Risk it for the Biscuit

A quantitative study about the relationship between risk and annual management fees in mutual funds
**Master Thesis in Business Administration**

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**Summary**

**Background:** The most common way to invest in stocks is to put the money in a mutual fund. These mutual funds have different investment strategies and risk profiles. However, evaluation of these funds is a subject debated continuously. In light of these discussions, it would be noteworthy to investigate the relation between the annual fee and the risk that mutual fund managers put in their portfolios.

**Research question:** i) *How much additional risk does a fund manager need to integrate into their portfolio in order to raise the fund fee on the Swedish mutual fund market?*  
ii) *At what level does Asset Under management fees become inefficient?*

**Purpose:** This research will attempt to find evidence for how much risk that a fund manager put in their mutual fund as the management fee increases and at what point the fee is inefficient.

**Delimitations:** The sample consists of 46 mutual funds, all investing in Sweden and having a management fee ranging from 0.00% to 0.7% and 1.2-2.5% during the year 2018. The sample is divided into two groups, low and high annual fees. Risk measurements are Beta, Alpha, Sharpe and standard deviation.

**Method:** The research questions will be explained by a multiple-linear regression analysis where the annual fee is the dependent variable tested against the risk variables to investigate their significance. A Pearson Correlation analysis is used to find out how the variables are correlated to each other. The sample is divided into two groups to more natural compare how risk adjustments have been performed from low to high annual fee funds.

**Conclusion:** No value could be found for how much risk a manager needs to add in their fund because of the missing relationship to raise the annual fee and the risk variables were not significant to the annual fee. The asset under management fee becomes insufficient somewhere between 0.7 – 1.2%.
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1 Introduction

This chapter will introduce the reader to the subject with a brief background, following with a problem discussion, and the research questions developed to be able to answer to the purpose.

1.1 Background

During the last decades, the global economy has been growing exponentially, it has allowed many people to place their savings into mutual funds. In fact, 80% of Sweden's total population has invested in mutual funds, either in a regular fund account or in a pension plan (Swedish Investment Fund Association, 2019). The large population investing in mutual funds means that investment banking has a large customer segment. However, one problem is that nearly half of the individuals consider themselves to have a knowledge gap and does not know how the funds they have invested in works considering different fees and how their bank perceives the term risk (Affärsvärlden, 2018). Therefore, most of Sweden's population becomes very dependent on the performance of the portfolio managers and their ability to deliver a good return on investors’ savings at a preferred risk level.

The financial sector has been expanding for a very long time, and the amount of money invested in the sector has been increasing exponentially over the decades. For instance, the amount invested in the financial services sector has grown from 4.9% of the US GDP to 8.3% in 2006 (Malkiel, 2013). A considerable part of that amount consists of fees paid for asset management. Even though economies of scale should be realizable, the expense on the asset-weighted expense ratio has been increasing substantially over time for both individuals as well as institutional investors. These fees could be considered as socially useful if the return would reflect the fee one pays for a maximized realized return and improve the efficiency on the market. However, depending on perspective, this would not be the case. Index funds consistently outperform the actively managed funds and have done so for many years. According to Burton G. Malkiel (2013), there was no change in the market efficiency between 1980 and 2011. How come that investors still invest
ridiculous amounts of money in actively managed funds when it does not, in general, give the investors a better return in correlation with the management fees?

Managers face difficulties when they present relevant information to the investors to make them realize the benefits of an actively managed portfolio. Risk can be presented in many different ways. However, most people compare funds based on the return when deciding on what fund to invest their capital. Therefore, there is a need to have several measurements to compare funds, not only looking at the historical return but also the amount of risk in the portfolio. Also, as a manager, it is essential to know in what markets conditions the fund perform the best. Is it when the market is rising or when it is on a decline?

1.2 Problem discussion

Let us say you are a fund manager. One day you decide to increase the management fee of your fund for reasons unknown. You know that a higher fee will lower the expected return of the fund if all other variables are held constant. This is not good for the investors as they pursue the most bang for their buck. Thus you decide to change the portfolio of the fund in order to have the same return as before. The most obvious thing to do is to increase the risk since higher risk hike return potential. However, you do not know precisely how much additional risk that needs to be added. This leads us to our main problem and focus of this paper – how much more risk is required in a portfolio when the fund fee is increased to maintain the same expected return as before?

Humans have always been aware of the term risk. Risk and reward in terms of money are a bit harder to find information about. The term risk can be traced back in time to the 17th century when Pascal, Fermat, and Huygen first wrote about the risk in gambling (James V. Watson, 2002). However, fund management is not gambling, but there are some similarities. For instance, both have individual payoffs and usually a percentage stating the possibility of receiving that payoff. The main difference is that in gambling, there is a specific set of winning combinations and another set of adverse outcomes. In finance, the outcomes are less clear and therefore, require more advanced calculations.
Historically, before any models were invented, managers had to rely on common sense and experience to gain trust and return (Fuller & Wong, 1988). It was in the 1960s the Capital Asset Pricing Model (CAPM) was created and introduced beta as a risk variable. This model was used for many years to describe the relationship between risk and return until further research in the eighties started to see anomalies in the model.

There is much information to gain about how managers set their fund fees and use different risk and performance measures in various aspects. However, to expand the literature, an investigation will be made on how a manager could raise its fund fee. What metrics and models one could use to evaluate how to stimulate the portfolio risk to get and maintain a desirable alpha and not become a "benchmark hugger" which means that the fund manager invests close to an index (Gruber, MJ, Elton, Edwin J, 1997). Secondly, investigate at what level the management fee becomes too high to be justified by the fund managers.

These observations have captured the interest of the authors, and in order to find answers to the described problems, the following research questions were formulated:

- **How much additional risk does a fund manager need to integrate into their portfolio in order to raise the fund fee on the Swedish mutual fund market?**

- **At what level does Asset Under management fees become inefficient?**

The summarized purpose of this paper is to investigate the extra amount of risk that a fund manager needs to put in her fund in order to cover an increase in the management fee. For this research, it is also necessary to present and investigate the most reliable indicators of risk for this type of evaluation.


2 Literature review

This chapter will highlight relevant prior research within the area relationship between risk and return. Descriptions of how funds work will go over into earlier findings concerning the subject area.

2.1 Mutual funds

A mutual fund is a registered opened-end investment company who gathers money from different investors and further invest this money in stocks, bonds, and money market instruments, other types of securities and asset or in a combination of these investments. The mutual fund's ownership in these assets and securities is called its portfolio, and it is further managed by a registered investment manager. Each share of this mutual fund represents the investor’s proportionate ownership in the mutual fund's portfolio and thus also the income the portfolio generates (Office of Investor Education and Advocacy, 2016).

An investor in a mutual fund buy their shares in the fund and sell/redeem their shares to, the mutual funds themselves. Usually, a mutual fund share is purchased directly from the fund or over-investment professionals like banks and brokers. The Investment Company Act of 1940 requires mutual funds to price their shares each business day the typical way to do this is to price it after the major stock exchanges close. The price, the per-share value of the assets the mutual fund possesses minus its liabilities, is called the net asset value and is shortened as NAV. A mutual fund must sell and redeem their shares at the current NAV that is calculated before the point when an investor places a purchase or redemption order. In practice, this means that an investor who places an order for shares in a mutual fund during the day will not know the final purchase price until the next NAV is calculated (Office of Investor Education and Advocacy, 2016).

