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SCHOOL OF BUSINESS, ECONOMICS AND LAW

Are Women the Real Alpha Males?

Gender differences through the lense of performance and risk in the Swedish mutual fund industry

GM1460 Master's Degree Project in Accounting and Financial Management

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Preface

We would like to thank our supervisor Van Diem Nguyen for her productive feedback during this process. Her comments and thoughts has helped us to increase the overall quality of the thesis. We would also like to express our gratitude to our seminar leader Ted Lindblom and our seminar peers for their valuable insights.

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Abstract

This master thesis examines gender differences between Swedish mutual fund managers concerning fund performance and risk behavior. The examined period extends from January 2015 to December 2019 and the data consist of 421 mutual equity funds of which 17% are mutual funds' managed by females. Fund performance is evaluated by comparing alphas derived from Jensen's single-factor model, Fama and French's three-factor model, and Carhart's four-factor model. Risk behavior is evaluated by examining standard deviation to capture both idiosyncratic and systematic risk, beta to differentiate systematic risk and Morningstar risk to evaluate relative risk. We hypothesized mutual funds' managed by women to generate greater alphas than mutual funds' managed by men, and that mutual funds' managed by women hold less risk in their portfolios compared to male managed funds. Our results do not provide any coherent evidence of gender differences concerning performance or risk behavior. As suggested by Atkinson, Baird and Frye (2003), one potential explanation could be that the educational qualifications are the same regardless of gender, thus reducing any differences attributed to gender characteristics. We conclude that neither performance nor risk behavior explains women's misrepresentation in the Swedish mutual fund industry and therefore there is a need for further studies within the area.

Keywords: Mutual Funds; Gender Differences; Risk Behavior; Performance

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1. Introduction

The mutual fund industry in Sweden has experienced tremendous growth since 1979 increasing from 1 billion SEK to 4 424 billion SEK. Farsighted political decisions and innovative solutions by the mutual fund companies have made the financial markets easily available for the financially sound households. This, in turn has made Sweden one of the countries in the world with the highest market participation and since 1979 savers that exposed themselves towards the stock exchange have been able to enjoy a yearly average return of 15.8 percent which thus also have been reflected through the performance of the mutual funds (Pettersson, Sjöholm & Hård, 2019). As the wealth of Swedish savers is continuing to increase, more equity ends up in the mutual funds which seems to continually be individuals preferred investment vehicle. Sweden has also shown to have a leading position concerning gender equality and in a recent publication by Gender Equality Index (2019) Sweden was ranked first in Europe, a position the nation has held since 2005. The Gender Equality Index measures the equality gap between women and men in the domains of knowledge, work, health, time, money and power. Even though Sweden is thought of as a relatively gender-equal country, there are still improvements that need to be constructed in the society. In businesses are board rooms and executive positions still dominated by men and there is still a distinct pay gap between men and women that cannot fully be explained by differences in profession, sector, position, work experience and age (Sweden, 2019).

Mutual fund management and other positions closely related to the financial markets are showing similar patterns as they historically have been dominated by men. But even though women during the last decade have increased their share of influence, men still have the dominant position as funds managed by women in Sweden is as poor as the global average of 12 percent (Lindmark, 2016). To understand this issue, recent research has tried to evaluate the relationship between mutual fund performance and the individual characteristics of the fund managers. Bliss and Potter (2002) examined whether mutual fund performance was affected by factors such as gender in the US market whereas Babalos, Caporale and Philippas (2015) looked into the European mutual fund industry. This study intends to complement prior research by examining the relationship between mutual fund performance and the gender of the fund manager in a new setting, the Swedish mutual fund industry. To be able to change the mutual fund industry's disproportionate gender distribution and poor diversity, one needs to address the classical gender stereotypes. As the finance industry historically has been dominated by men there is a general perception of the finance industry being a 'male-industry'. In the industry men have been thought of as being more competitive and higher performing compared to women and this prejudice might hamper women from seeking out a profession within the financial industry (Bordalo, Coffman, Gennaioli & Shleifer, 2019).

Therefore, this thesis aims to provide updated facts of gender differences considering the performance and risk behavior of Swedish mutual fund managers. This, to address the issue of a potential defective picture of the gender roles as it could consequently lead to neglecting women's ability to contribute to the financial industry. This will have important implications for mutual fund management firms and investor strategies from a profit-maximizing perspective. Contrary to prior research this study aims towards excluding cultural differences that a broader sample may include. By using one distinct market the result avoids being affected by other markets where the settings are significantly different. As Sweden is being viewed as a relatively gender-equal nation, a result for the European or the US mutual fund industry may not be generalizable for the Swedish counterpart as a setting in which gender equality is more expanded may impact women's perception and ability to influence. Besides, to our knowledge no studies have been conducted in the same context before which makes it an interesting setting to investigate further.

The remainder of the thesis is structured as follows. Section 2 presents a literature review applicable to the subject and the stated hypotheses. Section 3 focuses on the methodology including the performance measurement models and the multiple regression models. Section 4 describes the selection of the data set used. Section 5 presents the results and an analysis of the regressions and section 6 provides a conclusion of the findings.

2. Literature Review and Hypothesis Development

Section 2.1 consists of a thorough review of prior literature which are relevant to our study. The review addresses literature rooted in Modern financial theory devoted to study fund performance anomalies and the impact of different fund manager characteristics on fund performance. Furthermore, existing literature that stretches behavioral explanatory factors, as well as literature devoted to gender diversity are reviewed. Finally, in section 2.2 the hypotheses are formulated.

2.1 Literature Review

A fundamental issue in modern financial theory concerns how to maximize expected returns. Early to contribute was Jensen (1968) who concluded that mutual funds on average were not able to outperform the market portfolio. Additionally, Jensen (1968) developed the single-factor model which determines the excess return of an asset adjusted for the market risk the asset is exposed towards. Fama and French (1993) expanded the single-factor model by adding two more explanatory factors to the model; size and value. Carhart (1997) further extended the three-factor model with the momentum factor which reflects the tendency of the asset price to continue rising if it has gone up and continues to fall if it previously has declined. Moreover, Malkiel and Fama's (1970) efficient market theory has become a generally applied theory within the investment audience. The theory assumes that all available information is incorporated in the equity price at all times. Hence, if some new value affecting information is being disclosed, the price will instantly be adjusted to its new intrinsic value and as a result, investors will not be able to achieve superior net returns. Another underlying assumption the theory builds upon is that investors are perceived to be risk-averse. In relation to this, much of the prior research has attempted to investigate whether it is possible for a mutual fund to achieve superior risk-adjusted returns compared to a benchmark index. Another important researcher within the financial field is Markowitz (1952) who is considered being a pioneer of modern portfolio theory. Markowitz (1952) constructed the efficient frontier which implies that an investor can construct a portfolio of assets that will maximize return for a given level of risk. The essence of the theory is that risk and return should not be evaluated in isolation, it should rather be evaluated on the effect an asset has on the overall portfolio's risk and return. Therefore, an investor should not be willing to invest in assets with greater risk if it not generates a greater return.

From there on, the behavioral theory has become more widespread which compared to the market efficiency theory is based on the idea that humans do not always behave rationally, and that people are biased when making decisions (see e.g. Hirshleifer (2003)). Thereafter, research has moved to examine how the characteristics of investors influence its decisions, and Golec (1996) was one of the first to study this topic. Golec (1996) examined whether the characteristics of mutual fund managers could

explain mutual funds' performance, risk and fees. He finds that younger fund managers who possess MBA degrees are expected to provide better risk-adjusted returns for investors, but the most significant characteristic is the manager's tenure. Golec (1996) also finds that mutual funds that charge lower fees and hold more diversified portfolios achieve better returns. Finally, he finds that funds with low administrative costs achieve relatively strong results. However, high management fees do not necessarily have to imply worse performance as higher management fees may act as a signal for extraordinary investment knowledge which in turn leads to stronger fund performance. Ippolito (1989) for example argues that funds with higher expenses are generating greater performance compared to funds with lower expenses. Chevalier and Ellisson (1999) extended the research by examining the relationship between fund performance and the age of the manager, as well as the average SAT score of the manager's undergraduate school, and whether the manager possesses an MBA degree. They find that mutual fund managers who graduate from higher reputational schools perform better than those who graduate from schools with an inferior reputation. The data also confirmed substantial return dissimilarities between managers, but most of these can be explained by behavioral differences between the individuals and by selection biases.

