An analysis of mutual fund performance in Norway

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Abstract

I am analyzing the performance of 19 actively managed Norwegian mutual funds that primarily invest in the Norwegian equity market over a 10-year period from January 2006 to January 2016. This study investigates the stock picking abilities of the managers of these funds and compares their returns against four passive index funds as well as the active funds’ benchmark.

To test the performance, I am looking for positive alpha values using different statistical models. I am also calculating four different performance measures and comparing them to each other and the funds’ benchmark.

The results of this study are a bit mixed. Using statistical models, very few of the funds are able to produce significant outperformance when considering returns after expenses. When looking at gross returns there are a few more funds that are able to produce significant results, but they are still nowhere near the majority. The different ratios however, implies that the managers are actually doing better than their benchmark.
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1 Introduction

1.1 Background

Over the last years we have seen an increase in investments in Norwegian mutual funds, both in actively managed funds and passively managed funds. The number of funds and the total amount of assets under management has both increased substantially. Norwegians look to get higher returns on their investments and are willing to take higher risks and are turning more and more away from the safe alternative of just putting their savings in their local bank. This leads to an interesting question. Do you really get what you pay for when you invest in an actively managed fund, or are you better off going with an alternative such as investing in a passive index fund?

I up until recently assumed you got what you paid for, or else your customers would just go elsewhere, right? What inspired me to write my thesis on this topic was an analysis I did with three of my class mates a couple of weeks ago. We looked at the performance of a fund that is considered to have done well the last few years, but when looking closer at their performance there was no significant deviation from the benchmark. This was surprising to me and made me want to take a look at more funds and hopefully be able to form an opinion on the general performance in the industry.

The discussion of whether or not you get what you pay for in an actively managed mutual fund used to only take place in academic articles, but has recently gotten more attention in the media. During 2015 The Financial Supervisory Authority of Norway has criticized some of the largest active mutual funds in Norway of not being active enough (Finanstilsynet, 2015). The critique is based on the fact that the funds do not deviate enough from the index. You might get a higher return than you would get at your local bank in a savings account, but if the return is not higher than the benchmark you are paying too much. If the fund charges fees as if it was an actively managed fund, but behaves more like a passive fund, the customers are not getting the service they are paying for.
There is very limited research done on fund performance in Norwegian mutual funds in the recent years. Because the Norwegian market is not as extensively studied as for example the American market there might be a higher chance of inefficiencies in the Norwegian market. If the prices are set by irrational investors, finding underpriced shares and outperforming the market should be easy for a professional investor.

In this paper I seek to find out if you get what you pay for when choosing to put your money in an actively managed mutual fund. I am using data from several different actively managed funds in Norway over the last decade to measure performance and to find out whether or not there is a significant deviation from the benchmark.

1.2 Problem statement

The problem can be formally stated as:

“Do Norwegian actively managed mutual funds deliver a significantly different return compared to a passive benchmark?”

Fund performance has been researched a lot and is a relevant topic in Norway these days. I want to find out if actively managed funds can actually deliver on what they claim they are doing. I am also comparing their performance to the alternative of investing in passive funds to see if an investor is compensated for choosing an actively managed mutual fund instead of something else.

1.3 Contribution

With this study I aim to contribute to the existence of literature on mutual fund performance in Norway by a great deal as the amount of existing literature is limited. This study is meant to be complementary to existing literature and to add value by using a slightly different approach. This is a relatively comprehensive study due to the range of different tests of managers’ stock picking abilities. While other studies might use only one model I am using different models. I am also using weekly data instead of monthly or yearly data and I am looking at the last 10 years which include the financial crisis in 2008 so I believe this study
tests performance in not just an upwards trending market, but in a range of different markets.

1.4 Delimitations

I am primarily looking at 19 actively managed funds that invests all or most of their capital in Norwegian equities. I am also looking at four passive index funds to have something to compare the active funds to. As I am only looking at 23 funds in total I cannot say that my conclusion is valid for all Norwegian mutual funds. This study is meant to give an idea of how the actively managed Norwegian mutual fund market is in general. I believe that the study does this. It is worth noting that because I am only looking at data over the last 10 years I cannot say that this is the way it has always been or is always going to be. This period includes all different economic cycles and I think it serves its purpose of giving a general image of the market.

Several of the models used assumes that returns are normally distributed. The single index model has an underlying assumption that a mutual fund’s return can be explained sufficiently by a model where market return is the only risk factor.