There are many features of mutual funds that make them a popular way of saving investor money. Firstly, professional management is monitoring the investment. These managers are registered and have the proper experience for their work. Also, a mutual fund makes
diversification easier for an investor since they spread their investments across a wide range of companies and industry sectors and therefore, lower the risk if a company or sector fails. Mutual funds also benefit the investor who has a smaller amount of money to invest since the initial purchase can be low and thereby simplifies monthly saving plans. However, as an investor, there are annual fees that have to be paid even if the fund is performing badly, making it risky if the market environment is unstable. There is also a lack of control over the investment since the investor cannot control where the money is invested since the fund manager oversees the fund (Swedish Investment Fund Association, 2012).

2.1.1 Passively managed funds

The goal for a passive managed fund is to keep expenses low while still providing the investor a return equal, or close to, an index of choice excluding the fund fee. An index fund does not usually perform any analyses or evaluations of their own, thus following the index. This enables the fund to charge a relatively low fee (Lin, T. C, 2015). However, the fund does still require some form of management and adjustments to properly follow the underlying index.

Burton Malkiel says in his book *A Random Walk Down Wall Street* (1973) the famous quote “a blindfolded monkey throwing darts at a newspaper's financial pages, could select a portfolio that would do just as well as one carefully selected by experts.” The expression means that a broad index fund (passive) would give the same result as the active professional funds (Malkiel 2003, p. 60).

Malkiel promotes passive fund management in many different markets. Even in situations when markets are not effective, passive management is a winning strategy. This is motivated by the fact that several fund managers achieve better than the market, and thereby, there will be those who perform worse than the market. The sum of all this is that the fund managers achievements are a zero-sum game since not everyone can perform over the market (Malkiel, 2003).

2.1.2 Actively managed funds

Funds that are actively managed attempt to add value to their shareholders in two different ways. Firstly, selecting a portfolio consisting of securities which are expected to provide a superior risk-return trade-off and secondly, monitoring and re-arranging their portfolios
over time in response to current market conditions. Mutual fund managers argue to have the ability to perform well in both departments and therefore enable them to yield higher returns to their shareholders in comparison to other mutual funds or benchmarks such as the OMX30 or S&P 500 index. However, active management is relatively expensive and would only benefit the shareholders if the excess returns on actively managed portfolios are more significant than the gradual cost caused by the shareholders (Shukla, R, 2004).

The most common strategies for a manager are value investing and growth management. Value investing is a strategy where the manager actively invests in stocks and securities that are undervalued in comparison to factors such as earnings, sales, net current assets, and the book value of the issuing companies. These undervalued companies require some structural changes to perform better, and therefore, the investor can benefit once the company is turning around. It could also be a company that has a lower value than its intrinsic value and therefore is expected to rise once the intrinsic value becomes known (Graham, Benjamin, Zweig, Jason, & Buffett, Warren E. (2003).)

Growth investing is according to Sharpe, W., Alexander, G., & Bailey, V. (1999), to invest in stocks which have high P/B (Price to Book) and P/E (Price to Equity) ratios, the inverse relation is the case for value investing. This classification is confirmed by Fama and French (1998). However, they added the P/CF (price to cash flow) multiple when trying to separate growth from value stocks. Wall Street Journal has a similar definition and explains growth stocks as companies who experience higher than average gains in either earnings or stock price during the recent few years and are presumed to do so continually. They further state that these stocks have high P/E ratios and pay low to no dividends. Value stocks, on the other hand, have low valuation measures such as P/E or P/S (price to stock) ratios (Talley, 2003).

At a historical point of view, there is evidence that passively managed funds often outperform actively managed funds. Of course, it also depends on the current market state but Cremers, Ferreira, Matos & Starks (2016) did extensive research in 32 countries around the world argues that they found evidence that in general passive management yields a higher return when one takes the management fee into account. Malkiel (2013) identified the same result where he concluded that the Barclays U.S aggregate bond index outperformed 84% of U.S large-cap fund managers. Dahlquist, M., Engström, S., & Söderlind, P. (2000) found the same outcome on the Swedish market in a research they
made between 1992 and 1997, which was the time mutual funds boomed in Sweden. Wermers (2000), who investigated funds in the period 1975-1994, does provide evidence that active funds, in general, could pick stocks who bet the market. However, on an average, did not provide a better return than the index, which is explained by the fees and the fact that liquidity needs to be stable in the fund to meet investor withdrawals and inflow in the fund. These observations make the purpose of this paper more interesting and even more challenging, to justify an increase in fund fees amongst fund managers.

2.2 Fund Fees

A fund usually charges a fee for the investor during the investment period. This is to cover for the service itself, but also other expenses such as administrative costs, depot fee to the bank, and other costs for the manager. When the fund’s return is shown, all the charges that are applied to the fund have already been deducted. This means that both the manager’s skill and the actual charges (the cost) are essential for the result generated by the fund. The fee is usually stated as a yearly percentage but is deducted daily throughout the year with 1/365 of the percentage fee being withdrawn from the capital every day. Prices for the funds are freely set just as in any other marketplace for goods and services (Swedish Investment Fund Association, 2012).

When deciding on what fund to choose, investors should always consider both the return, risk and the fee. Two funds can have widely spread investment fees but have the same return during a period. This means that the end return for the investor will not differ regardless of which one she chooses to invest. Usually, stock funds have the highest fund fees, while interest funds charge the lowest (Swedish Investment Fund Association, 2012).

A valid question to ask is if there is any correlation between charges and return in the mutual fund business. Between 1980 and 2006, the financial sector in the United States rose from 4.9% to 8.3% of the country's GDP. A significant share of that increase has been stated as an increase in the fees paid for the asset management performed by different firms. However, in a case similar to this it is expected that the economics of scale should be realizable in the asset management business, but it turns out that the asset-weighted expense ratios charged to individual investors as well as institutional investors have risen during this time. Excluding index funds, fees have increased substantially as a
percentage of assets managed (Malkiel, B.G. 2013). Although there are examples of
discounts from economies of scale, in Sweden, there has been significant discounts for
the premium pension saving system where the pension companies possess a large amount
of money and therefore have negotiated discount on their investments (Swedish

Sharpe (1966) wrote a paper where he compared mutual funds and put them against a
general Dow-Jones portfolio. He found out that if all variables were equal and the only
variable not being equal was the expense ratio, investors would be most beneficial from
a small expense ratio. As the expense ratio increased, the results for the stakeholders
decreased. Note that this is an old paper and during this time technology was not as
developed as it is today, and the time of reference was only for ten years. Jensen (1968)
further researched the issue regarding fees and return by investigating 115 mutual funds
in the US in the period 1945-1964. He was looking at the ability to earn returns that were
higher than those he would expect, given the level of risk of each of the portfolios. The
evidence found indicated that mutual fund performance was on average not able to predict
security prices strong enough in order to outperform the buy-the-market-and-hold
strategy. Further, there is very little evidence in the paper that any individual fund would
perform better than he expected from mere random chance. Most interesting is the fact
that these findings hold even if the management expenses are deducted, meaning that on
average funds were not entirely successful enough in their management activities to
recoup even their brokerage expenses.

More recent research has claimed that studies done in the 1960s may be in error since
modern measures of rate of return earned by mutual fund managers suggest that
professionals can beat the market, at least before management expenses (Malkiel, 1995).
Malkiel took a new look, at the time, on mutual fund returns during 1971 to 1991-time
span and utilized a data set that included all the mutual fund returns in existence in each
year of the period. When he analyzed all the data, he could present evidence that mutual
funds have a tendency to underperform the market, and as in line with previous research
suggest not only do they underperform when the management fees are deducted, but also
gross of all the reported expenses except load fees.
2.2.1 Incentive Fees

In addition to the standard annual deducted management fee, an additional incentive fee has been on the uprising with the increase of hedge funds in the market. The most popular fee structure in hedge funds is the "2% and 20%", these funds charge a flat annual management fee of 2% and the additional incentive fee awards the hedge fund managers with 20% of the positive return, and no penalties are deducted if the results of the fund is negative. (Zhan, G. 2011) This type of fee has been in many debates because the fund managers often yield a considerable amount of profit while the investors stand for almost all the risk. However, the hedge fund managers motivate their fee structure with the argument that no one is forced to invest in their funds, which is hard to argue with (Goetzmann, 2003).