Bliss and Potter (2002) and Babalos et al. (2015) claim that prior research mainly focused on managerial characteristics such as manager age, level and quality of education and tenure, and fund characteristics such as turnover, size and expenses when investigating mutual fund performance. They therefore argue that previous research has disregarded the impact of gender on mutual fund performance. Based on the theory that suggests differences between men and women regarding overconfidence and risk aversion, Bliss and Potter (2002) predicted that female mutual fund managers are more risk-averse and less overconfident than male mutual fund managers. As women are expected to be less overconfident, they were also expected to trade less and therefore achieve superior net returns. The results were shown to contradict their expectations. First, evidence was found that female mutual fund managers held assets with marginally more risk than their male counterparts. Second, no evidence was found of differences in portfolio turnover between the genders. Third, Bliss and Potter (2002) found evidence of female mutual fund managers outperforming their male counterparts. After controlling for risk and other potential biases, no statistical significance was found between the performance of the genders. Similar to Bliss and Potter's (2002) study, Babalos et al. (2015) examined whether gender will influence the performance of European diversified equity funds. Their result indicates that female managers control larger funds and that the management fees are lower compared to funds managed by males, but the evidence is insignificant. The authors also claim that there is a lack of difference in the performance between male and female fund managers.

Both Bliss and Potter (2002) and Babalos et al. (2015) argue based on prior research that women are more risk-averse and less confident than men. The theory regarding men's overconfidence stems primarily from a paper conducted by Lundeberg, Fox and Punćcohaŕ (1994). They highlight that gender differences are consistent when males and females are able to express their general confidence. However, much less is known about the differences of confidence when the respondents are exposed to answer any particular test or exam question. Therefore, their study aims to evaluate gender differences in situation-specific confidence judgments by letting students answer exam questions and thereafter indicate their confidence in the answer being right. The result shows that gender differences depend on the context and the area being tested. Their result also shows that both men and women are overconfident and that undergraduate men were especially overconfident when being incorrect. Barber and Odean (2001) contributed to the theory when suggesting that overconfident investors trade more excessively than less confident investors. As psychological research has shown, in areas such as investing, men are more overconfident than women and thus Barber and Odean (2001) predict men to trade more excessively than women. They find support for their prediction as men are documented to trade 45 percent more than women. During the examined period, the excess trading performed by men reduced their net return by 2.65 percentage points per year compared to 1.72 percentage points for women. Prince (1993) contributes to further understanding of potential differences between genders by examining how money is handled. He finds that both men and women identify money with self-esteem and a sense of power, but that men are keener to feel included and competent while handling money. Therefore, men are also more prone to risk-taking to accumulate wealth.

As argued by Beckmann and Menkhoff (2008), the risk management between professionals and non-professional investors might differ. They conducted a survey to analyze the differences between professional women and men's risk behavior. It appears to be some differences between women and men and thereby women seem to be more risk-averse, less overconfident and have a less competitive approach. However, it does not indicate that women are inferior to men considering risk management as performance is risk-adjusted. This is in line with Hibbert, Lawrence and Prakash (2013) who identified that women and men with a higher level of financial education tend to invest in equally risky portfolios. They moreover suggest that financial education might mitigate the gap between the gender regarding financial risk aversion. Risk aversion has also been studied by Niessen and Ruenzi (2007) who show that female fund managers are more risk-averse and less overconfident compared to male managers. The result indicates that the performance of females is more persistent, and that males tend to achieve extreme performance ranks. Brown and Harlow (2005) further suggest that a more persistent investment style in turn is found to have a positive influence on performance. Atkinson, Baird and Frye (2003) have as well examined gender diversity as they compared the performance and investment behavior of professional money managers. The result suggests that there is no evidence of differences between female and male managers considering performance and risk as the educational qualifications

appear to be equal between the genders. Instead financial knowledge and wealth constraints may be connected to the differences in investment behavior often attributed to gender. Additionally, Atkinson et al. (2013) examined the capital inflow to mutual funds. Their findings indicate that the gender of the fund manager affects investors behavior as it is shown that the net equity inflows to funds managed by women are lower than for funds managed by men. They suggest that this could in turn affect and explain the unbalanced distribution between female and male managers as male investors would be more attractive to hire. Their study also suggests that the turnover for funds managed by men tends to be higher compared to funds managed by women which supports Barber and Odean's (2001) result that men trade more excessively than women.

Kahneman and Tversky (1979), two eminent researchers within behavioral finance, studied human decision making and find that the pain people feel when experiencing a loss was twice as strong as the pleasure they felt from an equivalent positive outcome. As the disutility of giving up an investment is greater than the utility associated with acquiring it, people tend to have a preference for avoiding losses rather than making gains – a phenomenon that came to be referred to as loss aversion. Loss aversion can in turn explain the disposition effect which is one of the most common fallacies among investors and traders. The disposition effect refers to the behavior of investors when holding on to their losing stocks too long while selling their winning stocks too soon, which thus may be seen as evidence for investors' loss aversion (Metilda, 2014). Several studies have examined the influence of gender on loss aversion. Gächter, Johnson and Herrmann (2007) studied demographic variables and find females to be more loss averse than males and Brooks and Zank (2005) find the same result when examining the behavior of students exposed towards lotteries. Rau (2014) examined the gender differences among investors in an experiment based on earlier research and finds that female investors realize fewer capital losses, are exposed towards significantly higher disposition effects and are more risk-averse than males. In addition, due to potential differences between professional and non-professional investors, Olsen and Cox (2001) examined differences in risk and gender attributes for professionally trained investors and find that female investors emphasize the loss potential and risk reduction to a greater extent than male investors.

2.2 Hypothesis Development

The addressed literature tends to be ambiguous with no coherent conclusion concerning whether the fund manager's gender affects mutual fund performance. For example, Bliss and Potter (2002) find weak evidence of female mutual fund managers outperforming male mutual fund managers while Babalos et al. (2015) claim that there is a lack of difference in the performance between female and male fund managers. Additionally, Barber and Odeon (2001) find the excess trading performed by men to reduce their net returns significantly compared to women and the result by Niessen and Ruenzi (2007)

indicate that the performance of females is more persistent. A more persistent investment style is in turn found to have a positive influence on performance (Brown & Harlow, 2005). Since women are found to be more risk-averse and trade less compared to men (see e.g. Niessen and Ruenzi (2007) and Beckmann and Menkhoff (2008)), they will avoid extreme performance ranks and create a more stable investment strategy which in turn should generate superior net returns. Therefore, we formulate the following two hypotheses

H1: Female mutual fund managers are predicted to achieve greater alphas than male mutual fund managers

H2: The risk for mutual funds managed by women is predicted to be lower compared to mutual funds managed by men

3. Methodology

This section discusses the methodology of the conducted study. Section 3.1 presents a general discussion of performance measurements. Section 3.1.1 consists of a review of Jensen's single-factor model, while section 3.1.2 and 3.1.3 review Fama and French's three-factor model and Carhart's four-factor model, respectively. Section 3.1.4 presents the multiple regression model employed to control for other possible explanatory factors that impact fund performance. Section 3.2 presents how risk differences will be assessed and section 3.3 provides a discussion about the tests' robustness.

3.1 Performance Measurement

In order to evaluate potential differences in performance across genders, several performance measures are being utilized which are explained in this session. Holmstrom (1979) emphasized the importance of using an accurate benchmark as the evaluated manager might have incentives to be benchmarked against a more self-advantageous benchmark than the most appropriate benchmark. There is therefore a continuous discussion regarding which performance measurement to use when evaluating fund performance. Sensoy (2009) for example identified that self-designated benchmarks in the fund's prospectus are not ideal when evaluating the manager's ability to generate excess returns. Meanwhile, other researchers such as Angelidis, Giamouridis and Tessaromatis (2013) argue that using a passive market-based portfolio adjusted for risk factors will not accurately capture the manager's selection skills and abnormal return. However, we follow Fama and French (2010) and use their value-weighted portfolio consisting of NYSE, Amex and NASDAQ stocks as the market portfolio. Since the single-factor, three-factor, and four-factor model adjust for widely accepted explanatory risk factors (Jensen, 1968; Fama & French, 1993; Carhart, 1997), this portfolio is being used as the overall benchmark for all funds. It will as well ensure us from not utilizing a potentially less appropriate benchmark by using the fund prospect's benchmark. Furthermore, using an overall benchmark opens for a comparison between active fund managers with comparable passive strategies (Babalos et al., 2015). The factor data are collected from French's (2020) webpage.

