UNIVERSITY OF GOTHENBURG

SCHOOL OF BUSINESS, ECONOMICS AND LAW

Performance Evaluation of Swedish and German Actively Managed Mutual Funds

Have Swedish Fund Managers Performed Better Than German Fund Managers 2010-2020?

Institution of Statistics and Economics

15 credits bachelor thesis

Autumn 2020

Authors:

Simon Olofsson

Robin Cederdahl

Supervisor: Jian Hua Zhang

Abstract

There are many studies examining the performance of actively managed mutual funds in different markets. The results of these studies vary depending on the used model and market. This thesis does as most of the previously mentioned studies use the Capital Asset Pricing Model (CAPM) as a baseline model, moreover this thesis uses the Fama-French Three Factor Model (FF3), which incorporates the value and size of the firm in the model. Inspired by Ferson and Schadt (1996) we modify our models by adding an information variable enabling us to present a result which in some regards are similar to previous studies. The results of our study shows that Swedish actively managed mutual funds have a higher average return, Sharpe ratio, and Treynor ratio than German actively managed funds. The intercepts, which measure the average superior performance, in our models of the Swedish funds are larger than those of the German funds. Our models are further tested by using the correlation, Breusch-Pagan, and Breusch-Godfrey tests.

Acknowledgments

We would like to thank our supervisor Jian Hua Zhang for his guidance and constructive remarks during the process of working on this thesis.

Furthermore, we would like to express our gratitude to everyone who helped us along the way, especially our opponents during the peer review process.

1. Introduction 1
1.1 Background 2
1.2 Purpose 3
1.3 Hypotheses 4
1.4 Layout 5
2. Theory 5
2.1 General fund theory 5
2.2 Efficient Market Hypothesis 7
3. Literature Review 7
3.1 Occurrence of abnormal returns 7
3.2 Validity of models 8
3.3 Comparative studies 9
4. Methodology 10
4.1 Rate of return 10
4.2 Sharpe Ratio 10
4.3 Treynor Ratio 11
4.4 Capital Asset Pricing Model 11
4.5 Fama French Three-Factor Model 12
4.6 Conditional alpha 13
4.7 Z-test for equality of regression coefficients 14
5. Data and Model Specification 15
5.1 Sample collection 15
5.1.1 Time period 15
5.1.2 Funds 15
5.1.3 Portfolio Construction 16
5.1.4 Survivorship-Bias 16
5.1.5 Benchmark 16
5.1.6 Risk-free rate 17
5.1.7 Factor-Loadings 17
5.1.8 Information variables 17
5.2 Model specification 17
6. Results & Analysis 18
6.1 Descriptive statistics 19
6.2 Multicollinearity 21
6.3 Risk-adjusted performance 22

6.4 Regression results 23
6.4.1 Equally Weighted Portfolios 23
6.4.2 Testing for Heteroscedasticity and Serial Correlation 26
6.4.3 Differences between estimated coefficients 27
7. Conclusion 29
References 31

1. Introduction

Trading and investing in securities on global equity markets is lucrative to investors due to the potential financial upside. There are several examples of periods in history when markets kept moving upwards on a daily basis. However, these markets are volatile since the price of securities can fluctuate over time. Granting major financial gain to investors analyzing securities correctly and depriving those with a poor basic analysis (Kader, Qing, 2007).

While all investors are entitled to the markets, investors that are not read up on the markets or are incapable of analyzing securities themselves might invest in a fund. By doing so they allow a fund manager to invest their capital for them. Some fund managers only invest in specific securities divided into market sectors, while others choose their investments based on other priorities and interests. Depending on the fund's focus the manager will have different prerequisites and rules to adapt to.

When evaluating if a fund has been a good investment or not, investors tend to use a benchmark. This benchmark is usually a market index or a specified index to a certain sector in the overall market. A fund that has outperformed the market is usually considered a good investment. Return exceeding the benchmark can be defined as positive abnormal return and are preferred by fund managers (Fisher, Jensen, Scholes, 1972).

What has been researched by scholars and is now considered common financial knowledge is that security prices are affected, not only by its own operations and situation, but by the market as a whole. Financial theory speaks of systematic risk, the risk a security is exposed to due to its market exposure, and the unsystematic risk, also named security specific risk. How the amount of risk is dealt with by investors differs due to the used analyzing tool and variables observed when analyzing securities and the markets. For example, if an investor expects an upwards moving market, the investor will try to invest in a manner that grants them a higher market exposure (Graham, Harvey, 2001).

Scholars have attempted to construct models aimed at helping understand security markets and analyze them. A classic model is the Capital Asset Pricing Model (CAPM) which is a single index model (Sharpe, 1964) (Littner, 1965) (Mossin, 1966). The CAPM is a single index regression model, using a predetermined market index as its variable of interest. Another acknowledged model is Fama-French Three-Factor Model (hereby referred to as FF3) (Fama, French, 1993; Fama French 1996). The FF3 can be considered an expansion of the CAPM as it while using the market variable as CAPM also has incorporated a size and value factor. Both of these models have been used in a variety of research papers examining fund returns, for example Rao, Ashan et al. (2017).

Some studies using the CAPM and FF3 have the objective of investigating whether it is possible for fund managers to achieve abnormal returns or not. Cuthbertson and Nitzsche (2013) were not able to prove the occurrence of abnormal returns when examining the German equity fund market. However, an example of a successful study is Fan and Addams (2012). More evidence of abnormal returns will be presented in section 3.1. This goes to show that achieving abnormal returns are not necessarily impossible, which opens for studies to use abnormal returns as a determining factor when determining performance.

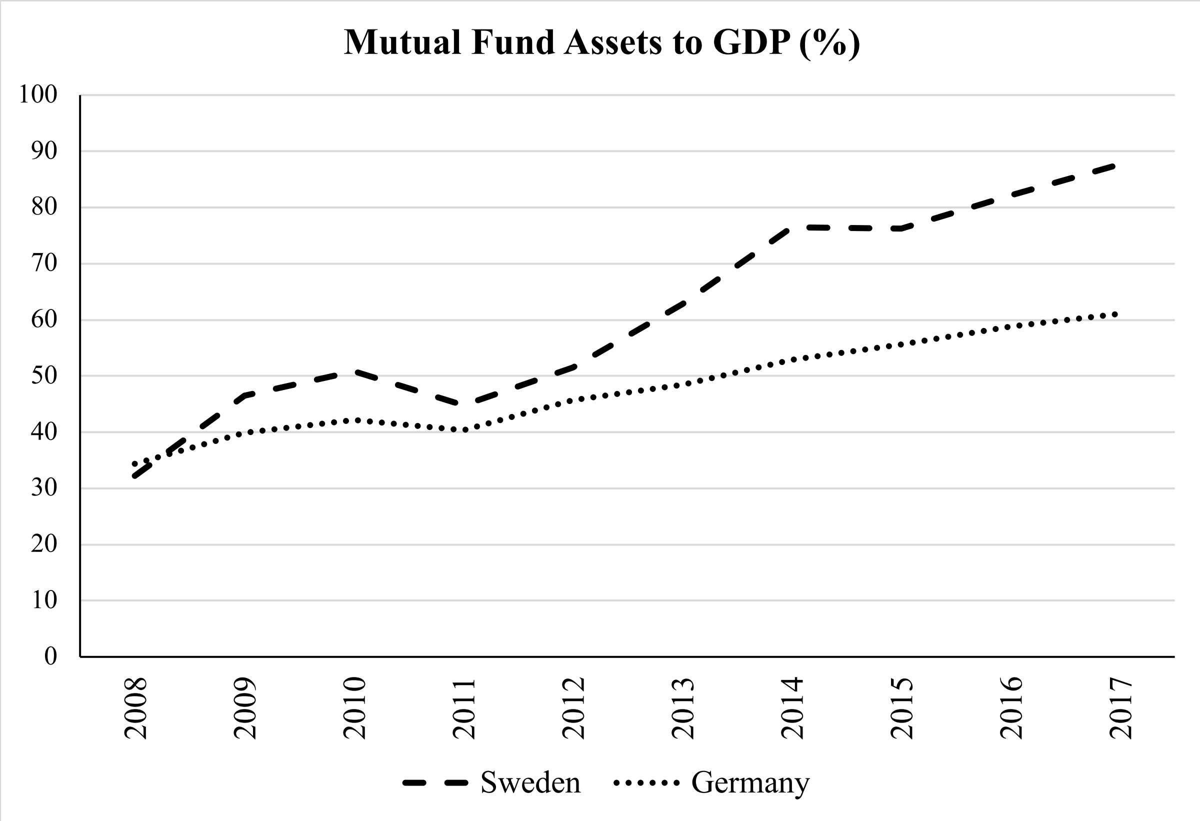
This thesis evaluates two different fund markets, the German and the Swedish, by using altercations of CAPM and FF3. An information variable, similar to the one proposed by Ferson and Schadt (1996) will be added to the CAPM and FF3. The reason for using FF3 as well as the CAPM resonates with the results of Dolinar (2012) who found that FF3 is more descriptive of the CAPM. The aim of the thesis is to find if the Swedish actively managed fund market has outperformed the German actively managed fund market when it comes to abnormal return. The Swedish market is examined as it is the home market of the authors, and the German market is examined due to it being the largest fund market in the Eurozone (EFAMA, 2020). Conducting this thesis creates a better understanding of if potential financial gain can be a reason for a smaller fund market attracting investments from larger fund markets.