2.3 Earlier studies

Throughout the year's mutual funds has been under constant evaluation. However, as mentioned earlier, most of the evaluations have been done on the US market, and the primary angle of the studies has regarded the relationship between management fees' and its risk-adjusted return. Performance evaluations can be traced back to the early 1960s where Sharpe, Jensen and Treynor were some of the first to study the relationship. Blake and Morey (2000) made a study on Morningstar's small-cap category. They found that they often generate a poor future risk-adjusted return. They also found evidence that funds in the large-cap category performed worse compared to funds in next-to-highest categories. Dahlquist, Engström and Söderlind (2000) made an analysis in their paper between fund attributes and its performance. They found that mutual funds charging lower fees outperform mutual funds that charge a higher fee on the US market. Burton, G. Malkiel (2013) found evidence from analyzing 358 funds from 1970 and 40 years forward that only 92 funds survived. The 266 funds that did not survive performed worse than the other and many of those 266 funds, were actually actively managed funds with a relatively high fee. Blake, Elton and Gruber (1993) analyzed risk-adjusted returns on expense ratios on the US market. Their study found evidence that an increase in the expense ratio of 1%, led to a decrease of 1% in returns.
These are only some of all analyses made on mutual funds, which shows the opportunity for a new angle to be evaluated. The relationship between risk rather than return and management fee on Swedish Mutual fund market is a new perspective that needs further investigation as risk management becomes of more importance for fund managers as well as the public.

3 Theoretical Framework

This chapter will present relevant concepts and theories to the research in a logical way. It will start with a thorough description of the term risk, breaking it down to historically fundamental theories that has been crucial for the evolution of risk management, breaking it down even more to key values that is important to analyze the relationship of risk and return.

3.1 Risk

Risk is a broad definition applicable in different fields. In this thesis, the focus is on how risk is perceived as a manager and private investors mainly looking at present risk measurements. To define risk without being too specific it can be broadly described as (1) To generate a negative return and experience a loss (2) Underperforming a benchmark such as an index or a similar portfolio and (3) Failing to meet the desired goals (Swisher, P. & Kasten, G.W, 2005). The general opinion among investors, however, is that risk is described as the possibility that something terrible will happen. There are almost no variables considering this fact in research models. For example, Markowitz risk measure and beta does not have to be negative if the market is in a positive period (Sharpe, W.F, 1994). Further description of how to measure risk will be presented in the following sections. Various ways exist to determine and analyze risk in funds. Standard deviation and Beta are two of the most useful and they are consistently being used throughout the world. These measurements are described further on.

3.1.1 Systematic and unsystematic risk

Through a manager perspective, there are numerous different risk factors to take into account. Some are easier to manipulate than others are. External risk factors like the PESTLE framework: Political, Economic, social, technological, legal and environmental
(Sebestova, J, 2013) which is self-explanatory, will not be further analyzed in this paper. More interesting in this case is the Systematic and unsystematic risk. The systematic factors (Beta) describe events that are unavoidable and affects the whole market, i.e., inflation and recessions. Unsystematic risk, on the other hand, can be linked directly to a particular asset, such as a managerial shift or a decrease in operations. Fund Managers can therefore decrease the unsystematic risk through diversification in the portfolio.

Figure 1: Elimination of unsystematic risk retrieved from: Gruber, MJ, Elton, Edwin J, (1997)

![Image of Figure 1](image)

The optimal amount of assets in order to eliminate as much unsystematic risk as possible has been widely debated. In William J. Bernstein (1997) research, he states that up to a hundred different assets are optimal while Kapusuzoğlu A and Karacaer S. (2009) argues that 18 assets in different industries are enough diversification to remove the unsystematic risk in the portfolio.

3.1.2 Agency conflict

A potential conflict between mutual fund managers and its investors is referred to as an agency conflict. In the financial sector, this conflict appears because the consumers invest in order to achieve a maximized risk-adjusted expected return, while the mutual fund manager’s profit from the annual fund fee, their primary incentive is the cash inflow into the fund. This means that if the fund company's investment decisions to maximize the company's profit differ from what would be done to maximize risk-adjusted expected return, the conflict is realizable (Chevalier, J & Ellison, G. 1997). In their study, Chevalier and Ellison (1997) found evidence that fund private investors often, due to lack of interest or information only looks at the results of year-end performance when they decide whether to invest or not. Fund managers do therefore alter the risk-level throughout the
year and in the last quarter increase the expected growth of the fund by increasing the risk level and therefore, present a better result.

3.2 Theories

As the financial and investment sector has been growing at an incredible speed, several theories have been developed. There are three risk- and return models that have given a strong foundation and is the industry standard, it is vital to understand in order to make an appropriate study. The first is Modern Portfolio Theory (MPT). From the flaws of MPT, Capital Asset Pricing Model (CAPM) has become the standard for university investment courses due to its relevance and simplicity to implement. Thirdly, Value at Risk (VaR) is a measurement that analyzes the probability of loss distribution and is also the market standard for fund managers.

3.2.1 Modern Portfolio Theory

Modern Portfolio Theory (MPT) or, mean variance-analysis, is a Nobel Prize awarded theory developed in the early 1950s by Harry Markowitz. MPT was a groundbreaking theory that allows investors that is risk-averse to construct and optimize a portfolios' expected return with a given level of market risk (Nobel prize, 1990). That risk is a crucial part of any investor's investment decisions that want to gain a higher reward. Markowitz pointed out that an investor's portfolio choice can be reduced to two dimensions, the variance and the expected return of the portfolio. Why? Because of the possibility to reduce risk through diversification, which means that the unsystematic risk decreases in correlation with the level of diversification. Until today, MPT has been and still are one of the foundations for additional research in financial economics (Gruber, MJ, Elton, Edwin J, 1997).

Markowitz proved that holding a constant variance would maximize expected return, and a constant expected return lowers the variance. These principles resulted in the development of an efficient frontier.
The efficient frontier allowed investors to build his or her portfolio, depending on her preferences regarding risk and return. Assets on the efficient frontier line are assumed to be optimal investments yielding the best return with the lowest amount of risk also called an efficient portfolio. Assets in figure 2 set the risk profile in relation to one another. Therefore, the variance or in other words, risk of the portfolio does not only depend on the variance for each individual asset but also the co-variance pairwise of all individual assets that would yield the same expected return but with lower risk compared to a portfolio that ignores the interactions between the portfolios assets (Gruber, MJ, Elton, Edwin J, 1997).

3.2.2 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is an extension of the MPT and was developed by William Sharpe and John Lintner in the early 1960s. Sharpe was also awarded the Nobel Prize for the model in 1990. CAPM offers intuitively pleasing and robust predictions about the relationship between expected risk and return and how to measure the term risk. While MPT offers an algebraic condition, the CAPM turns the algebraic function into testable predictions regarding the risk and return relationship (Fama, 2004). The CAPM formula is easily used and the equation looks like:

\[ ER_i = R_f + \beta_i (E R_m - R_f) \]

\( ER_i = \) Expected return of investment  
\( R_f = \) Riskfree rate
\[ \beta_i = \text{Beta of investment} \]
\[ ER_m = \text{Expected return of the market} \]
\[ ER_m - R_f = \text{Market risk premium} \]

However, in order for CAPM to hold a few assumptions needs to be respected (Bodie et al. 2004):

1: All investors are risk-averse and have the same initial amount of cash to invest. Leading to that all are looking for the highest amount of return with the least risk.