3.1.1 Jensen's single-factor-model

The single-factor model developed by Jensen (1968) measures a fund's excess return adjusted for market risk. The model is derived from the Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Treynor (1962), Lintner (1965) and Mossin (1966) which explains the relationship between an assets systematic risk and its expected return. The model can be used when evaluating a fund manager's ability to select securities that are likely to outperform the market. The model roots from the efficient market theory and assumes that: (1) all investors are averse to risk and seek to maximize their wealth, (2) all investors have homogeneous expectations regarding investment opportunities and decision

horizon, (3) investment decisions is based merely on expected return and risk, (4) transaction costs and taxes are zero, and (5) all assets are detachable (Jensen, 1968). The model has received various critique as it simplifies the reality but is still a commonly used model since it is an easy measure to establish when comparing investments. The single-factor model is expressed as

$$R_{i,t}^{x} - Rf_t = \alpha_{i,t} + \beta_{1i}(Rm_t - Rf_t) + \varepsilon_t \quad \text{(Eq. 1)}$$

$R_{i,t}^{x}$ reflects the gross or net return of the fund in period *t*. Rf_t is the risk-free rate at period *t* and Rm_t is the return of the market portfolio at period *t*. β_{1i} is the fund's factor weight towards the market portfolio, in other words, the fund's beta. ε_t is the error term and thereby the residual variable which represents other factors that influence the return that cannot be explained by the model. $\alpha_{i,t}$ is fund *i*'s alpha at time *t* and represents the abnormal return. A positive alpha implies that the fund is outperforming the market and a negative alpha indicates that the fund performs worse than the market.

3.1.2 Fama and French's three-factor model

Fama and French (1993) recognized that value stocks tend to outperform growth stocks, as well as small cap-stocks tend to outperform large-cap stocks. Therefore, Fama and French (1993) extended Jensen's (1968) single-factor model by including the size and value factors to the already existing market factor. The size, Small Minus Big (SMB), refers to the return of a portfolio that holds a long position in small-capitalization stocks and a short position in large-capitalization stocks. The value, High Minus Low (HML), refers to the return of a portfolio that holds a long position in stocks with high book-to-market and a short position in stocks with low book-to-market. By including these risk factors, the managers' performance and ability to select securities can be more accurately determined. The funds are divided into small and big capitalized funds in which funds greater than, or equal to, the median market capitalization of all funds is recognized as big and funds lower than the median are recognized as small. Furthermore, the funds are divided into high, medium and low book-to-market depending on the fund's book-to-market ratio relative to the bottom 30th, middle 40th and top 30th percentiles of all the funds. The three-factor model is expressed as

$$R_{i,t}^{x} - Rf_t = \alpha_{i,t} + \beta_{1i}(Rm_t - Rf_t) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \varepsilon_t \quad \text{(Eq. 2)}$$

$R_{i,t}^{x}$ reflects the gross or net return of the fund in period *t.* Rf_t is the risk-free rate at period *t* and Rm_t is the return of the market portfolio at period *t*. $\alpha_{i,t}$ is the abnormal return for fund *i* at period *t*. ε_t is the error term and thereby the residual variable which represents other factors that influence the return that cannot be explained by the model. β_{1i}, β_{2i} and β_{3i} represent the factor weight towards its corresponding factor, namely the market portfolio, SML_t and HML_t.

3.1.3 Carhart's four-factor model

The Carhart four-factor model is a refinement of the three-factor model as the momentum factor, Up Minus Down (UMD), is added as an explanatory factor (Carhart, 1997). Momentum concerns the tendency for an asset price to maintain a positive trend if gone up over the previous period and continue declining if gone down during the previous period (Jegadeesh and Titman, 1993). To construct UMD, Fama (2020) use six value-weighted portfolios formed on size and prior return. UMD then is the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios. The Carhart four-factor model may is expressed as

$$R_{i,t}^{x} - Rf_t = \alpha_{i,t} + \beta_{1i}(Rm_t - Rf_t) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}UMD_t + \varepsilon_t \quad \text{(Eq. 3)}$$

Again, $R_{i,t}^{x}$ reflects the gross or net return of the fund in period *t*. Rf_t is the risk-free rate at period *t* and Rm_t is the return of the market portfolio at period *t*. $\alpha_{i,t}$ is the abnormal return for fund *i* at period *t*. The ε_t is the error term and thereby the residual variable which represents other factors that influence the return that cannot be explained by the model. In addition to Fama and French three-factor model, β_{4i} refers to the factor weight towards the UMD_t factor.

3.1.4 Multiple Regression

An extended analysis is conducted since neither Jensen's single-factor, Fama and French's three-factor or Carhart's four-factor model account for fund characteristics that could explain fund performance. To examine whether there are performance differences across genders, we are regressing the estimated alphas from the models on several control variables, where especially $Female_{i,t}$ is of interest for this study. We are using a pooled OLS with time fixed effects and robust standard errors clustered on fund names. The regression model is formulated as follows

$$\begin{aligned} Alpha_{i,t}^{x} = {} & \beta_0 + \beta_1 Female_{i,t} + \beta_2 FundSize_{t-1} + \beta_3 ExpenseRatio_{t-1} \\ & + \beta_4 \#Holdings_{t-1} + \beta_5 \%Top10Holdings_{t-1} \\ & + \beta_6 \%AssetsCash_{t-1} + \beta_7 FundAge_{t-1} + \varepsilon_t \end{aligned} \quad \text{(Eq. 4)}$$

$Alpha_{i,t}^{x}$ denotes fund *i*'s estimated alpha at time *t* from Jensen's single-factor, Fama and French's three-factor, or Carhart's four-factor model. *x* reflects whether the alphas is based on gross or net return. $Female_{i,t}$ takes the value one if the fund is managed by a female and zero if the fund is managed by a male. $Fundsize_{t-1}$ and $FundAge_{t-1}$ are the lagged natural logarithm of *FundSize* and *FundAge*. $ExpenseRatio_{t-1}$, $\#Holdings_{t-1}$, $\%Top10Holdings_{t-1}$ and $\%AssetsCash_{t-1}$ are the lagged variables of *ExpenseRatio, #Holdings, %Top10Holdings,* and *%AssetsCash* respectively.

3.2 Risk measurement

In order to examine differences in risk behavior between female and male fund managers various risk measurements are assessed. The three risk measurements used are $StandardDeviation_{i,t}$, $Beta_{i,t}$ and $MorningstarRisk_{i,t}$. $StandardDeviation_{i,t}$ incorporates both idiosyncratic and systematic risk while $Beta_{i,t}$ only captures the systematic risk. $MorningstarRisk_{i,t}$ in turn assess the variations in a fund's monthly returns emphasizing the downside variation compared to similar funds. The regression model is formulated as follows

$$Risk_{i,t} = \beta_0 + \beta_1 Female_{i,t} + \beta_2 FundSize_{t-1} + \beta_3 ExpenseRatio_{t-1} + \beta_4 \#Holdings_{t-1} + \beta_5 \%Top10Holdings_{t-1} + \beta_6 \%AssetsCash_{t-1} + \beta_7 FundAge_{t-1} + \varepsilon_t \quad \text{(Eq. 5)}$$

$Risk_{i,t}$ denotes the risk measure and depends on whether $StandardDeviation_{i,t}$, $Beta_{i,t}$ or $MorningstarRisk_{i,t}$ is regressed. These risk measurements are regressed on the same control variables as in Equation 4 (see section 3.1.4 for details).

3.3 Robustness

In order to determine which model to use, we first conducted a Hausman test which estimated a fixed-effects model. However, in the fixed effects model, the gender dummy gets omitted as the gender of the fund manager is rather static over time and therefore, the fixed effects model is not appropriate. The decision to deviate from the Hausman test is supported by Wooldridge (2018) as he argues that the Hausman test is of limited use since it does not estimate a model adequately. In addition, a Breusch and Pagan test was conducted to identify heteroscedasticity and the test confirmed a presence of heteroscedasticity which violates the assumption of homoscedasticity. This makes a random-effects model not appropriate and we are therefore employing a pooled OLS. Wooldridge (2018) claims a random-effects model is more efficient, but he also argues that a pooled OLS can be used when a fixed-effects model is infeasible. Time fixed effects are included when conducting the multiple regressions to control for unobserved trends that vary over time but are constant across the funds (Brooks, 2015). This is also in line with studies performed by amongst others Niessen-Ruenzi and Ruenzi (2019) and Aggarwal and Boyson (2016). Furthermore, robust standard errors are clustered on fund names in order to control for heteroskedasticity and unrestricted forms of serial correlation (Wooldridge, 2018). By clustering standard errors on fund name, we account for unobserved fund characteristics that probably affect the dependent variable. Thus, the standard errors are potentially not accurate without any adjustments and therefore we use robust standard errors that allow cluster correlation and heteroskedasticity across the different funds (ibid.).