1.1 Background

Germany is Europe's largest economy in terms of GDP, which in 2019 was computed to nearly $3.9 trillion in nominal GDP (The World Bank, 2020). Looking at the net asset value in the fund industry, German funds in 2019 held 13.3% of Europe's total funds, nearly €2.4 trillion, while the Swedish funds represented 2.4% of Europe's fund industry with their fund's net asset value of €421.2 billion (EFAMA, 2020).

Furthermore, both countries have seen an upgoing trend in mutual fund assets in relation to their GDP over the past 10 years. Graph 1 presents the percentage of GDP consisting of mutual fund assets in Sweden and Germany. In 2017 Germany held assets in mutual funds equivalent to 61% of their GDP, while Sweden had increased their assets in mutual funds to 88% of their GDP (The World Bank, 2020).

Graph 1: Mutual fund assets in GDP for Sweden and Germany 2008-2017



Source: Graphical representation created by the authors. Data collected from The World Bank

Although it is not just the Swedish and the German mutual fund industry that have grown rapidly over the past decade, the entire global mutual fund industry has seen the same expansion. The growth of the global mutual fund industry has increased the competition between funds to acquire capital from investors. As the competition has increased between funds, it is reasonable to examine the performance from a national perspective.

Mutual funds can be either actively or passively managed, where passively managed funds often just strive to follow a benchmark, or specific index (Morningstar, 2019). Since passive funds, often with great results, just follow indexes their managers are unable to take any broader advantages of their expectations of the future. With that in mind, this thesis focuses on mutual funds that are actively managed, where managers can use their knowledge and predictions to place their investments more freely according to their strategy.

1.2 Purpose

Finding differences in national performance in actively managed mutual funds could lay a foundation for further analysis on what funds an investor should choose to gain the greatest future returns. Moreover, CAPM and FF3 can be used to find indicators on characteristics of funds, which can be used to also further the analysis. To indicate characteristics of Swedish and German actively managed mutual funds and indications of what country has been better at managing mutual funds the purpose of this study can be composed. The purpose of this study is to find whether investors in actively managed mutual funds between 2010-2020 were on average better off, considering return, choosing Swedish funds instead of German funds.

1.3 Hypotheses

The main objective of this thesis is to investigate whether Swedish actively managed equity mutual funds have outperformed their German counterparts. Achieving the main objective and purpose is done by constructing several time series regression models based on each country's equally weighted portfolio consisting of all funds sorted on their domicile, to evaluate the differences in past performance between the countries. Furthermore, we have also used different risk-adjusted performance measures to gain insights in potential differences between the funds returns according to their risk taking.

As Cuthbertson and Nitzsche (2013) and Grewe and Stehle (2001) found negative alphas on average when analyzing German equity mutual funds, the idea arises that the Swedish funds outperforming the German funds could be a plausible discovery during this thesis.

In order to clearly state what information this thesis strives to present, two hypotheses answered at the end of the thesis are stated as follows.

Hypothesis 1: Actively managed Swedish mutual equity funds will yield higher risk-adjusted return than actively managed German mutual equity funds.

Hypothesis 2: Actively managed Swedish mutual equity funds will yield higher abnormal returns than their German counterparts according to a relevant European market index

In order to answer these hypotheses and delimit the extent of this thesis, only the past 10 years will be investigated.

1.4 Layout

This thesis is divided into 7 sections, all containing relevant subsections. Section 1 gives an introduction to the subject of the thesis, as well as specifying the thesis' hypotheses. The second section presents a theoretical framework for the thesis, which is followed by previously conducted research in section 3. Section 4 presents the methodology of the study. Section 5 specifies the data relevant to the thesis, as well as specifying the models that are used in the analysis. Following, in section 6 the results of the study are presented and analyzed. Lastly, the study's conclusions are presented in section 7, along with proposed future research.

2. Theory

This section gives a more in depth understanding of the relevant theoretical framework needed for comprehending basic fund knowledge. Firstly, section 2.1 presents general fund theory specifically regarding mutual funds. Gaining knowledge of general fund theory will help the reader to understand the funds included in the thesis making the thesis as a whole more comprehensible. Secondly, section 2.2 presents the efficient market hypothesis, which is necessary for the following methodology and thus the thesis.

2.1 General fund theory

There are different types of funds, one of the most common types is mutual funds. These funds invest in different securities with money collected from their investors, often charging fees from the investor. Investing in the fund gives the investor the right to a share of the fund and also the return that is in proportion to their investment. Many mutual funds also have a limit for the minimum investment placed in that fund, but apart from that the investor can choose the amount to invest rather freely, since the ownership shares are adjusted according to the proportion invested from each investor (SEC, 2020).

Equity mutual funds are a major part of the world economy as they are one of the most commonly used investment vehicles used by individual investors. This is true for both self-managed retirement accounts and in brokerage accounts. In 2014 the combined worldwide value of equity mutual fund assets reached $31.4 trillion and 43.4 percent of American households had invested assets in mutual funds. This shows the extensive importance and popularity of equity mutual funds (Baker, 2015).

Not all mutual funds are equity funds, although, it can still be a mutual fund. What makes a fund a mutual fund is that private investors or institutions can invest in the fund, giving the fund managers capital to invest. Also, investors can extract their investment upon request. The American Securities Commission (SEC) states that similarly to a stock, the investor buys a share of the fund that represents their ownership (SEC, 2020).

When looking at mutual funds, there are a variety of investment strategies which can define the characteristic of the fund (Bodie et al, 2020). The most popular strategy type when investing in mutual funds is to invest in equity, which mainly consists of stocks. The fund could for instance focus their investments to stocks yielding a high amount of dividends, generally called income funds. Growth funds is another type of focus which increases the risk in relation to income funds, which is done by investing in stocks that are assumed to grow in the future, resulting in gains due to the increased value of their holdings.

Funds can also be divided into further categories such as sector funds, where fund managers focus their investments in a specific industry of the market. Another common strategy is when a fund mainly invests outside its origin country, where they can focus their investments to specific countries, regions or markets, giving them the name international funds.

When a fund classifies as a bond fund, it generally invests in different types of bonds such as corporate and government bonds. The fund can invest in a variety of bonds with different risks, yields and maturities which gives the fund fixed income. A bond fund is considered a low-risk investment. Money market funds consist of investments in money market securities, and are designed to generate low risk, while they also are supposed to be highly liquid due to often short maturities. A money market fund can be either a prime money fund, where investments are often found in commercial securities such as certificates of deposits

Many funds are also a combination of both equities and fixed income investments, generally called balanced funds. These funds consist of assets where the risk is partly defined by the allocation between the types of assets. Riskier funds often hold a larger proportion in equity than in fixed income securities. Another common type of fund is index funds, where the fund holds the same proportion of assets as the market that the fund is trying to reflect. If the fund fully reflects the market of whom it’s trying to track, the growth of the fund should be equivalent to the growth of its targeted market.

2.2 Efficient Market Hypothesis

Investors often seek for opportunities to collect abnormal returns on their investments from securities which they assume to be miss-valued. The Efficient Market Hypothesis assumes that prices on efficient markets already reflect all available information, which would rule out the opportunity to constantly gain returns above the market, although the level of efficiency on different markets is widely debated. If the market suffers from weak-form efficiency, the prices are only reflected by historical information, this will give an investor with any additional information about the security the possibility to find underpriced assets and exceed market returns. The next level is semi-strong efficiency which assumes that all prices are reflected by both historical information and current public available information about the securities. At last, there is strong form efficiency, where all prices are expected to be represented by historical information, current public information and also private information (Malkiel, Fama, 1970).

It is problematic to measure and argue whether a market is strongly efficient, since the access to private information is often limited by definition. Assuming that the market holds a semi strong efficiency, where prices do not reflect private information, would give investors with such information the ability to make abnormal returns by trading with that information, hence obtaining positive alpha's (Malkiel, Fama, 1970).