It is important to mention that this thesis is not meant to give advice on investing. This study is not meant to be used by individual investors as a guide to picking the right mutual fund. It is only meant as a general investigation of the industry. Therefore, no consideration has been taken when it comes to transaction costs or taxation as this will wary by a lot between different individuals.

1.5 Structure

The rest of my thesis is organized as follows: Section 2 will be an introduction to mutual funds and the Norwegian mutual fund market and its regulations and towards the end I’ll write about the differences between active and passive asset management. Section 3 is where I review relevant previous literature on the subject. In section 4 I present the theory of which this thesis is built upon. Section 5 describes all my data in detail and the methodology used to get my results and form my conclusion. Section 6 contains all the
empirical results from the tests described in the previous sections. In the last section of this paper is my conclusion.

2 Mutual funds

In this section I will write a little about what a mutual fund is, how they operate in Norway and their regulations. I am also going to introduce the concept of active vs passive management.

2.1 What a mutual fund is

A mutual fund is a fund made up of several pools of funds collected from different investors for the purpose of creating an investment vehicle. Mutual funds invest in securities such as stocks, bonds, money market instruments, cash and similar assets. Mutual funds are run by money managers who invest the capital of the fund and try to produce an income for the fund’s investors. A mutual fund can have different investment objectives that decides how the fund’s portfolio has to be constructed. A mutual fund provides investors with easy access to global markets, better diversification and professional money management. For a private investor these things would be harder to get on your own because a well-diversified portfolio spreads the risk over several different assets which would have high transaction costs. By collecting funds into one pool, the transaction costs decrease. A mutual fund typically provides a better return on your investment compared to regular bank deposits.

Each investor in the fund participates in the total gain or loss of the fund in proportion to how much they have invested. Mutual funds issue units or shares than can be purchased at the funds current net asset value (NAV). You can buy shares directly from open-end funds. When you buy shares the fund’s assets increase by the amount you spent on the shares. Closed-end funds issue a fixed number of shares which are sold and purchased in the market. The market determines the price of the fund’s shares and because of this the price might be different from the NAV of the fund and you might end up paying more for the shares or getting them at a discount. Mutual funds may charge a management fee to pay for their expenses. Fees are important to look at because these reduce the net return an
investor actually gets. A fund may have high gross returns, but if their fees are too high the investor does not actually benefit from it.

A common mutual fund is the index fund. An index fund aims to replicate the returns of a market index by holding the same assets as the index with equal weights. To keep equal weight in different assets takes a lot of rebalancing which can be expensive because of transaction costs. Because of this, some managers try to replicate the returns of the index by investing in fewer assets that tend to move in the same direction as the index and end up with the same return. An index fund’s goal is to follow the market and is therefore said to be following a passive investment strategy, the opposite of an active investment strategy that aims to beat the market.

Equity funds invest in one or several different markets. Bond funds invest in bonds or other type of debt securities. Money market funds invest in liquid, low risk securities typically with a shorter time to maturity. Exchange traded funds (ETFs) is a lower cost alternative to index funds. ETFs are traded on exchanges like regular stocks and are shares in a diversified portfolio. ETFs are traded during the opening hours of the exchange and its prices are determined by the market and therefore the shares might trade at a discount or a premium.

2.2 Norwegian mutual funds

Mutual funds were not well represented in the Norwegian market until recently. In 1982 there was only a single mutual fund on the Oslo Stock Exchange (OSE) and the market value of Norwegian equity mutual funds was only 290 million NOK (Gjerde and Sættem, 1991). Over the last couple of decades, the number of funds and the size of their assets has increased a lot. Today the market value of Norwegian mutual funds has increased to over 900 billion NOK (SSB, 2015).

Like other mutual funds Norwegian mutual funds are also divided into different categories by how they invest like equity funds, bond funds and money market funds. Equity mutual funds is the biggest group and accounts for about half of the total market value and it is continuing to grow along with the market as a whole. An equity mutual fund is a fund that invests at least 80% of its assets in equities. This is the group I have decided to focus on in this study.
Since around the year 2000 there has been a negative net flow from Norwegian equity funds (Sørensen 2009). Investors have decreased the share invested in equity mutual funds with a Norwegian mandate and have instead gotten more interested in equity funds with an international mandate. While 92% of all capital invested in equity mutual funds in 1994 was in funds with a Norwegian mandate, this fraction has decreased and was less than 20% by the end of 2008. Even though we have seen a withdrawal of funds, the Norwegian equity mutual fund industry is still substantial. The Norwegian Mutual Fund Association reports assets under management of around 86 Billion NOK (VFF, 2016).