Another common issue is multicollinearity which occurs when the independent variables are correlated. This is problematic as the independent variables should be isolated from each other and a change in one independent variable should not affect the relationship between another independent variable and the dependent variable (Wooldridge, 2018). The consequence of variables being highly correlated could be a misinterpreted result. With Variance Inflation Factors (VIF) one can identify multicollinearity and the strength of the correlation. Wooldridge (2018) argues that VIF is of limited use since the interpretation is rather arbitrary. A value above 10 could be considered problematic but he still concludes that it is not necessarily the case. The VIF is conducted in this study (see Appendix 3) did not imply any issue of greater multicollinearity. Also, a correlation matrix of the independent variables was as well studied to identify any issues related to correlation. As can be seen in the correlation matrix shown in Appendix 2, there is no substantial correlation between the independent variables which thus is in line with the VIF-test. Therefore, no further action was taken to correct for potential issues.

Finally, Wooldridge (2018) argues that there is often a time delay between the cause and the effect. Therefore, the independent variables *FundSize, FundAge, ExpenseRatio, #Holdings, %Top10Holdings* and *%AssetsCash*, are lagged by one period. By lagging these variables, previous factors that affect current performance can be identified (Wooldridge, 2018). The variables *FundSize* and *FundAge* are also taking the natural logarithmic form in order to estimate elasticity and thus to account for the variables not being normally distributed. For example, the estimated effect on performance can be considered nonlinear since one additional dollar in *Fundsize* will not have an equal effect on performance. In order to control for outliers, we conducted Grubb's test for the independent variables. Thereafter, a comparison was made between the regressions adjusting for outliers and the ones without adjustments. The result did not differ substantially and therefore we chose to not adjust for outliers. This since outliers also can provide insights and information which reduces standard errors (ibid.).

4. Data

This section contains a presentation of the data used in the study. Section 4.1 presents the data sources and the structure of the data collection. Section 4.2 presents and discusses the dependent variables while section 4.3 does the same for the independent variables. Section 4.4 describes the data in the sample and the differences between the genders. Finally, section 4.5 discusses how missing values have been handled.

4.1 Data Sources and Sample Selection

Morningstar Direct offers detailed data of mutual fund performance and its characteristics for mutual funds all over the world. Except data on performance such as gross and net returns, Morningstar Direct provides information of the fund manager, fund age, expenses and fund category. As this study intends to go beyond performance characteristics and investigate what impact fund characteristics have on mutual funds success, Morningstar Direct database serves as our primary data source. In some cases, where Morningstar Direct has lacked data of necessity, we have primarily assessed the mutual funds Key Information Document (KID) and the funds' official websites. Similar to Babalos et al. (2015) and Bliss and Potter (2002), a period of five years of monthly data is gathered and investigated. During the last decade women have increased their share of influence (Lindmark, 2016) making the most recent period interesting to examine. Therefore, the specific period examined in this study is from January 2015 to December 2019. This period captures the most present time and will most likely reflect the current situation. The data set is constructed as cross-sectional observations over a time series of 60 months, in other words, the data set is constructed as panel data.

We aim to investigate the Swedish mutual fund industry and naturally only mutual funds with Swedish domicile are included in the sample. To get a homogenous sample that will enable an accurate comparison between the genders, we follow the same approach of Babalos et al. (2015) and Bliss and Potter (2002) and thereby only include equity funds in the sample. Mutual funds are required to invest at least 75% of its assets in equities to be defined as equity mutual funds by Morningstar Direct. As a result, fixed income, bond and high yield funds are excluded from the sample due to their different investment characteristics.

The gender of the mutual fund manager was not specified by the data offered by Morningstar Direct and therefore we define gender as male or female based on the manager's name. In cases where we found the fund manager's name ambiguous, the manager's LinkedIn profile was visited to confirm the gender. Some funds had chosen not to disclose the name of the mutual fund manager which led the fund to be excluded from the sample as the gender of the manager could not be addressed.

Other funds had a team-based management consisting of several managers. Bär, Kempf and Ruenzi's (2011) finding that mutual funds managed by multiple managers behave differently than single managed mutual funds led us to follow the line of amongst others Bliss and Potter (2002) and Niessen and Ruenzi (2007) by excluding funds that Morningstar Direct reported to have multiple managers. Specifically, Bär et al. (2011) argued that team-based management take less risk than single managers and are thus less likely to achieve extreme investment returns. This action should therefore further increase the comparability within the final sample. Finally, due to a shortage of data, mutual funds that were established later than December 2018 were eliminated from the sample. Thus, at least 12 months of mutual fund data is of necessity to be included in the sample.

4.2 Dependent Variables

4.2.1 Performance

Mutual funds monthly returns are calculated by using the funds' net asset value (NAV) at the end period, assuming reinvesting all income and capital gains during the period and dividing it with the NAV of the period's start. There are no adjustments for management fees or sales charges, hence gross return is preferred over net return as it is assumed to better reflect the skills of the manager and the success of the chosen investment strategy (Babalos et al., 2015; Niessen-Ruenzi & Ruenzi, 2019). However, to capture the underlying fee structure impact on the mutual fund's performance and to examine the difference between the genders' (Sirri & Tufano, 1998), we obtained the net returns as well. Even though the funds' in the sample belong to the same category, namely equity funds, they are all exposed to different levels of risk which in turn according to Fama and French (1993), should affect their level of expected return. In order to get a more accurate measure of performance and to reliably compare the difference between the genders', we estimate the alphas from three commonly used methods: Jensen's single-factor model, Fama and French's three-factor model, and Carhart's four-factor model. The monthly alphas are estimated using a 12-month rolling window where the first estimated period is based on the previous 12 months (t1 to t12) and the second estimated period in turn is based on its previous 12 months (t2 to t13), and so on. The alphas estimated from these models later serves as the dependent variables when investigating the gender impact of mutual fund performance.

4.2.2 Risk

To assess the mutual fund managers' propensity for risk-taking we are, consistent with Bliss and Potter (2002), using three different risk measures. The mutual fund's total risk is captured through *StandardDeviation* which is a risk measure containing both systematic and idiosyncratic risk. Monthly values of *StandardDeviation* is offered by the Morningstar Direct database. Since idiosyncratic risk can be eliminated through diversification, we are also using the fund's *Beta* which, compared to *StandardDeviation*, only measures the systematic risk. The value of *Beta* is measured through the factor

weight towards the market portfolio in Jensen's (1968) single-factor model which is in line with Niessen and Ruenzi (2007). The third measure used to capture the mutual fund's risk is *MorningstarRisk. MorningstarRisk* is a proprietary data point offered by Morningstar and is an assessment of the variations in a fund's monthly returns, with an emphasis on downside variations, in comparison to similar funds. *MorningstarRisk* sets values between one and five where one indicates low risk and five indicates high risk.

4.3 Independent Variables

Several control variables that capture the funds' characteristics are used in the analysis. Consistent with similar studies (see e.g. Bliss and Potter (2002), Chevalier and Ellison (1999), and Aggarwal and Boyson (2016)), *FundSize*, reported on a monthly basis by Morningstar Direct, is included to control for size effects. *#Holdings* which is a figure meant to measure portfolio risk, displays the number of different holdings a fund possesses and is also included as a controlling variable. The lower the figure, the more concentrated the fund is in few companies leading to greater idiosyncratic risk in the portfolio. *%Top10Holdings* measures the concentration of the portfolio as it is the percentage of the fund's portfolio allocated towards its largest ten holdings. *%AssetsCash* represents the percentage of cash held by the mutual fund. A negative value indicates that the mutual fund is leveraged to gain more than 100% market exposure. The values for *#Holdings, %Top10Holdings* and *%AssetsCash* are gathered from Morningstar Direct where they are reported on a monthly or quarterly basis. From the funds' inception date reported by Morningstar Direct, we manually estimated the *FundAge* and included the variable as a controlling variable to adjust for experience (Bliss & Potter, 2002). If the fund's reported inception date was 2010, the fund age at the start of our sample period in January 2015 would be 60 months. Thereafter, the *FundAge* increases with one month for each additional month it remains in business. Further, we also include *ExpenseRatio* which is reported by Morningstar Direct on a yearly basis. The *ExpenseRatio* is the percentage of fund assets paid for interest expenses, operating expenses, and management fees. Including *FundAge* and *ExpenseRatio* as controlling variables are also in line with earlier conducted studies by for example Bliss and Potter (2002), Chevalier and Ellison (1999) and Aggarwal and Boyson (2016). Finally, Atkinson et al. (2003) as well as Hibbert et al. (2013) claim that the educational qualifications between genders are equal, and Niessen and Ruenzi (2007) show that there is no relationship between performance and manager experience or education. This seems reasonable as regardless of gender, the prerequisites for working as a fund manager is a higher education and a certain type of experience. Therefore, we do not expect manager characteristics such as education or manager experience to be related to gender. Thus, we follow the line of earlier conducted studies (see e.g. Aggerwal and Boyson (2016) and Atkinson et al. (2003)) and do not include other manager characteristics than gender among the independent variables. *Female* is the dummy variable that represents the managers' gender and takes on the value 1 if the fund manager at the specific period is a

woman and 0 if the person is a man. *Female* is estimated with the basis of the fund managers' names as described in the previous section. See the full variable description in Appendix 1 for more detailed information about all the variables and their origin. A correlation matrix of the independent variables can be viewed in Appendix 2.