3. Literature Review

There have been several studies evaluating fund performance around the world using different models for estimating their performance. This section is divided into three subsections. The first subsection presents papers evaluating the occurrence of abnormal returns, the second subsection presents studies showing that the models proposed in section 4 are valid and the third subsection presents completed comparative studies of different fund markets.

3.1 Occurrence of abnormal returns

Rao, Ashan et al (2017), mentioned in section 1.1 of this thesis conducted research on Chinese actively managed mutual equity funds. The authors found that the observed sample outperformed their benchmark in 2004-2015 using the CAPM and FF3. Their results also proved the three-factor model to give more predictive power to the past fund returns than the

CAPM. The key aspects of Rao, Ashan et al (2017) is that reliable research has found evidence of abnormal returns.

Mateus et al (2016) studied UK equity mutual funds and found underperformance in relation to the index, where the three-factor model helped to describe the variation better than the CAPM. Important to this thesis is the conclusion of Mateus et al (2016) that UK equity mutual funds had underperformed in relation to the used index. This conclusion gives evidence of abnormal return, despite it being negative.

Cuthbertson and Nitzsche (2013) investigated the performance of German equity mutual funds in 1990-2009. They found on average negative alphas using FF3, while their value factor did not give any significant explanatory power to the model according to the studied sample. The study of Cuthbertson and Nitzsche (2013) is highly relevant to this thesis due to its usage of FF3 when analyzing German funds.

Theissen (2006) also examined the German fund market, trying to find abnormal returns. Theissen observed values of open-ended mutual funds on a monthly basis from 1986-1998. Theissen (2006) did not find any results indicating that the sample had had any abnormal return.

Furthermore, Grewe and Stehle (2001) researched the occurrence of abnormal returns in the German market. The authors examine the German fund market from 1973-1998. While Theissen did not find abnormal returns in the German fund market, Grewe (2001) as Cuthbertson and Nitzsche (2013) found negative abnormal returns in the German fund market. The results of these three studies are all highly relevant to this thesis due to the importance of the German fund market.

Fan and Addams (2012) conducted a study on US-based international mutual funds. The authors choose to analyse the years of 2005-2009. The results of the study shows that many of the observed funds outperformed the market index used in the study, hence claiming abnormal returns.

3.2 Validity of models

The model used in this thesis is in part based on Fama and French (1996). The paper published by Fama and French in 1996 present evidence of their three-factor model from the US stock market. The authors find their variables significant when used on the US stock market, proving the efficiency of the model. However, as Fama and French are the original creators of the model that this thesis uses, more papers are used to describe the usage of this model.

Baloch and Rehman (2016) examined the Pakistan mutual fund market over the period of 2009 and 2015. The authors attempted to validate the CAPM and the FF3 by observing 100 open-ended mutual funds. The results of the study showed that the market variable of the CAPM were significant in explaining nearly every portfolio that they had constructed, while the FF3 was lacking. While the FF3 found significance for all market variables, the size and value factors were a bad fit. Balosh and Rehman (2016) conclude of CAPM being a better model in that specific situation, although without discarding the FF3.

Gorman and Weigand (2008) constructed a study investigating whether CAPM is a reliable model or if it is biased. The authors found evidence that the CAPM intercept can be positively biased if the portfolio is affected by other factors than the market, opening for other models to be used.

Lai and Lau (2010) set out to determine whether a single index model, FF3 or the Carhart model was proficient when describing mutual fund returns. The authors examined the Malaysian fund market. The study showed that all models were significant, and all observed variables were significant. Lai and Lau (2010) found the Carhart model most suitable for the study, but still described the validity of the FF3 and the CAPM.

Ferson and Schadt (1996) created a conditional model based on the CAPM. The authors reasoned that adding an information variable consisting of available public information should help explain the returns of stocks and funds. In their study Ferson and Schadt observe 67 open-ended mutual funds in the years of 1968-1990. They reach the conclusion of the information variable being relevant, adding to the explanatory power of the model.

3.3 Comparative studies

Few studies have been conducted where the authors compare national returns of two different markets. However, Bams and Otten (2002) examined five different fund markets using the Carhart four-factor model. The Carhart model is an extension of FF3, adding one variable. In the study Bams and Otten observe strict domestic funds from the UK, Italy, Germany, France and the Netherlands. The study uses the so-called Jensen's alpha as a measurement of potential outperformance. The results of the study shows that the UK funds have outperformed the other countries' funds and the German funds were significantly negative.

Furthermore, Bams and Otten (2007) conducted a study comparing the performance of US and UK fund managers investing in the US equity market. During the study, Bams and Otten (2007) observed 2436 US and 95 UK equity mutual funds. Bams and Otten (2007) use the Carhart mode, and the conditional model by Ferson and Schadt (1996). The result of the study indicates that the UK equity mutual funds, in some cases, have outperformed the US counterparts. Although as a whole, the US funds were better at achieving abnormal return. The importance of the study of Bams and Otten (2007) to this thesis is that alpha can be used as a determinant when comparing performance. Moreover, the usage of the conditional model by Bams and Otten (2007) and its intuition supports the adding of a similar information variable to this thesis.

4. Methodology

This section presents the prime formulas used in this thesis in order to answer the hypotheses. Both formulas for risk-adjusted as well as benchmarked-adjusted return are presented. Moreover, a Z-test to determine the equality between coefficients which will be used in section 6 to distinguish any differences between the results.

4.1 Rate of return

The rate of return will be used by calculating the change in net asset value (NAV), which is the fund's total assets minus its liabilities (Bodie et al, 2020). The rate of return is calculated from the following equation

$$Rate\ of\ Return\ = \frac{NAV_{t+l} - NAV_t}{NAV_t} \tag{1}$$

where NAV_t is the value in period t and NAV_{t+1} is the value in the next period, giving a percentage change of the funds NAV. This gives the rate of return for each period, and since this thesis uses a monthly time interval, the rate will be calculated monthly

4.2 Sharpe Ratio

The Sharpe ratio is a risk to return ratio that measures the excess return given by the portfolio's amount of risk. The equation is constructed as

$$Sharpe\ ratio\ = \frac{r_p - r_f}{\sigma_P} \tag{2}$$

Where the return of the portfolio is denoted by r_p, r_f is the risk-free rate and σ_P is the standard deviation of the portfolios returns over the same period of time. Since it uses standard deviation in the denominator, it represents the total risk taken (Sharpe, 1966). A higher Sharpe ratio is desirable in relation to lower ratios, since it implies that the portfolio's excess return is greater in comparison to the amount of risk taken.

4.3 Treynor Ratio

As being very similar to the Sharpe ratio, the Treynor ratio is also a return to risk ratio, with a slight altercation of the denominator, given the formula

$$Treynor\ ratio\ = \frac{r_p - r_f}{\beta_P} \tag{3}$$

Where r_p denotes the portfolio's return, r_f is the risk-free rate and β_P is the portfolio's sensitivity to the systematic risk, i.e., the market risk. When comparing portfolio's excess returns, higher Treynor ratios are preferred over smaller ones, since it indicates that the excess return was greater with respect to the amount of systematic risk of which the portfolio was exposed to (Treynor, 1965).

4.4 Capital Asset Pricing Model

The CAPM is the result of the work and theory by William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966) and was introduced to predict expected returns. It assumes that all investors try to minimize mean variance, has the same information available and has a single period planning for their investments. It also assumes that all assets traded are publicly available, lending and borrowing capital can be made at a risk-free rate as well as no tax or transaction cost should be charged, and at last, the investor should also have the ability to short assets (Bodie et al, 2020).

The equation of CAPM is constructed as follows:

$$E(r_i)\ =\ r_f + \beta_i[E(r_m) - r_f] \tag{4}$$

Where

$E(r_i)$ = the expected return of asset i

r_f = the risk-free rate

β_i = reflects the sensitivity of asset i to the market risk

$E(r_m)$ = the expected return of a market portfolio.

However, the CAPM have been criticized by scholars for being, among other reasons, of a too general nature. Fama and French (1996) for example claim that what according to Sharpe (1964), Lintner (1965) and Mossin (1966) is called anomalies is actually significant economic patterns. Several studies have been able to present models more precise when explaining cross-sectional returns than the CAPM (Dahlquist, Engström, Söderlind, 2000), (Chan, Chen, 1988), (Cochrane, 1992).

4.5 Fama French Three-Factor Model

The FF3, proposed by Eugene Fama and Kenneth French, is considered to be an extension of the Single-Index Model, and hence the CAPM (Fama, French, 1993). As the CAPM uses only the market's excess return as a describing variable, it's a reasonable assumption that the model captures less variation in average returns than what should be plausible by adding relevant factors to the model, creating a multi-factor model.