2: Everyone holds their investment for the same period.

3: Each portfolio is built from the same publicly traded stocks.

4: No transaction costs or taxes are taken into account. Gains from stocks and dividends should not be considered different for investors.

5: Investors cannot affect the prices on the market, because every investor is seen as a price taker.

6: Investors are mean-variance optimizers as described in the Modern portfolio theory.

7: Analysts are evaluating assets in the exact same way and have the same view on economic outlooks.

3.2.3 Value at Risk

During recent decades, the measurement of risk has been a primary concern due to the increase in market liquidity, more significant investments in all different kind of funds and more consistent shocks to the whole financial system. While Standard deviation or variance has been the go-to measure for a long time, Value at Risk is a statistical technique and has since the 90s, when it began to receive regulatory recognition in the Market Risk Amendment to the Basel Accord. It has since then been the most prevalent measure of financial risk and is becoming the industry standard for non-financial firms in their work with risk management (Gordon, 2009).

VaR measures and quantifies the risk within an investment portfolio or an entire firm over a specific period of time, E.g., one day, a month or annually. The model determines not only the potential loss in the asset being evaluated but also the potential amount lost. For example, if an investor does determine that an asset has a 2% one-day VaR of 3%, it means that the asset has a 2% chance to drop 3% each day. While the interpretation of
VaR is very straightforward, estimating it can be much harder. Mainly because of simplified assumptions for the loss distribution is needed (Gordon, 2009).

3.3 Key values

A few values are essential when comparing the relationship between risk and fee in a sample consisting of two or more funds. Metrics that evaluates performance in relationship with risk and return are described further in the following sections.

3.3.1 Beta

While CAPM relies on the theory that the total risk of one particular stock, which is measured by the variance of stock return, it can be broken down into unsystematic risk and systematic risk which is further explained in 2.3.1. However, the only risk that CAPM cares about is the systematic risk that cannot be eliminated by diversification and the beta coefficient measures this. The higher value of beta the larger is the fund's volatility compared to the market, and the opposite if the beta is low (Suhar, 2003). If the beta value is 1, the fund follows the index it is measured against. However, if the beta is 0.80, for example, it means that the fund's development has been 20% less than the index. If beta is 1.20 instead, the fund has been developing 20% better than the index. One problem when comparing different index is that it can give various indications about how the market behaves since they do not share the same references. This is referred to as a benchmarking problem. Thus, the beta value should not be mixed with the total volatility of the fund, hence, rather be analyzed as the fund's sensitivity to the market (Kreander, N., Gray, R. H., Power, D. M., Sinclair, C. D., 2005). Beta is calculated as followed:

\[
\beta = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}
\]

\( R_e = \text{The Return of a single stock} \)

\( R_m = \text{The return of the market} \)

\( \text{Covariance} = \text{The relation between the stocks return and the market.} \)

\( \text{Variance} = \text{How far the data points of the market differ from their average} \)
3.3.2 Smart Beta

Smart beta is an uprising investment strategy that aims to combine the benefits of active and passive investing strategies. The main goal is to obtain a desired level of alpha at a lower risk-level than for traditional active management. Like passive investing, smart beta follows an index. However, this index emphasizes alternative construction rules to traditional market-cap indices with a lower risk profile. Therefore, smart beta investment seize the opportunity to deliver an excess return higher than passively managed index-funds, for a lower price than actively managed funds.

Ronald N. Kahn and Michael Lemmon (2016) describes smart beta as a new disruptive innovation with the potential to affect the current market in a significant way and might over time outcompete actively managed funds on the market. Kahn and Lemmon also argue that managers that keep chasing alpha at a too high cost will sooner than later face extinction due to the increase of smart beta funds. To strengthen this statement, one can look at the numbers and expansion of smart beta strategies. As of 2016, 330 billion dollars are invested in these products and clients of Tower Watson doubled the allocation into smart beta between 2015 and 2016 (Kahn. R, Lemmon. M, 2016).

3.3.3 Alpha

Michel Jensen (1968) says that the degree of risk an investor is pursuing when investing is to be considered when analyzing the return of a mutual fund. Jensen's alpha, or as more commonly referred to as just alpha, was developed during an investigation of 115 stock funds during the period 1945-1964. Alpha is a way to analyze the risk-adjusted performance of a fund, i.e., the funds over- or underperformance in relation to theoretical return at the same risk level, and the risk is measured with beta (Jensen 1968, p. 389). Alpha measures and compares stock funds against the general stock fund market. The underlying model is the CAPM model. An alpha value of 0 means that the fund is developing in line with the market, while any value above 0 indicates an over performance concerning the market. Any value under 0, a negative value, indicates that the fund performs worse than the market (Jensen 1968, p. 390-391). Assuming that the CAPM is accurately calculated alpha can be expressed as follows:

\[ \alpha = R_i - (R_f + \beta \times (R_m - R_f)) \]

\[ R_f = \text{Riskfree rate} \]
\[ R_i = \text{Realized return of the portfolio} \]
\[ R_m = \text{Realized return of the comparing market index} \]
\[ \beta = \text{Beta of the portfolio with respect to the comparing market index} \]

### 3.3.4 Standard Deviation

The Standard deviation is a basic and widely used statistical tool that is used to measure risk in terms of how a stock or portfolio deviates from its mean/benchmark for each unique data point. With more spread in the data points the higher standard deviation (Berk J, DeMarzo P, 2014). The standard deviation is equal to the square root of the variance and the Mathematical formula is written as follow:

\[
\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum_{i=1}^{N}(X_i - \bar{X})^2}{N - 1}}
\]

\[ \sigma^2 = \text{The variance of the data set} \]
\[ X_i = \text{Value of a specific point in the data set} \]
\[ \bar{X} = \text{Mean value of data set} \]
\[ N = \text{Number of data points in the data in the data set} \]

### 3.3.5 Sharpe

The Sharpe Ratio is the most used tool to measure the risk and return relationship. More precisely, it measures the expected return that exceeds the risk-free rate per each unit of risk that in this case, is expressed as the standard deviation. A positive Sharpe ratio is optimal since it is equal to a higher expected return per unit of risk (Sharpe, 1994). The mathematical formula is written as:

\[
\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}
\]
\[ R_p = \text{Return of portfolio} \]
\[ R_f = \text{Riskfree rate} \]

\[ \sigma_p = \text{Standard deviation of the portfolios excess return} \]

The Sharpe ratio is particularly important when comparing different portfolios, as it considers the risk-adjusted return and not only the return, which would in a way, leave a biased result. The fact that the rational investor always is risk-averse, risk cannot be ignored. For the Sharpe Ratio to be viable in comparison to one another, the different portfolios must invest in the same market (Simons, 1998).

3.3.6 Other risk methods

Swisher and Kasten (2005) have the view that risk should not interfere with the fear of humans to achieve adverse outcomes. This means that they do not see the standard deviation of returns to describe risk in a pleasurable way since it is not normally distributed. They have developed, what they think is a better way of describing risk, the downside risk optimization (DRO). This is supposed to describe risk better since it uses downside risk as to the definition of risk itself. DRO measures, briefly explained, three factors:

- How often the stock experience negative returns.
- The size of the negative returns experienced.
- The frequency of negative returns.

