swedish market, the size strategy does still display higher returns in periods following high sentiment, but as in the previous regression, they are consistently negative. The results for the European market continue to show an opposite relation to the one obtained for the value strategy, where returns are significantly higher in periods following low sentiment.

**Table 3c**

Average benchmark-adjusted returns in periods following high or low sentiment. Average returns are estimates of $a_H$ and $a_L$ in the regression; $R_{i,t} = a_H d_{H,t} + a_L d_{L,t} + b_i(R_{Mkt,t} - R_{f,t}) + u_{i,t}$

where $d_{H,t}$ and $d_{L,t}$ are dummy variables for either high or low sentiment, $R_{i,t}$ is the excess return, and $R_{Mkt} - R_f$ is the market premium. The sample period for the Swedish data is from 1983:2 to 2017:1. The sample for the European data is from 1990:7 to 2019:1. P-values of the coefficients are reported in parenthesis. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | **High** | **Low** | **Average** |
|---|---|---|---|
| **Sweden** | -0.042% | -0.786% | -0.0603 |
| | (0.899) | (0.03) | |
| **Europe** | -0.248% | 0.313% | 0.033% |
| | (0.182) | (0.04) | |

When conducting the predictive regressions for the size strategy, it becomes clear that one hypothesis that is supported by the results from the Swedish market, is that mispricing is more prominent following periods of high sentiment. This is shown by the positive signs of the beta coefficients. This hypothesis is not supported by the results from the European data, since the beta coefficient is negative. A further conclusion to be drawn, is that the beta coefficients, both for the Swedish and the European market, are insignificant. This suggests that the level of investor sentiment is not an acceptable explanatory variable for the size premium.

**Table 3d**

Predictive regressions for excess returns on investor sentiment. Estimates for b are reported in the table, using the following regression, $R_{i,t} = a_i + b_i Sent_{t-1} + u_t$, where $R_{i,t}$is the excess return in month t, and $Sent_{t-1}$is the lagged investor sentiment from the index of Baker and Wurgler (2006). The sample for the Swedish data is between 1983:2 and 2017:1, and 1990:7 to 2019:1 for the European data. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | $\widehat{b}$ | P-value |
|---|---|---|
| **Sweden** | 0.264% | 0.447 |
| **Europe** | -0.361% | 0.121 |

## 5.3 Robustness test

The purpose of this analysis is to control the robustness of the results presented previously, and therefore these regressions are conducted to analyze whether the effect of sentiment diminishes, when including additional economic indicators. The chosen control variables for this analysis are the growth in Gross Domestic Product, GDP growth, and the market premium. The results for the value premium show consistency with earlier results, from table 2d, when controlling for additional variables. The sentiment coefficient remains positive and significant at a 10% level for the Swedish market and 5% level for the European market. This strengthens the hypothesis that mispricing is more substantial following high sentiment, and the finding that investor sentiment is a sufficient predictor for the value premium.

Further, the results for the size premium does also show consistency with previous results obtained from table 3d, when including control variables. The insignificance of the sentiment index for both Sweden and Europe strengthens the conclusion that the excess return in size premium cannot be explained by the investor sentiment.

**Table 4a**

Predictive regressions for excess returns on investor sentiment for the Swedish and European market. Quarterly data is used for the Swedish market, and annual data is used for the European market. Estimates for the coefficients are reported in the table, using the following regression, $R_{i,t} = a_i + b_i Sent_{t-1} + c_i(R_{Mkt,t-1} - R_{f,t-1}) + d_i GDPgrowth_{t-1} + u_t$, where $R_{i,t}$is the excess return in quarter/year t, $Sent_{t-1}$is the lagged investor sentiment from the index of Baker and Wurgler (2006), $R_{Mkt,t-1} - R_{f,t-1}$is the market premium in the previous quarter/year, and $GDPgrowth_{t-1}$is the lagged quarterly/annual growth in Gross Domestic Product in Sweden. The sample period for the Swedish market is from 1983:Q2-2017:Q1, and the sample period for the European market is from 1992-2019. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | **HML** | **SMB** |
|---|---|---|
| **Sweden** | | |
| Intercept | 0.0117 (0.211) | -0.02142 (0.043) |
| Sentiment | 0.02189 (0.073) | 0.01301 (0.200) |
| Market Premium | -0.08766 (0.442) | 0.22978 (0.007) |
| GDP growth | -0.00003 (1.00) | -0.7081 (0.511) |
| **Europe** | | |
| Intercept | 0.02301 (0.442) | 0.04637 (0.017) |
| Sentiment | 0.0748 (0.025) | -0.03001 (0.387) |
| Market Premium | -0.02753 (0.802) | -0.14615 (0.069) |
| GDP growth | 0.47275 (0.655) | -1.1719 (0.045) |

Due to the unavailability of an investor sentiment index specifically for the Swedish stock market, a limit for the thesis could be that it uses the US investor sentiment as a proxy. Because of this, a robustness test is conducted to determine if a Swedish Consumer Confidence Index would be a more advantageous explanatory variable for the excess returns in the strategies examined, rather than the US investor sentiment. Table 4b and 4c show the results from these analyses, and what can be concluded is that the value strategy displays an opposite relationship, in regard to average returns in periods following high or low sentiment. The value strategy now shows higher returns following low sentiment periods. The size strategy displays unprofitability, similarly, to results from the US investor sentiment.