Fama and French emphasizes that the average return on US stocks cannot be described by the market beta proposed by Sharp (1964) or Lintner (1965), nor the consumption beta proposed by Breeden (1979). Fama and French point their attention to what they claim to be empirically proven factors. These factors are for example Market Capitalization, earnings over price- ratio and book to market-ratio (Fama, French, 1993).

The FF3 uses the time series regression proposed by Fisher, Jensen and Scholes (1972). By doing so, Fama and French argue that the variables that they use will proxy for common shared risk factors. The authors claim that by interpreting the slope coefficients of the variables and the coefficient of determination measurement ratio (R^2) of the regression, their variables will explain variation better than a single index model. (Fama, French, 1993)

The model consists of three factors of which Fama and French found relevant to explain the variation in returns, except for the market excess return they extend the model with adding factors for size and value. The size factor is denoted SMB (small minus big) and consists of the differences in return between small cap assets and large cap assets. Lastly, the value factor, HML (high minus low) is the difference in return between high value stocks and low value stocks. All factors are denoted for values during a certain period.

The equation is given by:

$$R_{i,t} = r_f + \beta_0 R_{M,t} + \beta_1 SMB_t + \beta_2 HML_t + e_{i,t} \quad (5)$$

Where:

$R_{i,t}$ = Excess return of asset *i* at time *t*

r_f = Risk free rate

β_i = Assets *i* sensitivity to the factor

$R_{M,t}$ = Excess return of the market portfolio at time *t*

SMB_t = Size factor at time *t*

HML_t = Value factor at time *t*

$e_{i,t}$ = Error term for asset *i* at time *t*

As being an extension of the CAPM, much evidence has been showing the FF3 giving improved predictive power when explaining equity fund returns, over the CAPM single-index model (Bello, 2008).

4.6 Conditional alpha

Ferson and Schadt (1996) have constructed a conditional model, adjusting for the assumption that fund managers will adjust their capital allocations depending on market prerequisites. Moreover, Ferson and Schadt assumed that managers will lower (higher) their beta if they expect the market to go down (up). They adopted the assumption of semi-strong market efficiency, which refers to all prices being set exclusively by public information. Using these assumptions Ferson and Schadt were able to construct an information variable reflecting some publicly available information. The information variable (z_{t-1}) is constructed using national dividend yields, treasury bill rates, default spread and term spread**.** Ferson and Schadt create an information vector out of the information variable in a regression model based on the CAPM, looking as follows

$$r_{p,t} = \alpha_p + \delta_{1,p} r_{m,t} + \delta'_{2,p}(z_{t-1} r_{m,t}) + \varepsilon_{p,t} \quad (6)$$

Where:

α_p = Difference in portfolio *p* actual return and the models estimated return

$\delta_{1,p}$ = Sensitivity to market returns for portfolio *p*

$r_{m,t}$ = Market return at time *t*

$\delta'_{2,p}$ = Sensitivity to information vector for portfolio *p*

$(z_{t-1}r_{m,t})$ = Product of the market return at time *t* and the information vector at time *t-1*

$\varepsilon_{p,t}$ = Error term for portfolio p at time t

The information variable in the model is lagged. Lagging the information variables is how the model assigns for the assumption of changing capital allocations over time. The model matches each fund's market beta at time t with the information at time t-1. If the investor is able to allocate capital, only using the public information, that raises (lower) the portfolio beta when the market fluctuates upwards (downwards), abnormal returns are theoretically possible.

4.7 Z-test for equality of regression coefficients

In order to test whether the coefficients across different regression models can be assumed to be equal or different, z-scores are calculated for the differences between coefficients as proposed by Paternoster et al (1998). They argue that their model minimizes the probability of having bias in the test scores that could lead to a rejection of a null hypothesis which implies that no differences exist between the coefficients. The formula for the test is given by

$$Z = \frac{\beta_1 - \beta_2}{\sqrt{(SE\beta_1)^2 + (SE\beta_2)^2}} \tag{7}$$

Where

β_i = Coefficient *i* of our two coefficients of interest

$SE\beta_i$ = Standard error for coefficient *i*

5. Data and Model Specification

This section of the thesis presents how the data have been collected as well as specifying the models used to answer the hypotheses of the thesis. In section 5.1 portfolios are constructed, one Swedish and one German. Continuing, section 5.2 presents the model specification. The models specified in section 5.2 are derived from the models described in section 4, more specifically the CAPM, FF3 and the model including the information variable by Ferson and Schadt (1996).

5.1 Sample collection

This section describes how the data collection has been conducted during this thesis. Moreover, how the data have been adjusted due to for example insufficient specific fund data is explained.

5.1.1 Time period

All data used is collected from the time period of November 2010 to October 2020, which is the 10 year time period of interest.

5.1.2 Funds

Net asset values are retrieved from Bloomberg Terminal for both Swedish and German funds on a monthly basis from 2010 to 2020. The criteria in the filtering are to only include funds that invested primarily in equity assets, that had a domicile in their respective country and were classified as mutual funds, while excluding funds listed as passive. Funds not active today have also been included if they were active during the specified time period. The Swedish sample consists of 504 funds, and the German sample is larger and contains 945 funds.

While reviewing the data, we find that a noticeable amount of funds misses price information for the entire period, which has led us to delete 42 Swedish and 323 German funds from the sample. Supposedly these funds were missing price information because they had been active before the period of interest, and therefore should this exclusion not affect the validity of the sample. Reviewing the data further, some funds have very inconsistent reporting and also some gaps during the period. Common for these funds is that their number of reported months are very few, and that resulted in excluding all funds with 11 month or less reported data, only keeping funds active for one year or more. This last step excluded 22 Swedish and 67 German funds. The final sample therefore consists of 440 Swedish and 555 German funds, of which 277 Swedish and 403 German funds are active during the work of this thesis. From the mentioned data, we use equation (3) to calculate the rate of return for each month.

5.1.3 Portfolio Construction

Henceforth, the data is treated as portfolios in order to produce results that can be interpreted in a meaningful way. First, two portfolios are constructed consisting of all funds in each country's sample, which is called the "Swedish portfolio" and the "German portfolio". The German portfolio consists of 555 German funds and the Swedish portfolio consists of 440 Swedish funds.

5.1.4 Survivorship-Bias

In our sample we have considered survivorship bias which is the phenomenon of overestimating historical performance by excluding funds that have been terminated during the period, mostly because of poor performance (Grinblatt, Titman, 1989). Since bad performance often is the reason for termination of funds, hence excluded from the market, we will include the 329 funds that are not active as of this date in our sample, to give a fairer overview of the country's performances.

It is important to clarify that the clearance of funds with 11 month of data or less could have an impact on the survivorship bias. However, using 329 funds in the sample that are not active today, could do a great job minimizing the survivorship bias in this report, although the idea of bias cannot be totally ignored. This implementation is in line with the work of Rao, Ashan et al (2017), where they also included inactive funds in their sample while excluding funds that had few observations.

5.1.5 Benchmark

This thesis uses the MSCI Europe Index as a benchmark for both countries, since its index consists of both our countries and funds often invest outside their domicile, collected from Bloomberg. This index represents nearly 85% of the market capitalization in Europe. (MSCI, n.d)

5.1.6 Risk-free rate

As the risk-free rate 1 month US treasury bills are used. Treasury bills are issued by the government and are considered to give a risk-free return on the investment after a determined period of time and are used to estimate excess return on the market (Bodie et al, 2020). We use the US treasury bills to include a uniform risk-free rate in this thesis. This data is collected from Bloomberg Terminal.

5.1.7 Factor-Loadings

As for the Fama-French three-factor model, we obtain the factors for size (Small minus Big) and value (High minus Low). These factors are suitable for the European market and collected from Kenneth French´s database (Kenneth French). This data is calculated on a monthly basis and originates from Bloomberg Terminal.

5.1.8 Information variables

One information variable is constructed for each country by obtaining the predetermined data with the same idea as Ferson and Schadt (1996). As dividend yield, we collect the monthly dividend yields from our MSCI Europe index, for default spread we calculate the monthly differences between Moody's European BAA and AAA rated corporate bond indices. The treasury bill yield is calculated from each country's past 12-month average yield minus its current yield for each month for a treasury bill with the maturity of three months. The term spread is the monthly differences between each country's government bond with the maturity of 10 years and three months.

The final information variable for each country is then constructed by calculating the mean of each month consisting of the data above, while also lagging the variables backward by one month.

5.2 Model specification

After obtaining the data and creating our portfolios, we construct different models of interest for the purpose of running different regression models. These regression models will use the ordinary least squares method in order to estimate our models. This method predicts the estimations that give the model the smallest sum of squared errors, which is the estimation of a model with the least deviations of the predicted value from the true value of the dependent variable (Wooldridge, 2015).