These values are put in a portfolio with as low DRO as possible. What Swisher and Kasten (2005) suggest is that a DRO portfolio will help the investor to avert the most frequent mistakes of the mean-variance portfolio.

Byrne and Lee (2004) provided another method. They say that the best way to measure risk is to use a more flexible approach to risk, and therefore use the risk measurement that best fits the portfolios managers' attitude concerning risk and not uses the measurement that is mostly theoretical and practical. The reasoning behind this is that Byrnes and Lee’s study adorned that different risk measures create portfolios with considerable alterations.
in asset allocation and since two risk measures will not construct the same portfolio, the outcome will be relying on the portfolio manager to match their risk desires with available variables in the creation of the portfolio. Byrne and Lee made an extension of the research done by Cheng and Wolverton (2001) that risk variables can decrease risk in one manager own space but when comparing to other risk variables available on the same portfolio they often create lesser results.

3.4 Correlation Analysis

Correlation analysis is made to investigate if there is a connection between two or more variables and further how secure this connection is (Lind, Marchal & Wathen 2015, p. 428). A correlation coefficient (r) describes how strong or weak a connection is between the analyzed variables. The coefficient I made of a number between -1 and +1 and will indicate if the connection between the variables is strong or weak, and positive or negative. If the coefficient is +1 there is a very strong, positive connection between the variables while -1 indicates a very weak, negative connection. If the value is 0, there is no connection at all.

3.5 Hypothesis

In addition to the correlation analysis, a multiple linear regression analysis will be implemented to find evidence that there is a significant relationship between the risk of the fund and the management fee. Therefore, a hypothesis has been developed to strengthen the evidence of this paper.

\textbf{H0}: \textit{There is no relationship between the mutual fund's risk and the management fees.’}
4 Method

This chapter describes the practical method used to create the empirical study. It will present the process of data collection, sampling, limitations and how the empirical data will be analyzed to answer the statistical hypotheses and research questions to fulfill the purpose, the chapter will also present a discussion regarding the credibility of this research.

4.1 Choice of method

The content of this section will try to find a relationship between a portfolios' assumed risk, and the management fee that is charged from the consumers. The analyzing is done through the fund managers' perspective and the purpose is to find strong evidence on what conditions a fund manager can raise its fund fee in a justified way. The conditions refer to what amount of additional risk that needs to be integrated into the portfolio to reach a new desired return based on historical observations. The study will be done with the help of a statistical analysis together with earlier theories to analyze the data; this is typical for a quantitative study where analysis is done after the collection of data (Denscombe 2014).

The method and empirical findings will emphasize the positivism approach. Positivism approach means that the researchers need to have a value-free mindset. The researcher cannot alter data or change specific facts, nor is biased behavior allowed or letting any emotional attachments hinder the findings from being expressed in a proper way (Remenyi et al., 1998).

4.1.2 Reliability

The Reliability of a research is referred to as of which degree the data will provide related results if the research were to be conducted by another researcher at another time (Saunders et al., 2016). It shows the precision of the investigation. If the precision is excellent, the reliability will be high (Bell, 2000). This is of great importance to achieve a good quality of the report. Since this paper makes use of secondary data, a control has been issued to make sure all numbers are correct, and this is done to ensure that no
misleading results will be present. Data collected from DataStream is perceived as a reliable source.

4.1.3 Quantitative research

Two different methods are used to gather information in a research project. They are named qualitative and quantitative method. The methods gather information differently and thereby have different usages in research. Holme & Solvang (1991) defines the qualitative method as to where you use information from sources who have had a high degree of ability in presenting its own opinion. This way of collecting is usually used to gather information about very specific or narrow problems and is generally done during interviews or conversations.

The quantitative choice of method use qualification when gathering data (Holme & Solvang, 1991) and is in line with the theoretical standpoints of both positivism and objectivism (Bryman and Bell, 2013). Jackson, P. R., Easterby-Smith, M., & Thorpe, R. (2015) emphasizes the relevance of quantitatively methods when statistical analyzes of data from large samples which can later be used as a piece of evidence in a report and for policy decisions.

4.2 Data collection

In order to conduct the research, data was retrieved from DataStream. The funds chosen had to follow a set of criteria's in order to be viable in the research.

- The funds must be Swedish and have the majority of investments in Sweden.
- The annual fund fee must be within a span of 0,0 – 2,5%
- The funds need to be investing in mid or large cap companies
- There has to be at least one year of past performance data available
- The fund needs to be a stock fund

To find this data, all available stock funds investing in Sweden and Swedish companies were sorted in the Morningstar database, an independent database available to the public. The initial search gave 140 funds to choose from, but that included twin funds such as "Länsförsäkringar Sverige A and B" where one of them was left out from the sample
because they are identical in their investments. Also, funds with more than 500 SEK as an initial investment was left out as well since these funds would be considered "high-end" funds and not for the typical investor. The remaining fund's data, which was 52 different funds, was then collected from the Datastream database. Due to insufficient data, four of these funds had to be removed from the sample, bringing the total remaining funds to a count of 48. No smart beta funds were found to be incorporated into the sample due to the criteria's being set, which encourages that future research is being done. Data such as return as of 31 March 2019, beta, alpha, standard deviation and Sharpe Ratio was collected. The data retrieved from a trustworthy database, in this case, DataStream is referred to as secondary data. The characteristics of secondary data are that someone else has collected it (Lewis et al., 2016). The reason behind the choice of using secondary data is that it can be both troublesome and very time consuming to collect primary data. Therefore, the use of secondary data is more suitable to find answers for our stated problem, since time is of the essence in this case. (Lewis et al., 2016).

4.3 Data Sampling

When all data was collected, we divided the sample into two groups based on the management fee. The first group contains low fee funds in span from 0,0% to 0,7% and was a total of 17 funds, both passively and actively managed funds. The second group, high fee funds, has a total of 29 funds, the fee range was 1,2% to 2,25% and all were actively managed. Two funds in a gap between 0,7% and 1,2% were intentionally left out from the total sample space. Therefore the sample count, in the end, is 46. The reason they were left out was that it becomes easier to see correlations between the groups in order to draw valid conclusions.

The data was listed in their respective groups with all values in excel to be as easy as possible to interpret. A style box was developed to summarize what kind of shares each fund invests in summarized like: Share Value / Company Size. Also, other key values used were: management fee, Beta, Alpha, Sharpe Ratio, Standard Deviation, and Return in a timeline of one year, three years, five years and ten years respectively on an annual basis. However, since only a few funds had prior data longer than one year back in time, the result will only investigate a period of 1 year.
Table 1: Funds included in the research