4.4 Descriptive Statistics

In our sample, 421 mutual equity funds with Swedish domicile is included. The data set contains a total of 30 317 gender observations and 17% of these consist of female fund managers. This is in line with what earlier conducted studies within the area have found. Bliss and Potter (2002) had a sample consisting of 652 mutual funds of which 11% were mutual funds managed by women, and Babalos et al. (2015) had a sample of 354 mutual funds for of which 16.5% was funds managed by women. Others, for example Chevalier and Ellison's (1999) sample had a 7% share of female managed funds while Niessen and Ruenzi (2007) conducted their study with a female share of approximately 10%.

Descriptive statistics of our data can be viewed in Table 1. Table 1 displays each variables number of observations, the mean, the standard deviation, and the 1st, the 50th, and the 99th percentile. Overall, the average $GrossReturn_{i,t}$ and $NetReturn_{i,t}$ is 1.179% and 1.075% respectively. The top percentile (p99) is 10.02% and 9.93% and the bottom percentile (p1) is -9.09% and -9.28% respectively. The average $Beta_{i,t}$ is 0.619 while the median (p50) is slightly higher at 0.70. $StandardDeviation_{i,t}$ has an average value of 3.975 for the total sample with a top and bottom percentile of 7.44 and 1.93 respectively. $Fundsize_{i,t}$ has an average value of 7 046 mSEK in the total sample while the median (p50) is 3 519 mSEK. The number of holdings, $\#Holdings_{t-1}$, has an average value of 170.2. The top and the bottom percentile are 1 914 and 3 respectively, indicating different levels of diversification in the sample. $\%Top10Holdings_{t-1}$ shows that the mutual funds in the sample on average have 40.85% of the assets allocated towards its top 10 holdings and here, the bottom percentile (p1) is 8.465%. The average $FundAge_{i,t}$ is 128.4 months compared to its median (p50) of 121. The average value of the $ExpenseRatio_{t-1}$ is 1.144% and the top percentile expenses are 2.56% in relation to the fund's assets. Examining the estimated gross alphas from Jensen's single-factor model ($SF_{i,t}^{gr}$), Fama and French's three-factor model ($FF_{i,t}^{gr}$), and Carhart's four-factor model ($CAR_{i,t}^{gr}$) one can see that the alphas estimated from $SF_{i,t}^{gr}$ is greatest with a mean of 0.562, followed by $CAR_{i,t}^{gr}$ at 0.550 and thereafter $FF_{i,t}^{gr}$ at 0.524. The means for the estimated net alphas follow the same pattern whereas the mean for $SF_{i,t}^{net}$ is 0.481, the mean for $CAR_{i,t}^{net}$ is 0.410, and the mean for $FF_{i,t}^{net}$ is the lowest at 0.394.

Table 1. Descriptive Statistics

	(1) N	(2) mean	(3) std	(4) p1	(5) p50	(6) p99
$GrossReturn_{i,t}$	23,777	1.179	4.02	-9.090	1.350	10.02
$NetReturn_{i,t}$	27,233	1.075	4.034	-9.280	1.250	9.930
$StandardDeviation_{i,t}$	22,252	3.975	0.96	1.930	3.900	7.440
$MorningstarRisk_{i,t}$	17,365	2.165	0.92	1.050	1.980	6.510
$Beta_{i,t}$	18,591	0.619	0.42	-0.490	0.700	1.650
$FundSize_{i,t}$	28,836	7,046	19,229	36.66	3,519	36,241
$FundSize_{t-1}$	28,341	21.75	1.56	17.43	21.98	24.30
$ExpenseRatio_{t-1}$	28,846	1.144	0.632	0.100	1.300	2.560
$\#Holdings_{t-1}$	28,601	170.2	314.94	3	76	1,914
$\%Top10Holdings_{t-1}$	28,600	40.85	19.92	8.465	39.63	100
$\%AssetsCash_{t-1}$	29,392	2.671	4.766	-1.980	1.920	16.68
$FundAge_{i,t}$	30,320	128.4	93.654	2	121	348
$FundAge_{t-1}$	29,808	4.397	1.183	0.690	4.800	5.850
$SF_{i,t}^{gr}$	18,591	0.562	1.02	-1.950	0.500	3.300
$FF_{i,t}^{gr}$	18,591	0.524	1.122	-2.580	0.510	3.470
$CAR_{i,t}^{gr}$	18,591	0.550	1.166	-2.760	0.540	3.450
$SF_{i,t}^{net}$	21,915	0.481	1.068	-2.210	0.440	3.300
$FF_{i,t}^{net}$	21,915	0.394	1.157	-2.710	0.370	3.340
$CAR_{i,t}^{net}$	21,915	0.410	1.196	-2.920	0.370	3.380
$Female_{i,t}$	30,317	0.170	0.376	0	0	1

Note: This table displays a descriptive statistics of the data used in the empirical analysis. Column (1) shows the number of observations, column (2) the mean, and column (3) the standard deviation. Column (4), (5) and (6) show the 1st, the 50th, and the 99th percentile respectively.

The get an early indication of the gender differences between the variables used in the sample, Table 2 and a univariate analysis are examined. Column (1) and (2) display the means for male and female fund managers respectively. The difference and its significance can in turn be seen in column (3). One can note that neither $GrossReturn_{i,t}$ nor $NetReturn_{i,t}$ seems to be significantly different between male and female fund managers. Both variables show slightly negative differences indicating higher returns for mutual funds managed by females, which is similar to Bliss and Potter (2002) and Niessen-Ruenzi and Ruenzi (2019). $SF_{i,t}^{gr}$, $FF_{i,t}^{gr}$, and $CAR_{i,t}^{gr}$ show similar patterns as they are all negative and thus indicating greater alphas for mutual funds managed by women. However, only the differences observed from $SF_{i,t}^{gr}$ and $FF_{i,t}^{gr}$ are shown to be significant (-0.046* and -0.051*, respectively). The difference between the estimated net alphas from the models does not show any significance, however $SF_{i,t}^{net}$ and

$FF_{i,t}^{net}$ indicate greater mean alphas for mutual funds managed by women whereas $CAR_{i,t}^{net}$ indicates the opposite.

Looking at the risk measures one can see that $StandardDeviation_{i,t}$ is negative and significant as female managed mutual funds on average have 0.065*** higher $StandardDeviation_{i,t}$ than male managed funds. This indicates that female mutual fund managers, on average, hold more total risk in their portfolios. $Beta_{i,t}$ and $StandardDeviation_{i,t}$ show similar patterns as the differences between the means are -0.017* and -0.093*** respectively. Thus, indicating that funds managed by women are exposed to greater systematic and relative risk compared to funds managed by men. These findings differ from Niessen-Ruenzi and Ruenzi (2019) who do not observe any significant differences between genders regarding risk. $\#Holdings_{t-1}$ contradicts the observation of women bearing excess risk as women mutual fund managers on average hold more equities in their portfolios compared to men (183.8 against 169.1), and from that perspective holds less risky portfolios. From $\%Top10Holdings_{t-1}$ one can acknowledge the same pattern as female fund managers on average allocate 39.15% of their assets towards their top 10 holdings compared to male managers who on average invest 40.98% of their assets into their top 10 holdings, indicating that male managers on average hold more concentrated portfolios. This observation is similar to Bliss and Potter (2002) who find the allocation towards the top 10 holdings to be 41.43% and 36.3% for men and women respectively.

Furthermore, $Fundsize_{t-1}$ seems to be, on average, larger for female managed funds than for funds managed by men as the difference between the means is -0.044*** and significant. This result may be less surprising as female mutual fund managers on average manage funds with greater lifetime ($FundAge_{t-1}$ -0.226***), thus allowing for a larger capital inflow due to a longer availability for investors. These results are the same as for Babalos et al. (2015) who make the same observation.
Another variable that is shown to be significant is $\%AssetsCash_{t-1}$ (difference 0.541***) which indicates that women mutual fund managers on average hold less cash in relation to their total assets compared to male managers. Finally, the difference between the means for $ExpenseRatio_{t-1}$ is -0.218*** and significant which suggests that funds managed by women have slightly higher costs compared to funds managed by men. This result is similar to Niessen-Ruenzi and Ruenzi (2019) who finds the expense ratio for women and men to be 1.4% and 1.5%, respectively.