From the CAPM and FF3 equations (4) and (5), we construct equation (8) and (9).

$$R_{p,t} = \alpha_p + \beta_0 R_{m,t} + e_{p,t} \tag{8}$$

$$R_{p,t} = \alpha_p + \beta_0 R_{m,t} + \beta_1 SMB_t + \beta_2 HML_t + e_{p,t} \tag{9}$$

Where:

$R_{p,t}$	= The monthly excess return of portfolio p at the time t
α_p	= Difference in portfolio p actual return and the models estimated return
β_i	= The slope coefficient of independent variable i
$R_{m,\ t}$	= Market excess return at time t
SMB_t	= Size factor at time t
HML_t	= Value factor at time t
$e_{p,t}$	= Error term of portfolio p at time t
t	= Month 1, 2, …,120

Moreover, acknowledging the theory of Ferson and Schadt (1996) we will add an information variable to equation (8) and (9) to create equation (10) and (11). Unlike the model using the information vector by Ferson and Schadt, our models will not be conditional.

$$R_{p,t} = \alpha_p + \beta_0 R_{m,t} + \beta_3 INFO_{c,t-1} + e_{p,t} \tag{10}$$

$$R_{p,t} = \alpha_p + \beta_0 R_{m,t} + \beta_1 SMB_t + \beta_2 HML_t + \beta_3 INFO_{c,t-1} + e_{p,t} \tag{11}$$

Where $INFO_{c,t-1}$ denotes the information variable for country c when being lagged with one month. This variable is constructed as the combined mean of the information from section 5.1.8 for each country. The information in the variable is the national treasury bill yield, the national term spread, default spread and dividend yield.

6. Results & Analysis

In this section all results from the tests that have been conducted are presented in order to answer the hypotheses of the thesis. First the used data is described, then a few robustness tests are run for the purpose of discovering any problems with the data that could bias the results. Following the risk-adjusted ratios, and also the models of interest are tested. As for the uniformity in the interpretation of the results, the desired level of significance is set at 5-

percent or less throughout the tests and calculations, hence results that do not meet this threshold might be mentioned but not interpreted as significant results.

6.1 Descriptive statistics

To begin, this section overviews the sample that has been collected. Table 1 presents the descriptive statistics of this thesis' Swedish and German portfolios, specified in section 5.1, before subtracting the risk-free rate from the US treasury bills. Table 1 shows descriptive statistics of the two equally weighted portfolios. The return is presented with a monthly average return without adjustments for risk-free rate, i.e., non-excess return. A one-sided t-test is conducted to determine whether the portfolios mean returns for the period are significantly different from each other.

Table 1: Descriptive Statistics for the equally weighted portfolios non-excess return

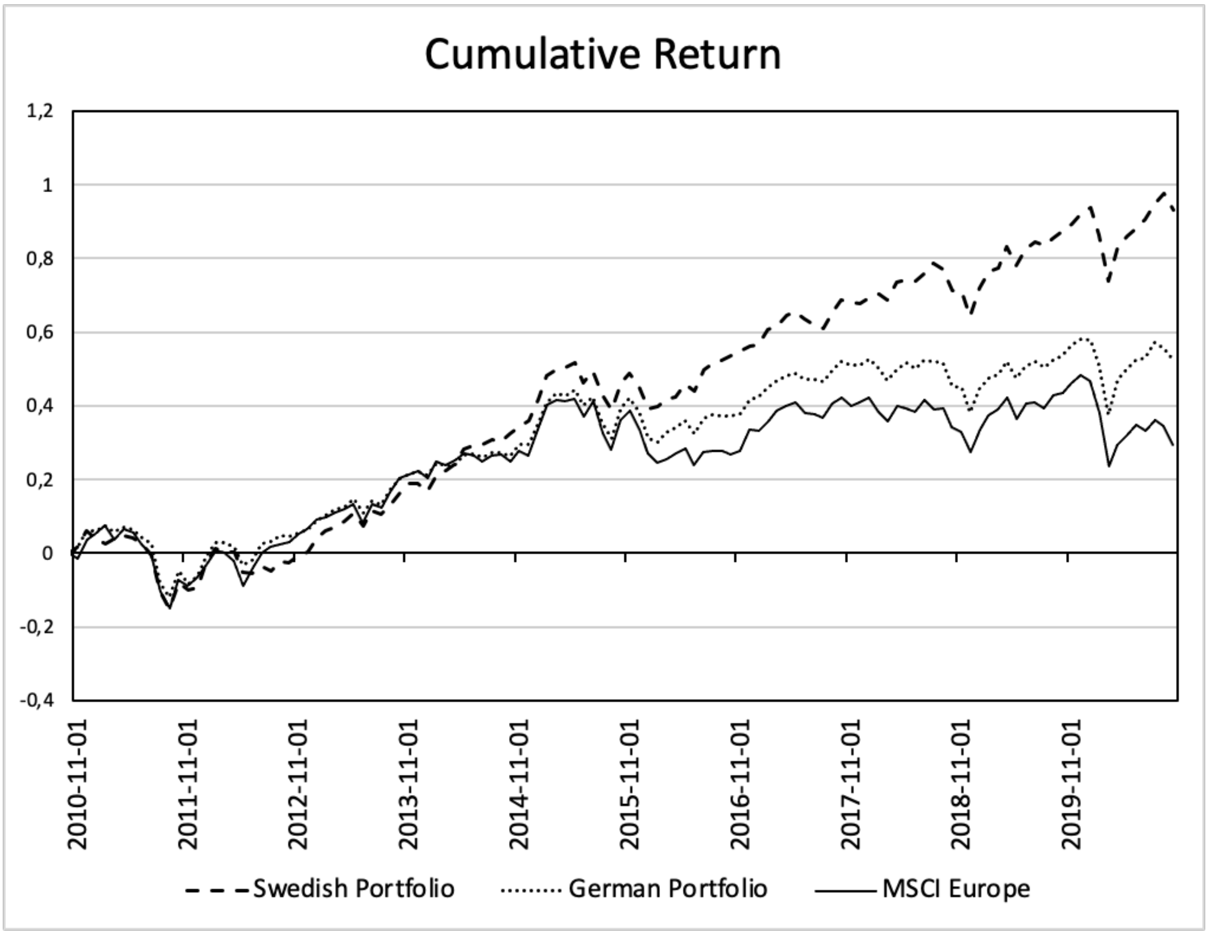
	Swedish portfolio	German portfolio	Difference
Monthly Average Return	0.78%	0.44%	+ 0.34%** (0.002)
Median Return	1.19%	0.94%	+ 0.25%
Max	9.17%	9.5%	- 0.32%
Min	-12.4%	-13.4%	+ 0.96%
Variance	0.001	0.001	+ 0.000
Standard deviation	0.035	0.035	+ 0.001
Observations	120	120	0
Number of funds	440	555	- 138

*Results being marked *** for 1% level, ** for 5% level and * for 10% level. Source: table constructed by the authors. Data collected from Bloomberg database.*

When overviewing the portfolios without subtracting the risk-free rate, i.e., looking at non-excess return, we find both a higher mean and median for the Swedish portfolio. The average monthly return for the Swedish portfolio is 0.78%. As for the German portfolio, the mean return is also positive, but the average monthly return is only 0.44% which is less than for the Swedish portfolio. We compare the difference in average monthly return between the portfolios, finding the Swedish portfolio's 0.34% excess return over the German portfolio being significant at the 5-percent confidence level. The German portfolio has shown both the highest max value and lowest min value during the period, and also consists of 138 more funds than the Swedish portfolio.

We calculated the cumulative return for both of the equally weighted portfolios and also our index from the start in November 2010, and graphed them over the designated time period, 2010-2020 in graph 2.

Graph 2: Cumulative return for the equally weighted portfolios and MSCI Europe



Source: Graphical presentation created by the authors. Data collected from Bloomberg.

Observing the first half of the designated period until the start of 2014, both portfolios show a similar increase in cumulative return as the benchmark has, with the Swedish portfolio right below the index. However, during 2014 the Swedish portfolio managed to climb above the index and have stayed there since then. The German portfolio did also manage to increase their cumulative return in comparison to the index shortly after Sweden did, but have not managed to reach the Swedish level, however the German portfolio has yet remained over the index as well.

6.2 Multicollinearity

Multicollinearity is a problem when two or more independent variables turn out to have a high pairwise correlation. If two or more independent variables have a high correlation among them, they use similar information when trying to predict the model, usually leading to smaller coefficients and increased standard errors (Woodridge, 2015). If two variables show a correlation higher than 0.8 or smaller than -0.8 in a correlation matrix, it should definitely be considered that a multicollinearity problem exists. Table 2 represents the results from a correlation matrix where all independent variables pairwise correlation are shown.