<table>
<thead>
<tr>
<th>Low Fee Funds</th>
<th>High Fee Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avanza Zero</td>
<td>AstraZeneca Allemansfond</td>
</tr>
<tr>
<td>Handelsbanken Sverige OMXSB Index</td>
<td>Jämställda Bolag Sveri A</td>
</tr>
<tr>
<td>Spiltan Stock Fund Investmentbolag</td>
<td>PriorNilsson Sverige Aktiv A</td>
</tr>
<tr>
<td>Swedbank Robur Access Sverige</td>
<td>Didner &amp; Gerge aktiefond</td>
</tr>
<tr>
<td>Länsförsäkringar Sverige Indexnära</td>
<td>Swedbank Robur Ethica Sverige</td>
</tr>
<tr>
<td>SPP Stock Fund Sverige A</td>
<td>Swedbank Robur Sverigefond</td>
</tr>
<tr>
<td>SEB Index Fund Sverige</td>
<td>SEB Sverigefond</td>
</tr>
<tr>
<td>Skandia Sverige Exponering</td>
<td>Danske Invest Sverige SA</td>
</tr>
<tr>
<td>Aktiespararna direktavkastning</td>
<td>Alfred Berg hållbar tillväxt Sverige A</td>
</tr>
<tr>
<td>SPP Sverige Plus A</td>
<td>Länsförsäkringar Sverige Aktiv A</td>
</tr>
<tr>
<td>Danske Invest Sverige Beta SA</td>
<td>Quesada Sverige</td>
</tr>
<tr>
<td>Folksam LO Sverige</td>
<td>Nordea Alfa</td>
</tr>
<tr>
<td>SEB Hållbarhetsfond Index</td>
<td>Skandia Sverige</td>
</tr>
<tr>
<td>Handelsbanken Sverige Index Criteria</td>
<td>Skandia Sverige Hållbar</td>
</tr>
<tr>
<td>Catella Sverigena Hälbart Beta A</td>
<td>Carnegie Sverigefond A</td>
</tr>
<tr>
<td>Handelsbanken Sverigefond Index</td>
<td>Skandia Världsnaturfonden</td>
</tr>
<tr>
<td>SEB Sustainability Fund Sweden d - sek</td>
<td>Indecap Guide Sverige C</td>
</tr>
<tr>
<td></td>
<td>C Worldwide Sweden 1A</td>
</tr>
<tr>
<td></td>
<td>SEB Stiftelsefond</td>
</tr>
<tr>
<td></td>
<td>SEB Swedish Value Fund</td>
</tr>
<tr>
<td></td>
<td>Nordea Swedish Ideas Equity</td>
</tr>
<tr>
<td></td>
<td>Spiltan Stock Fund Stabil</td>
</tr>
<tr>
<td></td>
<td>Nordic Equities Sweden</td>
</tr>
<tr>
<td></td>
<td>Cliens Sverige B</td>
</tr>
<tr>
<td></td>
<td>Catella Sverige Aktiv Hållbarheter</td>
</tr>
<tr>
<td></td>
<td>Norron Active RC SEK</td>
</tr>
<tr>
<td></td>
<td>Enter Sverige A</td>
</tr>
<tr>
<td></td>
<td>Handelsbanken Sverige Selektiv</td>
</tr>
<tr>
<td></td>
<td>Viking Fonder Sverige A</td>
</tr>
</tbody>
</table>

4.3.1 Criticism of data sample

The sample consists of 46 funds, where 17 funds are, according to the study's limitations, considered as low fee funds and 29 high fee funds. These funds are both having active management and passive management. The reason to why the study consists of both active and passive management is the fact that it is the fee compared to what risk that is involved and therefore the management style is not essential to the study. Also, compared to the initial result of 17 funds a sample of 46 funds may seem low, but due to the nature of this study and the criteria's being set, a lot of them had to be sorted out.

Since the sample group consists of a non-equal amount of funds, the values have been calculated to present a result that is as representative as possible. The criteria's who are present caused a loss in funds and therefore it is possible that the result cannot be
representative for the entire Swedish fund market. The best outcome would have been to have an equal number of funds in each group and that they both had funds with the exact same investment style and management. The study only examines the Swedish stock fund market and therefore, no conclusions can be said about other fund markets or other types of funds than stock funds. However, the goal is to see tendencies and a broader understanding of the relationship between risk and fees.

4.4 Statistical Method

The most reasonable approach for this paper is to use a multiple linear regression analysis. The multiple linear regression model is a fundamental and useful statistical method to find a significant relationship between a dependent variable and independent variables. It helps to determine the statistical significance of the results generated, both in terms of the model as a whole and the contribution of each of the individual variables (Pallant, 2005). To create the regression analysis, SPSS was used. As mentioned previously, the regression model will contain the mutual fund’s management fee as the dependent variable, and Beta, Alpha, Sharpe and Standard deviation were used as independent variables. To test a possible connection between the mentioned variables, a confidence interval of 95% was used. The P-value generated through the regression analysis has to be below 0.05 for the connection to be seen as significant. The formula is written as follows:

\[ y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_p x_{ip} + \epsilon \]

\( y_i = \) Dependent variable  \\
\( x_i = \) Independent variables  \\
\( \beta_p = \) Slope coefficients for each independent variable  \\
\( \beta_0 = \) Y – intercept  \\
\( \epsilon = \) Error term

4.5 Correlations

The purpose of this study is to analyze and come to a conclusion regarding risk, return and management fee. The focus has been to create a multiple regression analysis between
key values as independent variables and the annual management fee as the independent variable. In addition, multi-correlations in excel between Management fees, Standard Deviation, Beta, Alpha, Sharpe and in this part, a decision was made to include the average annual return as well. In the empirical findings chapter, figures of the correlations will be presented, and scatterplots will be presented in the appendix to generate a clearer vision in addition to the regression analysis. As mentioned before, the correlation takes on a value between +1 and –1. Breaking it down to smaller parts in accordance with Shiu et al. (2009). They describe the different correlation coefficients between variables of 0 and 0.2 has no relationship, 0.21 to 0.40 has a weak relationship, 0.41 to 0.60 has a limited relationship, 0.61 to 0.80 has a strong relationship and 0.81 to 1.00 has a very strong relationship to one another. Same applies to the negative values but explains a negative relationship instead of positive.
5 Empirical findings and analysis

This section presents the empirical findings from both the multiple regression analysis and correlation analyses. Links towards prior research will be drawn and an analysis of the achieved results will be explained. An answer to the stated research questions, purpose as well as the hypotheses will be presented.

5.1 Empirical findings

Table 2 shows the average values of the total sample space incorporated into the regression analysis.

Table 2 Descriptive statistics

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AnnualFee</td>
<td>1.0524</td>
<td>.50995</td>
<td>46</td>
</tr>
<tr>
<td>Beta</td>
<td>.9878</td>
<td>.10639</td>
<td>46</td>
</tr>
<tr>
<td>Alpha</td>
<td>.0693</td>
<td>.36358</td>
<td>46</td>
</tr>
<tr>
<td>Sharpe</td>
<td>.1099</td>
<td>.08042</td>
<td>46</td>
</tr>
<tr>
<td>STDdev</td>
<td>15.0598</td>
<td>1.43202</td>
<td>46</td>
</tr>
</tbody>
</table>

Table 3 display that the value of R Square (the regression coefficient) is .330, which is equal to 33% (.330x100=33%). This indicates that this model explains the variance in the dependent variable. Also, 33% of the variance in annual fees are explained by the model and that it has a positive relationship with the independent variables.

Table 3 Summary of the multiple linear regression analysis

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>Model R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.775a</td>
<td>.330</td>
<td>.205</td>
<td>.0483</td>
<td>.330</td>
<td>5.555</td>
<td>4</td>
<td>41</td>
<td>.002</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), STDdev, Alpha, Beta, Sharpe
b. Dependent Variable: AnnualFee
Table 4 demonstrates that the low F value and the less significant value (p<.002) announce that the model has a statistical significance and that there is a relationship between the variables. Table 4 also argues that the current study's model is statistically significant as there is a lower F value.

*Table 4 ANOVA from the multiple linear regression analysis.*

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>5,155</td>
<td>4</td>
<td>1,289</td>
<td>5,055</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>10,453</td>
<td>41</td>
<td>.255</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>15,600</td>
<td>46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*ANOVA*  
  
a. Dependent Variable: AnnualFee  
b. Predictors: (Constant), STDDev, Alpha, Beta, Sharpe

In accordance with the regression analysis the smaller significance level P<0.05 shows the most significant contribution to the dependent variable (Shiu et al., 2009). As we can see in table 5 the P-value or Sig, shows that all regressors are higher than 0.05 which means that we accept the null hypothesis and concludes that there is no significant relationship between a mutual funds' annual management fee and the individual values used as regressors. However, Standard deviation with a P-value of 0.058 shows that there are some tendencies to a relationship which also is reflected in table 8 further down.