Table 2. Univariate Analysis

	(1) Male	(2) Female	(3) Difference
$GrossReturn_{i,t}$	1.166	1.297	-0.131
$NetReturn_{i,t}$	1.054	1.168	-0.114
$StandardDeviation_{i,t}$	3.949	4.014	-0.065***
$MorningstarRisk_{i,t}$	2.125	2.218	-0.093***
$Beta_{i,t}$	0.619	0.636	-0.017*
$FundSize_{i,t}$	6,029	12,463	-6,434***
$FundSize_{t-1}$	21.68	22.12	-0.44***
$ExpenseRatio_{t-1}$	1.107	1.325	-0.218***
$\#Holdings_{t-1}$	169.1	183.8	-14.7**
$\%Top10Holdings_{t-1}$	40.98	39.15	1.83***
$\%AssetsCash_{t-1}$	2.738	2.197	0.541***
$FundAge_{i,t}$	125.5	142.7	-17.2***
$FundAge_{t-1}$	4.358	4.584	-0.226***
$SF_{i,t}^{gr}$	0.551	0.597	-0.046*
$FF_{i,t}^{gr}$	0.513	0.564	-0.051*
$CAR_{i,t}^{gr}$	0.547	0.550	-0.003
$SF_{i,t}^{net}$	0.463	0.494	-0.031
$FF_{i,t}^{net}$	0.380	0.387	-0.007
$CAR_{i,t}^{net}$	0.408	0.371	0.037
* p < 0.05, ** p < 0.01, *** p < 0.001			

Note: This table is a continuation of the descriptive statistics. Here, the means are separated for Male (column (1)) and Female (column (2)). The difference (Male-Female) and its significance can be viewed in columns (3). *, ** and *** show the significance at the 10%, 5%, and 1%-level respectively.

4.5 Missing Values

Even though the data gathered from Morningstar Direct primarily are reported on a monthly basis, for some variables on specific time periods, there is a gap of data. In some situations, there is simply a gap between the reported periods, and in others there is a complete lack of data. To handle these situations one can take on different approaches. One method according to Batista and Monard (2003) is to delete instances and/or attributes with a high level of missing data. Before deleting any attribute, one has to evaluate its relevance to the analysis. Making specific adjustments to the data could lead to selection bias or inference error which we seek to avoid. Thus, we avoided making any adjustments to the data related to our dependent or independent variables.

Data for variables such as *#Holdings, %Top10Holdings* and *%AssetsCash*, are for some funds reported on a quarterly basis. To adjust the data for these variables we primarily used imputation with Nearest

Neighbour - an imputation technique where the previously reported value is used until a new value is reported (Batista & Monard, 2003). As the *ExpenseRatio* only are reported on a yearly basis we made an assumption of the *ExpenseRatio* remaining the same for the full year. Hence, we are using the same *ExpenseRatio* for the eleven forthcoming months after the last reported period. We believe this assumption is reasonable as mutual funds fees compared to companies in other industries should be less exposed to variable costs and therefore there should not be too much variability in the monthly costs. In general, the number of adjustments used to complement the data set is relatively small compared to the total number of data and therefore we believe the potential bias stemming from the imputation methods will be low if not insignificant.

5. Result and Analysis

This section presents the findings from the empirical analysis. First section 5.1 presents the results from the performance analysis and thereafter section 5.2 presents the results from the risk analysis.

5.1 Performance

In order to examine whether female mutual fund managers achieve greater alphas than their male counterparts, we conducted in total six regressions according to Equation 4. The result from these regressions can be viewed in Table 3. Panel A displays the results from the regressions using gross alphas as the dependent variable whereas Panel B displays the results from the regressions using net alphas as the dependent variable. The alphas are generated as previously described from Jensen's single-factor model, Fama and French's three-factor model, and Carhart's four-factor model.

From column (1) and (4), one can see that $Female_{i,t}$ have a positive and significant relationship with $SF_{i,t}^{gr}$ and $CAR_{i,t}^{net}$. These findings suggest that mutual funds managed by women generate greater alphas than mutual funds managed by men. As the coefficient is greater for $Female_{i,t}$ in relation to $SF_{i,t}^{net}$ than with $SF_{i,t}^{gr}$, the result seems to be even greater after fees have been deducted. One potential explanation could be that male managed funds' have greater fees compared to mutual funds managed by women as suggested by Niessen and Ruenzi (2007). From the relationship between $Female_{i,t}$ and $FF_{i,t}^{gr}$ (column (2)) and $FF_{i,t}^{net}$ (column (5)) one can again observe positive coefficients but as the results are insignificant one could not make any clear interpretations. The result from column (3) and (6) is ambiguous as the coefficients for $Female_{i,t}$, have a negative and positive relation with $CAR_{i,t}^{gr}$ and $CAR_{i,t}^{net}$, respectively. Here as well, there are no signs of significance in the relationships which make it impossible to draw any conclusions of whether mutual funds managed by women perform better than mutual funds managed by men. As can be seen, the relationship between $Female_{i,t}$ and the dependent variables is greatest when using the alphas from the Jensen's single-factor model in both Panel A and Panel B. The relation is thereafter declining as SMB_t and HML_t are included in the model used to estimate the alphas according to Fama and French's three-factor model. The relation further declined as the momentum-factor was included when using Carhart's four-factor model. As Fama and French's three-factor model as well as Carhart's four-factor model are including improved common explanatory factors attributed to fund performance, these models provide a better estimate of the manager's actual contribution compared to Jensen's single-factor model. As the results generated by Fama and French's three-factor model and Carhart's four-factor model both are insignificant, we interpret the overall result as there is no difference in performance across genders. This result is in line with Niessen and Ruenzi (2007), Bliss and Potter (2002), and Atkinson et al. (2003) who all find no difference regarding performance between genders.

Table 3. Performance Regression Result

	Panel A: Gross			Panel B: Net		
	(1) $SF_{i,t}^{gr}$	(2) $FF_{i,t}^{gr}$	(3) $CAR_{i,t}^{gr}$	(4) $SF_{i,t}^{net}$	(5) $FF_{i,t}^{net}$	(6) $CAR_{i,t}^{net}$
$Female_{i,t}$	0.0558*	0.0187	-0.0176	0.0894***	0.0434	0.0070
	(0.0334)	(0.0447)	(0.0422)	(0.0301)	(0.0374)	(0.0350)
$FundSize_{t-1}$	0.0537***	0.0420***	0.0454***	0.0552***	0.0460***	0.0478***
	(0.0143)	(0.0137)	(0.0150)	(0.0136)	(0.0134)	(0.0145)
$ExpenseRatio_{t-1}$	0.1210***	0.2150***	0.1650***	0.0398*	0.1330***	0.0873***
	(0.0250)	(0.0300)	(0.0298)	(0.0240)	(0.0290)	(0.0289)
$\#Holdings_{t-1}$	0.0167	0.0223	0.0088	0.0187	0.0089	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
$Top10Holdings_{t-1}$	0.0003	-0.0015**	-0.0002	0.0003	-0.0016**	-0.0001
	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0008)
$\%AssetsCash_{t-1}$	0.0064*	0.0048	0.0021	0.0081**	0.0067**	0.0035
	(0.0035)	(0.0030)	(0.0034)	(0.0037)	(0.0034)	(0.0038)
$FundAge_{t-1}$	-0.0241	-0.0544**	-0.0469**	-0.0284*	-0.0570**	-0.0512**
	(0.0174)	(0.0269)	(0.0229)	(0.0169)	(0.0255)	(0.0217)
Constant	0.4970***	0.5390***	0.4660**	0.4880***	0.5160***	0.4490***
	(0.1550)	(0.1920)	(0.1820)	(0.1440)	(0.1760)	(0.1670)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,103	17,103	17,103	18,849	18,849	18,849
Adj. R-squared	0.362	0.352	0.361	0.371	0.365	0.371

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table shows the overall regression results from the estimated alphas from the Jensen's single-factor model, Fama and French's three-factor model and Carhart's four-factor model. Panel A reports the result based on the dependent variable gross alpha and Panel B reports the result based on the dependent variable net alpha. The independent variables are the following: $Female_{i,t}$ representing the fund managers gender, $Fundsize_{t-1}$ representing each fund's lagged monthly reported total assets, $ExpenseRatio_{t-1}$ representing the lagged annual fee charged, $\#Holdings_{t-1}$ representing the lagged number of holdings. $\%Top10Holdings_{t-1}$ representing the lagged aggregated assets in percentage of the fund's top ten portfolio holdings. $\%AssetsCash_{t-1}$ representing the lagged percentage cash held by the portfolio including receivables and subtracted with payables. $FundAge_{t-1}$ representing the fund's lagged age in months estimated based on the fund's inception date. The results do not show any strong evidence that the manager's gender affects the ability to generate alphas. The robust standard errors are represented in the parentheses and *, ** and *** show significance at the 10%, 5%, and 1%-level respectively.