Table 2: Correlation Matrix for independent variables

	Market Factor	SMB	HML	Sweden Information	German Information
Market	1				
SMB	-0.1202	1			
HML	0.3258	0.0360	1		
Sweden information	-0.2337	-0.1342	-0.0980	1	
German information	-0.1488	-0.1507	-0.0534	0.7886	1

Source: Table constructed by the authors. Data collected from Bloomberg database and Kenneth French database.

As shown in the correlation matrix in table 2, the strongest correlation among our independent variables is the country's information variables, which correlates at 78.9%. We consider this to not affect our results at all, since these variables won't be used in the same models. The second strongest correlation is the value factor and market but correlating at 32.6% is far from a sign of multicollinearity. It is therefore assumed that the data is free from multicollinearity problems

6.3 Risk-adjusted performance

Table 3 gives an overview of the Sharpe ratio for each portfolio from 2010 to 2020, measuring a ratio of the excess return of the portfolio in relation to the amount of risk taken. The countries' Sharpe ratios are obtained from equation (2) in section 4.2 and the countries' Treynor ratios from equation (3) in section 4.3. Furthermore table 3 presents the results from one-sided T-tests of Sharpe ratios and Treynor ratios with the null-hypothesis of the value being zero.

Table 3: Statistics for comparison of Sharpe Ratios and Treynor Ratios

	Sweden	Germany	Difference
Sharpe Ratio	0.207** (0.0256)	0.112 (0.2235)	0.095** (0.0028)
Treynor Ratios	0.009** (0.0256)	0.004 (0.2235)	0.004** (0.0011)
Observations	120	120	120

*Significance marked with *** for 1% level, ** for 5% level and * for 10% level. Source: Table constructed by the authors. Data collected from Bloomberg database.*

Shown in the first row of results in table 3 there is a positive Sharpe ratio for the Swedish portfolio, that is significantly deviated from zero at the 5-percent confidence level. As for the German portfolio we cannot draw any conclusion whether their Sharpe ratio is positive at all. The difference in Sharpe ratios between the portfolios is significantly higher for the Swedish portfolio at the 5-percent confidence level. This difference entitles arguments for a superior risk-adjusted return according to the unsystematic, i.e., total risk for the Swedish portfolio towards the German portfolio.

As for the return in relation to the market risk, Sweden shows an overall significant positive Treynor ratio at the 5-percent level for their portfolio. Looking at the German portfolio, we cannot make any conclusions regarding if the portfolio's Treynor ratio is positive at all due to the level of significance presented. However, when looking at the differences, a higher Treynor ratio is found in the Swedish portfolio than the German portfolio. The difference shows significance at the 5-percent level, meaning that the Swedish portfolio has shown a better risk-adjusted return according to the systematic, i.e., market, risk than the German portfolio during the observed time period.

6.4 Regression results

Section 6.4 gives evidence for a further analysis of the thesis. The results presented are used to answer the second hypothesis, which is whether Swedish actively managed funds have outperformed their German counterparts. All results in section 6.4 are calculated using earlier specified models and data. Following the results, the major findings are analyzed.

6.4.1 Equally Weighted Portfolios

Table 4 shows the results from applying CAPM (equation (8)) and FF3 (equation (9)) on the previously specified equally weighted portfolios for each country. Doing so, the results will present the countries' funds from an overall perspective, hence we have created a benchmark for further analysis.

Table 4: CAPM and FF3 without information variable

	(1) CAPM Sweden	(2) CAPM Germany	(3) FF3 Sweden	(4) FF3 Germany
Market	0.82*** (0.000)	0.875*** (0.000)	0.893*** (0.000)	0.927*** (0.000)
SMB			0.004*** (0.000)	0.004*** (0.000)
HML			-0.002*** (0.000)	-0.002*** (0.000)
Intercept	0.567%*** (0.000)	0.215%** (0.009)	0.366%** (0.023)	0.068% (0.204)
Adjusted R^2	0.768	0.907	0.823	0.943
Observations	120	120	120	120

*Significance for factor loadings and intercept being marked with *** for 1% level, ** for 5% level and * for 10% level. Newey-West p-values with 12-lags in parenthesis. Source: Table constructed by the authors. Data collected from Bloomberg database and Kenneth French database.*

Only using CAPM, as shown by the estimations from model (1) and (2) in table 4 we find higher intercept for the Swedish portfolio This is equivalent to saying that the Swedish portfolio presented higher returns than the model predicted, also called abnormal return and henceforth mentioned as alpha. The alphas for both the Swedish and German portfolio are positive and significant at a satisfactory level. The German portfolio has a higher market beta than the Swedish portfolio. Intuitively this means that the German portfolio is on average more sensitive to market fluctuations and systematic risk than the Swedish portfolio.

Furthermore, using the FF3 in model (3) and (4) shows, just like the CAPM, that Germany has a higher market coefficient than Sweden, for both models this coefficient is significant at 1-percent level. When using the FF3 the Swedish portfolio still presents a significant positive alpha, while the German portfolio still has a positive alpha, but is no longer significant. Looking at the SMB-factor, both portfolios have significantly positive coefficients. This indicates that both portfolios seem to weigh more towards small cap assets, since the model expects the portfolios return to respond positively when small cap returns increase over large cap returns. For the HML-factor, which is the excess return of value stocks over growth stocks, the significantly negative coefficient in both portfolios indicates that both portfolios weigh more towards growth stocks.

The layout of Table 5 is duplicating table 4 apart from the information variable being added to table 5. Furthermore table 5 is constructed using equation (10) and (11), which is CAPM and FF3 with the information variable, instead of equation (8) and (9).

Table 5: CAPM and FF3 using the unconditioned information variable

	(5) CAPM Sweden	(6) CAPM Germany	(7) FF3 Sweden	(8) FF3 Germany
Market	0.799*** (0.000)	0.869*** (0.000)	0.876*** (0.000)	0.924*** (0.000)
SMB			0.004*** (0.000)	0.004*** (0.000)
HML			-0.002*** (0.000)	-0.002*** (0.000)
Info	-0.021** (0.002)	-0.008** (0.009)	-0.015** (0.032)	-0.003 (0.121)
Intercept	3.54%*** (0.000)	1.39%** (0.003)	2.52%** (0.014)	0.56% (0.102)
Adjusted R^2	0.775	0.908	0.826	0.943
Observations	120	120	120	120

*Significance for factor loadings and intercept being marked with *** for 1% level, ** for 5% level and * for 10% level. Newey-West p-values with 12-lags in parenthesis. Source: Table constructed by the authors. Data collected from Bloomberg database and Kenneth French database.*

What is clearly visible from looking at the information variable, the estimated coefficient is significant in all models apart from the German FF3 (model 8). The negative coefficients in the models indicates that when the value of the variable which represents the lagged mean of our predetermined information increases, the expected return of the portfolios decreases. When adding the information variables to the models, the alpha for all models increases in comparison with the alphas presented in table 4 for model (1), (2), (3) and (4). These results speak in the same direction as Ferson and Schadt (1996) when they included similar public information in their conditional model and found higher alphas. But since we don't construct our model in the same way, any closer comparison can't be done to their study.

We do however still find higher alphas for the Swedish portfolios, where both are significant at a satisfactory level. The estimations from model (8) show lack of significance for the alpha from the German portfolio, which is evidence to assume that the German portfolio did not manage to outperform the market. Reading relevant recent studies of German mutual funds, it is clear that our study is not the first one showing these results. Theissen (2006) reached the same conclusion that there is no empirical evidence showing significant abnormal return for German actively managed mutual funds.

Looking at the market coefficient, the estimations are slightly smaller when adding the information variables, but it does not change the fact that the German portfolio presents a higher sensitivity for market fluctuations in all models. As for the SMB and HML-factors, adding the information variables does not change neither the sign nor the level of significance regarding the coefficients, and the change in the portfolios sensitivity to these factors is not noticeable when rounding off as done in this table.

Whether the models have been sufficient to describe the portfolios adjusted R^2 is used. The adjusted R^2 measurement is commonly interpreted as how descriptive the model is of the sample. More specifically how much of the observed sample variance that can be explained by the model's variables. The German portfolio's adjusted R^2 is higher than the Swedish portfolio's measurement. Intuitively this shows that the German portfolio variance is explained better by the models than the Swedish portfolio variance. However, the adjusted R^2 of the Germany portfolio might not be accurate. Lhabitant (n.d) explains when discussing the R^2 value in general, that the R^2 measurement might be biased. This opens for a discussion whether the adjusted R^2 of this thesis is accurate or not. The high German portfolio adjusted R^2 measurement is the matter of concern as it, using both models, is higher than 0.90. On one hand, the results of Cuthbertson and Nitzsche (2013) show a lower adjusted R^2 value than

0.80, similar to the adjusted R^2 measurement this thesis' results show for the Swedish portfolio. On the other hand, an intuitive explanation to the difference could be that the German actively managed mutual funds follow the market portfolio in their capital allocation to a greater extent than Swedish actively managed mutual funds. This would result in both a higher beta, as well as a higher adjusted R^2 value. As we have used different indexes than Cuthbertson and Nitzsche (2013) we can not use their results as an absolute certainty regarding what we are to expect in our study. Therefore, we maintain confidence in our results, although remain open to further statistical tests potentially being necessary.