The most crucial results from this analysis, are found when predictive regressions are executed. The Swedish consumer sentiment index shows insignificance for both the value- and size strategy, suggesting that this measure of sentiment is not a suitable explanatory variable. One reason why the Consumer Confidence Index does not seem to be a fair measure of sentiment could be that it includes macroeconomic variables. The investor sentiment is derived from the consumer sentiment by adjusting the index to exclude rational components, such as fluctuations in macroeconomic variables, and in turn leaves an index that only reflects investors irrational beliefs (Sekkat & Väljamets, 2016).

A further argument for the US sentiment being a satisfactory variable, is that a previous study by Baker et al. (2012) found the correlation between the US investor sentiment and a world sentiment to be 0.88, as previously mentioned. The high correlation suggests that the US sentiment should be a reasonable variable for predicting the excess returns on both the Swedish, and the European stock markets.

For further examining the robustness of this thesis, similar calculations can be executed for a European consumer sentiment index. Due to the arguments described above, this is not deemed necessary for justifying the validity of the results in this thesis.

**Table 4b**

The table reports average returns in months following high and low levels of sentiment. The sample period is between 1993:4 to 2017:1. P-values of the coefficients are reported in parenthesis.

| | **High** | **Low** | **Average** |
|---|---|---|---|
| HML | 0.143% (0.790) | 0.416% (0.198) | 0.2795% |
| SMB | -0.136% (0.720) | -0.753% (0.096) | -0.445% |

**Table 4c**

Predictive regressions for excess returns on investor sentiment. Estimates for b are reported in the table, using the following regression, $R_{i,t} = a_i + b_i Sent_{t-1} + u_t$, where $R_{i,t}$is the excess return in month t, and $Sent_{t-1}$is the lagged consumer sentiment from the index of SCB (2020). The sample period is between 1993:4 and 2017:1. All regressions include heteroskedasticity-consistent standard errors of White (1980).

| | $\widehat{\boldsymbol{b}}$ | **P-value** |
|---|---|---|
| HML | -0.031% | 0.931 |
| SMB | 0.1378% | 0.663 |

# 6. Discussion

This thesis has examined the profitability of both a value- and a size strategy on the Swedish and the European stock markets. What can be concluded is that, for the sample period examined, there is only evidence that supports profitability of the value strategy, whereas the size strategy seems to show consistent unprofitability. The only exception to this is when excess returns following low sentiment months are examined for the European market, where the size strategy shows profitability. The somewhat unexpected results of the size strategy pose some limits to the thesis, but the main contribution is believed to be the results examined from the value strategy.

The sample size varies somewhat in the regressions for the different markets. This limitation in mainly due to discrepancies in data availability. Whilst this can be argued to disrupt the conclusions drawn, the different samples are believed to capture similar effects, since both samples contain important events, such as the dot com bubble, and the 2008-2009 financial crisis. Further, the unprofitability of the size strategy can depend on the sample. Although the size strategy has not been seemingly profitable in the sample examined in this thesis, it could prove to be profitable if a different sample was examined.

The first hypothesis, where mispricing is assumed to be more prominent following periods of high sentiment, can be argued to hold true when the results from the value strategy are studied. This can mainly be found by the results in Table 2d, where predictive regressions on the value premium, with investor sentiment as the explanatory variable, are examined. The positive sign of the sentiment coefficient can be interpreted as an increase in sentiment, leading to subsequent periods of increased excess return. Further, the significance of the coefficient establishes investor sentiment as an adequate explanatory variable for the anomalous excess returns of the value premium. These results coincide with the expectations prior to the analysis, since previous research by Stambaugh et al. (2012) found a similar relation in their examination of the US stock market. This finding can largely be explained by previous research of Miller (1977) wherein he found that the limits on short selling, lead to mispricing that reflect the view of over optimistic investors. Baker and Wurgler (2006) contributed with their research, and assembly, of an investor sentiment, as this gave a proxy for the level of optimism and pessimism on the market. Stambaugh et al. combined the earlier

findings of these researchers, to examine if there was a way to estimate how the level of mispricing differs over time, as investors beliefs of the market shifts.