*Table 5 Coefficients from the multiple linear regression analysis*

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>1,451</td>
<td>1,533</td>
<td>.947</td>
</tr>
<tr>
<td></td>
<td>Beta</td>
<td>-2,006</td>
<td>1,301</td>
<td>-.362</td>
</tr>
<tr>
<td></td>
<td>Alpha</td>
<td>2,114</td>
<td>1,754</td>
<td>1.305</td>
</tr>
<tr>
<td></td>
<td>Sharpe</td>
<td>-12,511</td>
<td>8,074</td>
<td>-1.708</td>
</tr>
<tr>
<td></td>
<td>STDDev</td>
<td>.187</td>
<td>.095</td>
<td>.454</td>
</tr>
</tbody>
</table>

*Coefficients*  
a. Dependent Variable: AnnualFee

Table 6 illustrates the correlation matrix for the low fee funds. Most interesting is the correlation between the annual fee and the risk measures included in the paper. Alpha has
a moderate positive relationship to the annual fee, while Sharpe only has a weak positive relationship. Beta and Standard deviation both share no relationships to the annual fee. This is interpreted as if the annual fee increases with 1% the Beta, for example, would decrease with \(-0.83\%\)\((-0.0083039\times100=-0.83\).

**Table 6 Correlations between low fee funds**

<table>
<thead>
<tr>
<th></th>
<th>Annual fee</th>
<th>Beta 1Y</th>
<th>Alpha 1Y</th>
<th>Sharpe 1Y</th>
<th>STDEV 1Y</th>
<th>RETURN 1Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual fee</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta 1Y</td>
<td>-0.0083039</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alpha 1Y</td>
<td>0.414005127</td>
<td>-0.3850059</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharpe 1Y</td>
<td>0.357404932</td>
<td>-0.5823748</td>
<td>0.97328901</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STDEV 1Y</td>
<td>-0.01884916</td>
<td>0.9772244</td>
<td>-0.4264822</td>
<td>-0.61147449</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RETURN 1Y</td>
<td>0.41827844</td>
<td>-0.3338823</td>
<td>0.95572179</td>
<td>0.927652488</td>
<td>-0.359250165</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7 illustrates the correlation matrix for high fee funds. In comparison to the findings above the opposite is found in this matrix. Alpha and Sharpe share a weak negative relationship to the annual fee while both Beta and Standard deviation both experiences no relationships.

**Table 7 Correlation between high fee funds**

<table>
<thead>
<tr>
<th></th>
<th>Annual fee</th>
<th>Beta 1Y</th>
<th>Alpha 1Y</th>
<th>Sharpe 1Y</th>
<th>STDEV 1Y</th>
<th>RETURN 1Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual fee</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta 1Y</td>
<td>0.068368268</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alpha 1Y</td>
<td>-0.30905726</td>
<td>-0.6089607</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharpe 1Y</td>
<td>-0.34004382</td>
<td>-0.5967172</td>
<td>0.99307463</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STDEV 1Y</td>
<td>0.071775792</td>
<td>0.7338026</td>
<td>-0.3524039</td>
<td>-0.38095682</td>
<td>1</td>
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</tr>
<tr>
<td>RETURN 1Y</td>
<td>-0.33105762</td>
<td>-0.5512468</td>
<td>0.99582039</td>
<td>0.985557436</td>
<td>-0.274010777</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 8 shows that when both high fee funds and low fee funds are combined, there is a weak positive relationship between fees and Beta. Alpha has a weak negative relationship while Sharpe experiences a moderate negative relationship. The standard deviation has the most positive relationship, although it is a moderate positive relationship.
Table 8 Correlations between the full sample space

<table>
<thead>
<tr>
<th>Correlation Total</th>
<th>Annual Fee</th>
<th>Beta</th>
<th>Alpha</th>
<th>Sharpe</th>
<th>STDdev</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Fee</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>0.269459222</td>
<td></td>
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<td>Alpha</td>
<td>-0.373297448</td>
<td>-0.80506</td>
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<td></td>
<td>1</td>
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<tr>
<td>Sharpe</td>
<td>-0.41794669</td>
<td>-0.62475</td>
<td>0.990933</td>
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<tr>
<td>STDdev</td>
<td>0.443150253</td>
<td>0.783164</td>
<td>-0.45216</td>
<td>-0.50524</td>
<td>1</td>
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</tr>
<tr>
<td>Return</td>
<td>-0.377358501</td>
<td>-0.55538</td>
<td>0.993638</td>
<td>0.984304</td>
<td>-0.38709</td>
<td>1</td>
</tr>
</tbody>
</table>

5.2. Analysis

Management fee

Implications in the final model show that an increase in the risk variables beta and standard deviation leads to a higher management fee yet delivering a decreasing return. Burton, G. Malkiels (2013) findings described in 2.3 was that actively managed funds with a high fund fee tend to go out of business looking at long timespan.

The R-square value of 33% shown in table 4 implies that a significant amount of the variance of the dependent variable is left unexplained by the chosen regressors. Suggestion on how to find the remaining amount of explanatory variables will be presented in the next section.

Beta

Beta had a P-value of 0.131 in the regression analysis showed in table 5 since the significance level is set at 0.05 or 5% beta is proven not to be significant at this point. Beta is not significant in explaining the annual fees. However, table 8 shows that there is a weak positive relationship as annual fees increases. There is no relationship for annual fees and beta when looking at the two separate groups consisting of low and high fee, meaning that beta does increase as the annual fee increases within the groups. Since this paper does not have any samples in between the two groups, more studies need to be done to find the point when beta stops to increase in relation to the annual fee. Since "middle fees" are not present the relationship heavily relies on the fact that beta has increased from the low fee funds to the high fee funds since there is no relationship when looking at the groups separately.
Standard Deviation
As mentioned in 5.1, Standard deviation with a P-value of 0.058 has no significant relationship with the management fees. It is not far from being significant thought and has the lowest P-value among the independent variables. However, looking at table 8 and table 10 in the appendix, we can see tendencies for the standard deviation to increase as the management fee of the fund's increases. This was somewhat expected as for an efficient portfolio, higher risk, or volatility in a fund leads to the investors demanding a higher return. All funds in this data sample do not, however, hold an efficient portfolio which is clearly shown due to the fact that as the risk and annual fee increases, the return tends to decrease. Breaking the funds down to low and high fee funds, the change in standard deviation is almost still in relationship with how the management fee increases.

Sharpe and alpha
Neither Sharpe or alpha had a P-value near 0.05 and has therefore no significant relationship with the management fee. Looking at table 8, we can see that Both values decrease as the standard deviation, beta and management fee of the fund's increases. In the two different groups, we can see an inverse relationship between the variables which shows that in the low fee funds group, alpha and Sharpe increases and in the high fee funds group they decrease as the management fee increases. Even though this research only analyzes the annual values of a one year period, the results are that in accordance with Dahlquist, Engström and Söderlind (2000) and Burton, G. Malkiel (2013) findings that low fee funds outperform high fee funds on average.

5.2.1 Overall analysis
Looking at all scatter plots in the appendix regarding the low fee funds, we do not see any difference in how the passively managed and actively managed funds perform. As mentioned in 1.2 Gruber, MJ, Elton, Edwin J, (1997) found evidence that managers of actively managed funds have tendencies to invest as benchmark huggers, which is confirmed in this case.