Since the adjusted R^2value increase when adding the information variable, intuitively, this would mean that the models containing the information variable describes a greater part of the portfolio variance. At first glance this would make us certain in assuming that the models adopting the information variable are better than the models not using the information variable. However, the rise in adjusted R^2 in our models is very small, which begs the question whether it is actually more descriptive or a statistical inaccuracy. Following what is mentioned by Lhabitant (n.d) we are, considering this uncertainty, not able to conclude whether the information variable is relevant when assessing performance.

6.4.2 Testing for Heteroscedasticity and Serial Correlation

A Breusch-Pagan's test is conducted to check for heteroscedasticity, which is the phenomenon of the error terms from a regression not being normally distributed, i.e., not having constant variance. As this being a problem with variance, data that suffers from heteroscedasticity result in unreliable confidence intervals and t statistics for coefficients. A solution to this problem is to use robust standard errors in the regressions, which takes non-equal variance into consideration (Wooldridge, 2015). When conducting a Breusch-Pagan test we assume that a p-value under a given threshold is evidence to assume that the data suffers from heteroscedasticity, i.e., rejecting the null hypothesis that the error terms have constant variance.

Serial correlation is a problem when a variable's observation is predictive about its next observation, meaning if we have a high correlation between lagged values, we might have a problem with serial correlation (Wooldridge, 2015). The null hypothesis in the Breusch-Godfrey test is that no serial correlation exists, but if we obtain a p-value under the predetermined level of significance, the null hypothesis should be rejected and serial correlation in the data should be suspected.

After running the Breusch-Pagan test, no evidence is found to reject the null hypothesis that we have equal variance among our residuals in any model according to the predetermined level of significance, shown in table 7 (Appendix), Panel A. We assume that our dataset does not suffer from heteroscedasticity and makes no adjustments for this.

When conducting the Breusch-Godfrey test for serial correlation, no signs of serial correlation are found in six of our models. Thus, for the German FF3, both with and without our information variable (models 4 & 8), we do reject the null hypothesis that no serial correlation exists, and assume the model could have a problem with serial correlation, shown in table 7 (Appendix), Panel B, Panel B. Jiao & Lilti (2017) conducted a study on the Chinese stock market using the FF3, during their study they corrected for serial correlation and heteroscedasticity by reporting t-statistics and standard errors from regressions using Newey-West standard errors. Due to the evidence of probably dealing with serial correlation, we use our standard errors and t-statistics in the same way to report our p-values, using Newey-West standard errors for all models, with the lag of 12 as Wooldridge (2015) suggests for monthly data.

6.4.3 Differences between estimated coefficients

In an attempt to find any differences in the results between the countries' portfolios estimated coefficients, differences of each coefficient across the models are calculated with Z-tests using equation (11). Continuing to test whether we can reject the null hypothesis that the slope of the coefficients is the same or not. The results of these tests are presented in table 6. In these tests the Swedish portfolio is the base, hence positive values in table 6 imply higher value in the Swedish portfolio compared to the German portfolio. Table 6 presents the results from one sided z-test statistics for the difference of each coefficient. With positive values indicating higher values in the Swedish portfolio, p-values in parenthesis.

Table 6: Test statistics for differences between the countries' portfolios

	(1) & (2) CAPM Difference	(3) & (4) FF3 Difference	(5) & (6) CAPM info Difference	(7) & (8) FF3 info Difference
$Intercept_{Swe} - Intercept_{Ger}$	0.35%** (0.021)	0.297%** (0.038)	2.15%** (0.022)	1.97%** (0.033)
$Market_{Swe} - Market_{Ger}$	-0.055 (0.138)	-0.034 (0.229)	-0.070* (0.085)	-0.047 (0.164)
$SMB_{Swe} - SMB_{Ger}$		0.001 (0.308)		0.0003 (0.370)
$HML_{Swe} - HML_{Ger}$		-0.001 (0.13)		-0.001 (0.112)

*Significance being marked with *** for 1% level, ** for 5% level and * for 10% level. Source: Table constructed by the authors. Data collected from Bloomberg database and Kenneth French database.*

The results from the Z-tests for CAPM, presented in table 6, shows a difference in alpha of 0.35% between model (1) and (2), which is significant at the 5-percent level, and a difference in market coefficients of -0.055 that is not significant. The interpretation of the difference in the market beta is that if the results would have been significant, there would be evidence to argue that the Swedish portfolio is less sensitive to changes in the market in comparison to the German portfolio. But as mentioned, in this case the results are not significant, which does not enable us to express any further remarks on such differences.

Looking at the tests for differences in the FF3 models (3) and (4), we can draw no statistical conclusions regarding any difference in the portfolio's sensitivity to the market, SMB or HML-factor since the results turned out to be non-significant. If we would have obtained significant results, it could have been argued that one portfolio is more or less sensitive to the size or value factor than the other. In this case conclusions of such difference are not appropriate. As for the alpha, we do find statistical evidence that a significant difference exists between the portfolios. While the difference in alpha of 0.297% is significant at the 5-percent level, it can be argued that strong evidence exists to conclude that the Swedish portfolio yields higher benchmark-adjusted return in comparison to the German portfolio, when using the FF3 models.

When comparing the differences in the CAPM models when adding the information variables in model (5) and (6), the difference in alpha is larger than before, resulting in a 2.15% higher alpha in Sweden, with the difference being significant at 5-percent. This difference follows the patterns of previous model comparisons, showing a significantly higher benchmarked-adjusted return in the Swedish portfolio. In these models the market coefficient is calculated to be 0.07 units smaller in the Swedish portfolio, and as the result is significant at the 10-percent level, we do have slight evidence to argue that the Swedish portfolio is less sensitive to market fluctuations than the German portfolio. Although the level of significance is not on a satisfactory level, therefore we should not use these results as any strong evidence to argue the difference, nor declare any established finding.

Adding the information variables to FF3 in models (7) and (8) also shows a higher difference in alpha, the difference of 1.97% turned out significant at the 5-percent level and provides more evidence to our hypothesis that the Swedish portfolio has yielded a higher benchmarked-adjusted return than the German portfolio. Regarding the other factors, adding information variables did not facilitate the possibility to distinguish any differences in the estimated coefficients either for the market, SMB or HML-factors.

7. Conclusion

The purpose of this thesis was to analyze the performance of Swedish and German actively managed mutual equity funds, during the past 10 years. This investigation was done in order to provide answers to our hypothesis whether the Swedish funds on average have been able to yield higher risk-adjusted return, as well as higher return according to the chosen benchmark, than the German funds. Two equally weighted portfolios were created, where each portfolio contained all funds in the sample within each country. In this study we also constructed an information variable which contains similar information used by Ferson and Schadt (1996) in their paper about the conditional alpha, which we used when estimating past returns.

To provide answers regarding the risk-adjusted returns, Sharpe and Treynor ratios were used to distinguish the differences between the countries. Both these ratios showed superior risk-adjusted return for the Swedish portfolio, with the difference between the countries' portfolios being significant at the 5-percent level which shows support for hypothesis 1. As for the benchmark-adjusted return, we mainly interpret model (7) and (8) that we constructed from the FF3, presented in table 5, with our additional information variables. These findings did show support for hypothesis 2 by presenting a higher return relative to our benchmark for the Swedish funds, where we also found their superior performance being significantly higher than for the German funds at the 5-percent level as shown in table 6 in section 6.4.3.

The results of this thesis indicates that the Swedish examined funds on average have shown both higher risk-adjusted returns, as well as higher return relative to the chosen benchmark, in relation to the German examined funds. Concerning the added variables of information, the results have shown that the returns of Swedish funds are in some way correlated with publicly available information, while the same evidence for the German funds are weaker. Although the way we constructed our information variables could be assumed to at least correlate with the returns from the Swedish funds, the variable itself brought extremely small additional explanatory power to our models, indicating that the construction of the variable is worth questioning.

Even though the handling of the information variables deserves to be questioned, the other more commonly used ways to investigate past performance of funds, as shown in table 4, do speak in the same direction even without the information variables being included. Even these differences are being significantly established at the 5-percent level in table 6, which we argue to bring additional support for the conclusion that Swedish funds on average have shown higher returns relative to our benchmark than the German funds and supporting hypothesis 2. We therefore claim that both hypotheses in this thesis have been confirmed.