Further, the result from both Panel A and Panel B shows that $Fundsize_{t-1}$ is positive and significant at the 1%-level for all models, and thus indicating that larger funds tend to create greater alphas than smaller ones. This is in line with Otten and Bams (2002) who find a positive significant relationship between fund size and performance, suggesting that European funds compared to US funds are small enough to utilize economies of scale. If, however, funds' get too large diseconomies of scale becomes apparent instead (ibid.). Another variable showing interesting results is $ExpenseRatio_{t-1}$, where the coefficient is positive and significant for all models. This result implies that mutual funds that charge

higher fees tend to create greater alphas than mutual funds with less expenses in relation to its assets. In a historically well-performing fund, the fund managers are probably better compensated for their work compared to managers who managed a less successful fund, leading to greater expenses. Therefore, as Golec (1996) suggests, higher expense ratios may act as a signal to investors of the fund's ability to generate superior performance. Moreover, our finding follows the pattern of Ippolito (1989) who suggests that funds with higher expenses are outperforming funds with lower expenses.

$\%Top10Holdings_{t-1}$ shows a minor negative relation to both $FF_{i,t}^{gr}$ and $FF_{i,t}^{net}$ and is significant at the 5%-level. Thus, indicating that a higher degree of diversification leads to greater abnormal returns. This is supported by Markowitz's (1952) modern portfolio theory that highlights the importance of diversification. Furthermore, $\%AssetsCash_{t-1}$ has a positive and significant relationship with $SF_{i,t}^{gr}$, $SF_{i,t}^{net}$ and $FF_{i,t}^{net}$. This could indicate that a leveraged portfolio does not necessarily generate greater returns. Finally, $FundAge_{t-1}$ has a negative relationship to the estimated alphas for all models except with $SF_{i,t}^{gr}$. Hence, the results indicate that younger funds tend to create greater abnormal returns than older funds which is consistent with Otten and Bams (2002).

5.2 Risk

From the univariate analysis presented earlier in Table 2, one could observe a first indication about the gender differences with regards to risk. The results indicate that mutual funds managed by women on average have greater $StandardDeviation_{i,t}$, $MorningstarRisk_{i,t}$ and $Beta_{i,t}$ than mutual funds managed by men. In order to further examine differences between genders risk propensity, Equation 5 is employed, and the results are displayed in Table 4. Column (1) shows the results from the regression when using $StandardDeviation_{i,t}$ as the dependent variable, whereas column (2) and (3) shows the output from when $Beta_{i,t}$ and $MorningstarRisk_{i,t}$ are used as the dependent variables.

As can be seen, $Female_{i,t}$ do not show any significant relationship with any of the risk measures. One could interpret this result as there is no difference with regard to idiosyncratic and systematic risk across genders. Neither is there any significant difference between genders concerning relative risk in their portfolios. This result contradicts the result found by Bliss and Potter (2002) that female mutual fund managers held assets with marginally more risk than male fund managers. In our result, $Female_{i,t}$ show a positive relationship with both $StandardDeviation_{i,t}$ and $MorningstarRisk_{i,t}$, but as the result is insignificant we cannot draw the same conclusion. Our results do also contradict the result from Niessen and Ruenzi (2007) who find that female mutual fund managers are more risk-averse and thus less overconfident than male managers. One can observe similar intentions as $Female_{i,t}$ is negatively related to $Beta_{i,t}$, but once again the observation is insignificant and we cannot make any clear interpretations.

However, our result could be interpreted to be in line with both Atkinson et al. (2003), who find there to be no differences between female and male mutual fund managers considering risk, and Hibbert et al. (2013), who suggest that there is no difference in risk propensity between individuals with the same level of education. The explanatory factor behind their finding is that the educational qualifications are similar between the genders and therefore men and women tend to demonstrate equal risk propensity. As Sweden is being viewed as a relatively gender-equal nation, this explanation may be appropriate for our result as well.

In addition, consistent with Niessen and Ruenzi's (2007) finding, $Fundsize_{t-1}$ shows a positive and significant relationship with $Beta_{i,t}$, indicating that larger funds tend to have higher betas. $ExpenseRatio_{t-1}$ shows a positive and significant relationship with both $StandardDeviation_{i,t}$ and $MorningstarRisk_{i,t}$. This result indicates that funds with greater idiosyncratic and systematic risk and relative risk also tend to have larger expenses in relation to their total assets. On the opposite, $ExpenseRatio_{t-1}$ shows a negative and significant relationship with $Beta_{i,t}$ which thus indicates that funds with higher betas tend to have lower expense ratios. $\%Top10Holdings_{t-1}$ shows a significant and positive relationship with $MorningstarRisk_{i,t}$. This could be interpreted as funds with greater portfolio concentration also tend to have higher relative risk in their portfolios which is line with Markowitz (1952). Finally, $\%AssetsCash_{t-1}$ shows a positive and significant relationship with $StandardDeviation_{i,t}$, thus indicating that a greater share of cash in relation to the fund's total assets increases the idiosyncratic and systematic risk in the portfolio.

Table 4. Regression Result Risk

	(1) $StandardDeviation_{i,t}$	(2) $MorningstarRisk_{i,t}$	(3) $Beta_{i,t}$
$Female_{i,t}$	0.0650	0.0382	-0.0114
	(0.0891)	(0.120)	(0.0185)
$FundSize_{t-1}$	-0.0127	0.0161	0.0262***
	(0.0271)	(0.0334)	(0.0056)
$ExpenseRatio_{t-1}$	0.2850***	0.3940***	-0.0603***
	(0.0905)	(0.110)	(0.0149)
$\#Holdings_{t-1}$	0.0552	-0.0544	0.0067
	(0.0001)	(0.0002)	(0.0000)
$Top10Holdings_{t-1}$	0.0016	0.0075**	-0.0001
	(0.0033)	(0.0037)	(0.0005)
$\%AssetsCash_{t-1}$	0.0212**	0.0053	0.0024
	(0.0091)	(0.0069)	(0.0021)
$FundAge_{t-1}$	0.0165	0.0133	-0.0086
	(0.0373)	(0.0603)	(0.0070)
Constant	2.7390***	1.6250***	0.4870***
	(0.420)	(0.570)	(0.0641)
Time Fixed Effects	Yes	Yes	Yes
Observations	18,811	15,473	17,103
Adj. R-squared	0.333	0.161	0.499

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table report the results from the regressions based on the dependent variables $StandardDeviation_{i,t}$, $MorningstarRisk_{i,t}$ and $Beta_{i,t.}$ $StandardDeviation_{i,t}$ representing the fund's idiosyncratic risk and systematic and measures the fund's dispersion around its average return. $MorningstarRisk_{i,t}$ representing the variations in a fund's monthly return in relation to similar funds with a focus on downside variations. $Beta_{i,t}$ representing the fund's systematic risk and is estimated as the factor weight towards the market portfolio from the Jensen's single-factor model. The independent variables are the following: $Female_{i,t}$ representing the fund managers gender, $Fundsize_{t-1}$ representing each fund's lagged monthly reported total assets. $ExpenseRatio_{t-1}$ representing the lagged annual fee charged. $\#Holdings_{t-1}$ representing the lagged number of holdings. $\%Top10Holdings_{t-1}$ representing the lagged aggregated assets in percentage of the fund's top ten portfolio holdings. $\%AssetsCash_{t-1}$ representing the lagged percentage cash held by the portfolio including receivables and subtracted with payables. $FundAge_{t-1}$ represents the fund's lagged age in months estimated based on the fund's inception date. The result does not show any evidence indicating differences in risk propensity between the fund manager's gender. The robust standard errors are represented in the parentheses and *, ** and *** show significance at the 10%, 5%, and 1%-level respectively.