The Inverse results showed in table 7 and 6 is an exciting finding as it shows an opportunity for fund managers that charges a low fee. In this sample, we can see that
managers can raise their fund fee up to a point between 0.7% and 1.2% without manipulating the risk profile of the fund and still yield a higher return if investment decisions are accurate. Regarding the high fee funds, when the fee starts to exceed the point of 1.2%, the return starts to decline, and the risk slightly increases on an average basis, yielding no opportunity to raise its fund fee if all investors would be perfectly risk-averse. It also shows the inefficiencies of high fee funds and the saying "high risk high return" actually could be rephrased to "high risk low return." Which leads into the research question; “At what level does Asset Under management fees become inefficient?”

There is no definitive answer. However, when looking at the fund “Viking fonder Sverige A” which is the highest fee fund, it is the fund that performs the worst return wise and has one the higher risk profiles. Speaking on an average basis, funds that exceed a management fee of 1.2% gets both riskier in terms of beta and standard deviation and the return does not reflect that at all. Therefore, inefficiencies are starting to occur already when the fee exceeds 1.2% on average.

The question, how much additional risk a fund manager needs to integrate into their portfolio in order to raise the fund fee on the Swedish mutual fund market, can be answered by looking at table 5 to analyze each of the four risk variables. Note that these findings are as a group, both low and high annual fees. The risk measurement beta has a standardized beta value of –0.362, meaning that as annual fees increase by 1%, the beta value will decrease by 0.362%. This conducts that as annual fees increase, the fund will be less volatile than the market. Combining the beta coefficient values of the four risk measurements, it shows that risk develops slower than the annual fee on average. However, Alpha has a high beta coefficient of 1.305 and as the annual fee increases the fund will still increase its potential to beat the benchmark index, but since Sharpe has a beta coefficient value of –1.708 the risk-adjusted performance will be worse of as the fee increases. The standard deviation has a beta value of 0.454, meaning that it will increase by 0.454% as the annual fee increases by 1%. Since the beta, as mentioned above, will decrease as the fee increases standard deviation will still increase meaning that the volatility will increase although less than the market itself. These values are not significant since all of them show P>0.05.
Looking at the correlation in table 8 there is a relation for standard deviation and beta to the annual fee in a positive manner while Sharpe and Alpha show a negative relationship, noticeable is that the return shows a negative relationship as well. The relations are either weak or moderate. Since the sample consists of a majority high fee funds rather than low fee funds, the total result will lean towards a high fee fund bias. The negative relationship for alpha, Sharpe and return suggest that the funds perform worse when annual fees are increased. This is confirmed in table 6, where the opposite relation is found. In the low fee funds, a positive relationship to Alpha, Sharpe and return is present while standard deviation and beta have no relationship at all.

These findings make it hard to precisely predict how much extra amount of risk that is needed for a fund manager to raise its fund fee to a level that is justified by the development of the return in the fund. It rather suggests that the fund managers should deal with the decision to raise its fee with extreme caution so that it does not decrease the cash inflow to the fund.

6 Conclusion and recommendations

In this chapter, we will present answers to our purpose and research questions. The social impact of the content will also be discussed and several angles on future research regarding the risk and fund fee relationship will be recommended.

6.1 Conclusion

The purpose of this research was to investigate the relationship between the annual fee of both active and passively managed mutual equity funds investing in mid and large-cap companies in Sweden. The sample space of 46 funds was divided into low fee funds and high fee funds to analyze how different risk measures behave in the two groups as well as a full sample space. By fulfilling the purpose, it led to many interesting conclusions. As a whole, this sample does not reflect an opportunity for fund managers to raise the fee, risk and still generate a higher return. This shows that the market lacks in terms of efficiency and raises further questions regarding consumer behavior.
An obvious conclusion is that as the management fees increases, risk does follow the same trend, but not in a significant way. Thereby, high fee funds generate worse profit in comparison to the low fee funds. The weak correlation for the annual fee to beta and standard deviation shows that risk increases as fees increases. However, according to the regression analysis the variables are not significant and does not affect the fee as a whole. The correlation analysis does tell us that they move together a little bit but not enough to provide a return good enough to beat the market.

It is also clear that when comparing the correlations for low fee funds and high fee funds the results are the opposite to each other and therefore we assume that there is a point in between these groups that leads to the most efficient outcome. Our concluding remarks is that there is such a point and that it exists somewhere in between management fees of 0.7% to 1.2%.

As a manager who evaluates their performance via these values, the ultimate outcome would be to have a correlation between annual fee and return as close to 1 as possible. In addition to that, evaluation measurements such as Sharpe and Alpha would be preferred to be close to 1 as well. This is not the case and the only group which has positive correlations with Alpha and Sharpe are the low fee funds. However, looking at the groups individually, we can see that there are no strong correlations at all in any of the groups. The regression analysis also proved that these variables we have measured not to be significant.

Overall, there is enough evidence to conclude that due to market inefficiencies fund managers has a hard time to justify any increase in risk and fund fee as it decreases the performance of the fund and that if managers are thinking about raising the fee, it should not exceed 1.2% in delivering a well-functioning fund.

6.2 Social contribution

The evidence provided in this paper can help the public understand the relationship between fund fee, risk and return. This will lead to more excellent knowledge encouraging a different mindset regarding how consumers invest their savings. Hopefully, this will lead to a more efficient market, as supply and demand are essential as it is overall different
industries. This will, in turn, lead to fund managers reevaluating their strategies in terms of fund fee decisions in relation to their risk profiles.

6.3 Further studies

In this study, no significant relationship was found between a funds annual management fee and several different risk measures. This encourages further investigation to be made on different fronts. Firstly, a more extensive similar research is needed with a higher amount of funds over a more extended period of time to see if the findings in this paper are accurate. Also, an idea is to incorporate smart beta funds into the research in the future as they still are a very new investment strategy with minimal information as of now. Secondly, research of customer behavior would be an exciting extension of this paper to see why these inefficiencies are allowed to persist. Why do customers keep investing in funds that do not generate a return that reflects the fee of the fund? What are the underlying reasons? Is it that they are too lazy to analyze what it means to invest in a riskier fund? That would be of great interest both for fund managers and the public.

Our research excluded funds within the annual fee range of 0.7% to 1.2%. Therefore, funds within this range need to be included in further investigations to see if any correlations exist or if a regression analysis can find any significant relationships. There are also possibilities to exclude any of the types of management styles a mutual fund can have, such as passive or active management. This can enable the research to compare the amount of risk an active fund includes in the portfolio to a passive and vice versa. Since Sweden is a relatively small market, there is also a need to either include more Nordic countries or broaden the research to the US where a considerable amount of funds exist and to incorporate a global mindset that will, over time most definitely become of greater importance.

Another way for further research to approach this subject is to widen the risk definition and adapt the research after other risk measurements. During the research, we discovered that the risk profile stated in the information paper every fund present that they often tend to have their own risk measurements such as what markets they operate in, whereas the fund invest in growth or value funds or the combination between them both. Narrowing
the research to specific sectors could also be a way to limit the risk measurements into a smaller segment.
References


Appendix 1

Table 9  Scatter plots of correlations between annual fee and return
Table 10 Scatter plots of correlations between annual fee and alpha
Table 11 Scatter plots of correlations between annual fee and standard deviation

![Correlation Low fee](image1.png)

![Correlation high fee](image2.png)

![Correlation Total](image3.png)
Table 12 Scatter plots of correlations between annual fee and Sharpe