As this study presents on average positive excess return according to the benchmark for the Swedish funds in a national perspective, it’s worth to clarify that this thesis only uses a single benchmark in the comparison. This thesis does not claim that all Swedish funds on average have outperformed their specific benchmarks, since the selected benchmark is far from suitable for all funds in the sample. In order to give a more extensive view of collective performance according to each fund's specific benchmark, we do recommend future research where each fund is compared against its own benchmark.

Henceforth we do find it valuable to do a more detailed comparison regarding specific investment strategies. One might find certain differences between funds investing in different market caps or market sectors, that could bring more clarifications of the differences between the countries. Also, the German examined funds seem to be more sensitive to fluctuations in the market than the Swedish examined funds, although these differences cannot be established in this study. We do believe that a study done on these countries’ funds with the approach of the active share ratio could be of great interest. However, we do feel the need to mention that active share ratios, as of this date, are rather difficult to access, and could be very time-consuming calculating by hand.

References

Published Sources

Abdel-Kader, M., & Qing, K. (2007). Risk-Adjusted Performance, Selectivity, Timing Ability, and Performance Persistence of Hong Kong Mutual Funds. *Journal of Asia-Pacific Business, 8*(2), 25-58.

Baker, H. (2015). *Mutual Funds and Exchange-Traded Funds: Building Blocks to Wealth.* (Financial Markets and Investments Ser).

Bams, D., & Otten, R. (2002). European Mutual Fund Performance. *European Financial Management, 8*(1), 75-101.

Bams, D., & Otten, R. (2007). The Performance of Local versus Foreign Mutual Fund Managers. *European Financial Management, 13*(4), 702-720.

Bello, Z, Y. (2008). A Statistical Comparison of the CAPM to the Fama-French Three Factor Model and the Carhart's Model. *Global Journal of Finance and Banking Issues Vol. 2, No. 2,* 2008.

Brame, R., Paternoster, R., Mazerolle, P., & Piquero, A. (1998). Testing the equality of maximum-likelihood regression coefficients between two independent equations. *Journal of Quantitative Criminology, 14, 245-261.*

Bodie, Z. Kane, A & Marcus, A, J. (2020). *Investments (12th edition).* McGraw-Hill Education.

Breeden, D. (1979). An intertemporal asset pricing model with stochastic consumption and investment opportunities. *Journal of Financial Economics, 7*(3), 265-296.

Chan, K. C., and Nai-fu Chen. (1988). An unconditional asset-pricing test and the role of firm size as an instrumental variable for risk, Journal of Finance 43, 309-325.

Cochrane, John. (1992). A cross-sectional test of a production-based asset pricing model, Working paper, University of Chicago.

Cuthbertson, K., & Nitzsche, D. (2013). Winners and losers: German equity mutual funds. *The European Journal of Finance, 19*(10), 951-963.

Dahlquist, M., Engström, S., & Söderlind, P. (2000). Performance and Characteristics of Swedish Mutual Funds. *Journal of Financial and Quantitative Analysis, 35*(3), 409-423.

Dolinar, D. (2013). Test of the Fama-French Three-Factor Model in Croatia. *UTMS Journal of Economics, 4(2), 101-112.*

Fama, E., & French, K. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56.

Fama, E., & French, K. (1996). Multifactor Explanations of Asset Pricing Anomalies. *Journal of Finance, 51*(1), 55-84.

Ferson, W., & Schadt, R. (1996). Measuring Fund Strategy and Performance in Changing Economic Conditions. *Journal of Finance, 51*(2), 425-461.

Fisher, B., & Jensen, M., & Scholes, M. (1972). *Studies in the theory of capital markets* (New directions in management and economics). New York.

Fan, Y., and H.L. Addams. 2012. United States-based international mutual funds: Performance and persistence. *Financial Services Review* 21 (1): 51.

Gorman, L. R., & Weigand, R. A. (2008). Measuring Alpha-based performance: Implications for Alpha-focused structured products. *Investment Management and Financial Innovations, 5*(2), 16-22.

Graham, J., & Harvey, C. (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics, 60*(2), 187-243.

Grewe, O., & Stehle, R. (2001). The long-run performance of German stock mutual funds, discussion paper, Humboldt University, Berlin.

Grinblatt, M., & Titman, S. (1989). Portfolio Performance Evaluation: Old Issues and New Insights. *The Review of Financial Studies, 2*(3), 393-421.

Jiao, W., & Lilti, J. (2017). Whether profitability and investment factors have additional explanatory power comparing with Fama-French Three-Factor Model: Empirical evidence on Chinese A-share stock market. *China Finance and Economic Review, 5*(1), 1-19.

Lai, M., & Lau, S. (2010). Evaluating mutual fund performance in an emerging Asian economy: The Malaysian experience. *Journal of Asian Economics, 21*(4), 378-390.

Lhabitant, F. (n.d.). *Hedge Funds*. Oxford, UK: John Wiley & Sons.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics,47*(1), 13-37.

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica, 34*(4), 768-783.

Malkiel, B., & Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work*. *Journal of Finance, 25*(2), 383-417.

Mateus, Irina B, Mateus, Cesario, & Todorovic, Natasa. (2016). UK equity mutual fund alphas make a comeback. *International Review of Financial Analysis, 44*(C), 98-110.

Rao, Z., Ahsan, T., Tauni, M., & Umar, Z. (2018). Performance and Persistence in Performance of Actively Managed Chinese Equity Funds. *Journal of Quantitative Economics, 16*(3), 727-747.

Rehman, A., & Baloch, Q. B. (2016). Evaluating Pakistan's Mutual Fund Performance: Validating through CAPM and Fama French 3-Factor Model. *Journal of Managerial Sciences*, 10(1).

Sharpe, W. (1964). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. *Journal of Finance, 19*(3), 425-442.

Sharpe, W. (1966). Mutual Fund Performance. *The Journal of Business (pre-1986), 39*(1), 119-138.

Theissen, Erik. (2006). Investment performance and market share: A study of the German mutual fund industry. *06-06*.

Treynor, J. (1965). How to Rate Management of Investment Funds. *Harvard Business Review, 43*(1), 63.

Wooldridge, J. M. (2015). *Introductory Econometrics: A Modern Approach*. South-Western. ISBN: 9781305270107

Internet Sources

European Fund and Asset Management Association. *Quarterly Statistical Release No.80, 2020* Retrieved from: https://www.efama.org/Publications/Statistics/Quarterly/Quarterly%20Statistical%20Reports/20-03%20Quarterly%20Statistical%20Release%20Q4%202019.pdf

Securities and Exchange Commission (SEC). (2020). *Mutual Funds and ETFs,* A guide for Investors. Retrieved from: https://www.investor.gov/sites/investorgov/files/2019-02/mutual-funds-ETFs.pdf

Schramm, M. (2019). What is passive investing?. Morningstar. Retrieved from: https://www.morningstar.com/articles/946546/what-is-passive-investing

The World Bank. (2020) GDP Data. Retrieved from:
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=DE&most_recent_value_desc=true

The World Bank. (2020) Mutual Funds over GDP Data. Retrieved from:
https://databank.worldbank.org/reports.aspx?source=1250&series=GFDD.DI.07

Federal Reserve Bank of St Louis. (2020). Mutual Fund Data. Retrieved from:
https://fred.stlouisfed.org/series/DDDI07DEA156NWDB

MSCI. (2020). Europe Index Data. Retrieved from:
https://www.msci.com/documents/10199/db217f4c-cc8c-4e21-9fac-60eb6a47faf0

Kenneth French Database. (2020). SMB and HML Data. Retrieved from:
https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Appendix

Table 7: Breusch-Pagen test in Panel A, and Breusch-Godfrey test in Panel B

	(1) Swe CAPM	(2) Ger CAPM	(3) Swe FF3	(4) Ger FF3	(5) Swe CAPM Info	(6) Ger CAPM Info	(7) Swe FF3 Info	(8) Ger FF3 Info
Panel A								
Breusch-Pagan Test								
Chi2 Value	0.19	0.81	1.26	1.08	0.03	0.92	1.16	0.55
P-value	0.659	0.367	0.261	0.299	0.865	0.338	0.281	0.459
Degrees of freedom	1	1	3	3	2	2	4	4
Panel B								
Breusch-Godfrey Test								
Chi2 Value	5.35	15.29	13.73	22.13	7.21	17.55	14.45	22.96
P-value	0.945	0.226	0.318	0.036**	0.843	0.130	0.273	0.028**
Degrees of freedom	12	12	12	12	12	12	12	12

*Significance marked *** for 1% level, ** for 5% level and * for 10% level.*