Furthermore, the second hypothesis, where the profitability of the strategies with regards to investor sentiment was examined, can also be argued to hold true for the value strategy. The evidence for this is mainly found in table 2b and 2c, where the sample period is divided into subsamples, in regard to whether it is a high- or low sentiment month. The results display higher average returns in months following high sentiment periods, and thus it can be argued that this is evidence for the possibility of improving the returns of a value strategy, when investor sentiment is taken into account.

The analysis on the 2008-2009 financial crisis' effect on the occurrence of mispricing, concluded that mispricing was more significant in the period before the financial crisis on the Swedish market. However, the results for the European market showed some inconsistencies. Mispricing was more prominent in the pre-crisis period for the value strategy, whilst the size strategy displayed more significant mispricing in the period after the crisis. The expectation of this analysis was that mispricing would be more distinguished in the period before the crisis. This because, sentiment was generally higher in this period, and other analyses in this thesis have shown that high levels of sentiment, leads to subsequent periods of significant mispricing. The majority of the results from this analysis supports this expectation, and only the size strategy for the European market does not. Other analyses in this thesis have shown that the data for the size strategy in the European market provide inconsistent results, and thus this could explain the unexpected results in this analysis.

For the robustness test of the predictive regressions, the GDP growth and the market premium were added as control variables to adjust the excess returns to economic indicators, that represent the economy's development as a whole. The aim was to control the robustness of the results to confirm that the anomaly returns cannot be explained by the general movements of the economy. Table 4a provide the results of this regression, which is consistent with earlier findings from table 2d and 3d, where control variables are not used. Because of this, it can be concluded that the first hypothesis still holds. The addition of control variables does not change the effect of investor sentiment, and it is therefore still a good explanatory variable for the value premium, in both the Swedish and European markets, whereas the market premium is still a good explanatory variable for the size premium.

However, The GDP growth is also significant for the European stock market, indicating that the excess return in size premium can be explained by the general movements of the economy.

To further strengthen the results, another robustness test was conducted where it was of interest to control if the Consumer Confidence Index, CCI, would be a superior option to predict excess returns in the aforementioned strategies. The results of table 4c display that the Swedish CCI is not an appropriate predictor of the value premium on the Swedish market, since it is insignificant. Furthermore, table 4b reveals an opposite relationship, to what was found in table 2b, where the value premium increases during periods of low sentiment and decreases during high sentiment. However, the effect of consumer sentiment on the size premium is consistent with the results of table 3b since the average return increases during high sentiment, but its coefficient is still negative. Table 4c provides results of a predictive regression with the CCI, and it can be concluded that this is not an appropriate determinant of the size premium, since its p-value is insignificant. This was also found when the investor sentiment was used as the explanatory variable.

As aforementioned, the difference between consumer sentiment and investor sentiment indices is that the latter does not contain macroeconomic variables. Investor sentiment indices are often derived from consumer sentiment with adjustments to exclude the fluctuations that result from macroeconomic variables. The result of this adjustment is an index that represent investors irrationality (Sekkat & Väljamets, 2016). It can therefore be concluded that Baker and Wurgler's investor sentiment index, which has a correlation of 0.88 with the world sentiment, is a better measure, as confirmed by our analyses.

As mentioned above, the Consumer Confidence Index contains macroeconomic variables, which could explain the relationship between value premium and high/low levels of consumer sentiment presented in table 4b. Table 4a shows that the GDP growth and the market premium are negatively correlated with the value premium in the Swedish market. These relationships could offer an explanation as to why the average return is lower in periods of high consumer sentiment, compared to low sentiment. A high level of CCI can be interpreted as high levels of its components. Since this includes macroeconomic variables, such as the GDP growth and market premium, it is reasonable that the average return will decrease following periods of high consumer sentiment.

# 7. Conclusion

To conclude, it can be determined that both hypotheses examined in this thesis, can be argued to hold true for the value strategy. The same can be said for the size strategy with the exception of the European market, where results consistent with the hypotheses have not been obtained. The analysis of the financial crisis effect on mispricing in the market, shows that mispricing is more prominent in the pre-crisis period for the Swedish market. This shows consistency with the value strategy in the European market, whereas the size strategy displays an opposite relation.

Suggestions for further research could be examining whether it is possible to construct investor sentiment indices specifically for the Swedish and the European stock market, respectively. This could further strengthen the validity of the relationships examined. Another research topic of interest could be to analyze other anomaly returns for the Swedish and European stock markets. The Swedish market, especially, has some limited data availability on this subject, and the construction of data over other anomalous patterns could further examine the effect of investor sentiment on mispricing.

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