6. Conclusion

We examine the differences between female and male mutual fund managers regarding performance and risk behavior in the Swedish mutual fund industry. Among earlier studies, Barber and Odeon (2001) find the excess trading performed by men to reduce their net returns substantially, while the result by Niessen and Ruenzi (2007) indicate that the performance of women is more persistent. A more persistent investment style is in turn found to have a positive influence on performance (Brown & Harlow, 2005). Therefore, we first hypothesized female fund managers to achieve greater alphas than male mutual fund managers. By estimating alphas from Jensen's single-factor model, Fama and French's three-factor model, and Carhart's four-factor model, we performed six multiple regressions. We conclude that there are no differences between genders regarding performance which is in line with studies conducted by amongst others Niessen and Ruenzi (2007), Bliss and Potter (2002), and Atkinson et al. (2003). Additionally, since women are found to be more risk-averse and trade less compared to men (see e.g. Niessen and Ruenzi (2007) and Beckmann and Menkhoff (2008)) we hypothesized that mutual funds managed by women have less risk in their portfolios compared to mutual funds managed by men. By using three different risk measures, $StandardDeviation_{i,t}$, $MorningstarRisk_{i,t}$ and $Beta_{i,t}$, to capture different types of risk, we estimated three regression models. The result from these models do not indicate there to be any differences regarding risk between genders. This contradicts the result found by Bliss and Potter (2002) and Niessen and Ruenzi (2007). However, our result is in line with Atkinson et al. (2003) who find there to be no differences between female and male mutual fund managers considering risk, and Hibbert et al. (2013) who suggest that there is no difference in risk propensity between individuals who have the same level of education.

Our overall result implies that there are no differences regarding neither performance nor risk behavior between female and male fund managers. A profit-maximizing investor would therefore not follow an investment strategy that neglects female managed mutual funds'. Neither is there any reason to neglect women in recruiting processes as the reason for why women are underrepresented in the financial industry cannot be derived from their performance. Instead, the reasons for why women are misrepresented in the industry is due to other factors which should be further investigated. Further research might therefore study differences between the genders' investment styles in a Swedish setting to examine whether women or men are incorporating a more persistent investment style. Finally, to increase the credibility of the result one could according to Rohleder, Scholz and Wilkens (2011) adjust for survivorship bias by including liquidated as well as merged funds in the examined sample. By excluding non-surviving mutual funds, the result could be misinterpreted as the performance could be overestimated because poorly performing funds will be liquidated. However, just like Atkinson et al. (2003) we could not get access to the necessary data to do such adjustments, but we believe that the result still gives a reliable reflection of the Swedish mutual fund industry.

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Appendix

Appendix 1. Variable Description

Variable (1)	Description (2)	Source (3)
$NetReturn_{i,t}$	The fund's return in percentage after fees have been deducted. Calculated as the change in the monthly net asset value (NAV), reinvesting, if applicable, all income and capital gains distributions during the period and divided by the starting NAV adjusted for management, administrative costs and net expense ratio.	Morningstar Direct
$GrossReturn_{i,t}$	The fund's return in percentage before fees have been deducted. Calculated as the change in the monthly net asset value (NAV), reinvesting, if applicable, all income and capital gains distributions during the period and divided by the starting NAV.	Morningstar Direct
$Female_{i,t}$	Dummy variable that takes the value of 1 if the mutual fund manager is female and 0 if the manager is a male	Morningstar Direct; Estimated
$StandardDeviation_{i,t}$	An estimate for the fund's idiosyncratic risk. Measures the dispersion around its average and thus represents the fund's return variability.	Morningstar Direct
$MorningstarRisk_{i,t}$	An assessment of the variations in the fund's monthly returns, with emphasis on downside variations, in comparison to similar funds.	Morningstar Direct
$\%AssetsCash_{t-1}$	The percentage cash (and cash equivalents) held by the portfolio plus receivables minus payables. A negative percentage indicates the portfolio is leveraged to gain more than 100 % exposure to the market. The percentage of assets to cash is lagged by one period	Morningstar Direct
$FundSize_{t-1}$	The month-end total assets of the mutual fund, in millions of dollars. The fund size is lagged by one period and takes the natural logarithmic form	Morningstar Direct
$\#Holdings_{t-1}$	The net number of holdings in the fund's portfolio. The number of holdings is lagged by one period	Morningstar Direct
$\%Top10Holdings_{t-1}$	The aggregated assets, expressed as a percentage, of the fund's top 10 portfolio holdings. The percentage in the top ten holdings is lagged by one period	Morningstar Direct
$ExpenseRatio_{t-1}$	The annual fee the fund charges its shareholders. Including management fees, administrative fees, operating costs, and all other asset-based costs incurred by the fund. The expense ratio is lagged by one period	Morningstar Direct

Appendix 1. Variable Description continued

$FundAge_{t-1}$	Fund age in months, estimated based on the fund's inception date. The fund age is lagged by one period and takes the natural logarithmic form	Morningstar Direct; Estimated
$Beta_{i,t}$	A measure of the fund's systematic risk. Estimated as the factor weight towards the market portfolio from the Jensen single-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$SF_{i,t}^{gr}$	The fund's gross abnormal return estimated by Jensen's single-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$FF_{i,t}^{gr}$	The fund's gross abnormal return estimated by Fama and French's three-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$CAR_{i,t}^{gr}$	The fund's gross abnormal return estimated by Carhart's four-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$SF_{i,t}^{net}$	The fund's net abnormal return estimated by Jensen's single-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$FF_{i,t}^{net}$	The fund's net abnormal return estimated by Fama and French's three-factor model.	Morningstar Direct; Kenneth French's website; Estimated
$CAR_{i,t}^{net}$	The fund's net abnormal return estimated by Carhart's four-factor model.	Morningstar Direct; Kenneth French's website; Estimated
SMB_t	The factor weight towards the SMB-factor estimated by Fama and French's three-factor model, or Carhart's four-factor model.	Morningstar Direct; Kenneth French's website; Estimated
HML_t	The factor weight towards the HML-factor estimated by Fama and French's three-factor model, or Carhart's four-factor model.	Morningstar Direct; Kenneth French's website; Estimated
UMD_t	The factor weight towards the UMD-factor estimated by Fama and French's three-factor model, or Carhart's four-factor model.	Morningstar Direct; Kenneth French's website; Estimated

Note: This table presents a detailed description of the variables used in the analysis of this study. Column (1) displays the variable, column (2) provides an explanation of the variable, and column (3) provides information about the data source.

Appendix 2. Correlation Matrix

	$Female$	$Fundsize_{t-1}$	$ExpenseRatio_{t-1}$	$\#Holdings_{t-1}$	$\%Top10Holdings_{t-1}$	$\%AssetsCash_{t-1}$	$FundAge_{t-1}$
$Female_{i,t}$	1						
$FundSize_{t-1}$	0.0828***	1					
$ExpenseRatio_{t-1}$	0.130***	-0.173***	1				
$\#Holdings_{t-1}$	0.0278***	0.227***	-0.357***	1			
$\%Top10Holdings_{t-1}$	-0.0694***	-0.292***	0.220***	-0.458***	1		
$\%AssetsCash_{t-1}$	-0.0353***	-0.131***	0.118***	-0.108***	-0.111***	1	
$FundAge_{t-1}$	0.0835***	0.383***	0.0616***	-0.109***	-0.102***	-0.0413***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: This table shows the correlation matrix for the independent variables used in the regressions. $Female_{i,t}$ representing the fund managers gender. $Fundsize_{t-1}$ representing each fund's monthly reported total assets. $ExpenseRatio_{t-1}$ representing the annual fee charged. *#Holdings* representing number of holdings. $\%Top10Holdings_{t-1}$ representing the aggregated assets in percentage of the fund's top ten portfolio holdings. $\%AssetsCash_{t-1}$ representing the percentage cash held by the portfolio including receivables and subtracted with payables. $FundAge_{t-1}$ represent the fund's age in months estimated based on the fund's inception date. *, ** and *** show the significance at the 10%, 5%, and 1%-level respectively.

Appendix 3. VIF-Test

	VIF	1/VIF
$Female_{i,t}$	1.02	0.981429
$FundSize_{t-1}$	1.28	0.783180
$ExpenseRatio_{t-1}$	1.20	0.833602
$\#Holdings_{t-1}$	1.50	0.665622
$\%Top10Holdings_{t-1}$	1.37	0.729288
$\%AssetsCash_{t-1}$	1.10	0.911220
$FundAge_{t-1}$	1.15	0.866977
Mean VIF	**1.23**	

Note: This table displays a VIF-test of the independent variables used in the empirical analysis. VIF measures the variance inflation factors and test whether multicollinearity is of greater concern or not. If VIF takes a value above 10 multicollinearity could be an issue and as can be seen in the table the VIFs is relatively low. $Female_{i,t}$ representing the fund managers gender, $Fundsize_{t-1}$ representing each fund's lagged monthly reported total assets, $ExpenseRatio_{t-1}$ representing the lagged annual fee charged, $\#Holdings_{t-1}$ representing the lagged number of holdings. $\%Top10Holdings_{t-1}$ representing the lagged aggregated assets in percentage of the fund's top ten portfolio holdings. $\%AssetsCash_{t-1}$ representing the lagged percentage cash held by the portfolio including receivables and subtracted with payables. $FundAge_{t-1}$ representing the fund's lagged age in months estimated based on the fund's inception date.