Most Norwegians have the majority of their assets invested in real estate, and less in equities (Andreassen, 2014). According to Andreassen (2014), this is because of the tax benefit Norwegians obtain by investing their savings in housing instead of securities. In Norway, capital gains on your house is not taxed. Gains on equities and other financial instruments are taxed at 27 per cent. An explanation of the large number of funds in Norwegian mutual funds even though most people have their savings in real estate is the restructuring of the Norwegian pension system. Over the last years Norwegian companies changed from defined benefit to defined contribution. The changes imply that instead of the companies having to guarantee the level of pensions, the pensions are now dependent on the return of the savings. This has led to an increase in interest for mutual funds because the employees are now responsible for their own pensions. Another reason might be the positive development of both the OSE and international investors wanting to invest in the Norwegian market.

2.3 Regulations

Like most funds in the rest of Europe, the most of open-end mutual funds in Norway are subject to the European Securities and Market Authority’s “Undertaking for Collective Investment in Transferable Securities Directives” (UCITS). The purpose of UCITS is to provide protection for investors and to promote competition between mutual funds in the European market. UCITS also aims to reduce hidden risks and increase transparency in the mutual funds that are offered to retail clients. If a fund does not follow the rules that are set by the UCITS directive, they are not allowed to be marketed freely across Europe.
The UCITS regulates both what kind of securities a fund may invest in, and the weight of the investments. In addition to this Norway has a legislation called Verdipapirfondloven (Mutual fund act) regulating mutual funds as a protection for investors. These regulations are somewhat similar and complements each other in many ways, especially considering diversification.

A fund abiding by the UCITS may only invest in the following instruments:

- Transferable securities
- Deposits
- Ancillary assets
- Financial derivative instruments
- Money market instruments
- Closed- and open-ended UCIs

There are also rules and strict definitions of what qualifies as one of these assets in terms of liquidity for example.

To encourage diversification and to reduce risk a UCITS fund is required to invest in at least 16 different securities. Funds are usually not allowed to invest more than 10% if its total value in securities or money market instruments issued by the same body, but if the security or instruments are issued by trustworthy public authorities or by a highly rated credit institution there can be made exceptions and the limit can be increased to 35 per cent for securities and 25 per cent for money market instruments.

Because UCITS aims to guarantee well diversified portfolios there is another rule in addition to the 10% max limit. This rule states that the sum of all positions exceeding 5% of the total value put together cannot exceed 40% of the total value of the fund. To regulate which securities the funds are allowed to invest in, the directive has several measures designed to target excessive bets. They can for example not have their total global exposure of the portfolio exceed the total value of the portfolio. Gearing is also regulated. A UCITS fund is not allowed to borrow more than 10% of net value.

These regulations are worth keeping in mind for this study mainly for one reason. These rules are international and regulate most mutual funds in developed countries without taking the size of the different economies into consideration. This means that regulations
influence mutual funds investing in different economies differently. A fund investing in a relative small economy such as Norway will be affected in a very different way than a fund investing in a bigger economy.

There are also some tax benefits when you invest in mutual funds in Norway that are worth mentioning here. Part of the gains from mutual funds is subject to a shielding rate which means that some of the returns are tax free. This rate is usually on the same level as the risk free interest rate you would get in a savings account at a bank. Any gains or above this rate are taxed with a rate of 27%, but only when the gains are realized. Losses on the other hand are tax deductible with the same rate of 27%.

2.4 Passive vs active asset management

Most Norwegian mutual funds have an active investment strategy. This is true for 19 out of the 23 funds I am looking at in this paper so it is important to distinguish between active and passive asset management as the whole point of this paper is to do research on whether or not active asset managers deliver what they are supposed to.

A mutual fund with an active investment strategy aims to produce higher returns than the market and its benchmark. In this case they aim to beat the Norwegian stock market. To deliver higher returns than the benchmark, asset managers have to hold a portfolio that is different from the benchmark. The actively managed funds try to do so by analyzing stocks using different tools and pick stocks that they think will outperform the market. For an active investment strategy to work one has to assume that there is mispricing in the market which conflicts with the efficient market hypothesis (EMH), but more on that later. Another way active funds can beat the market is by market timing. They can enter the market when they think the market is going to go up and exit the market when they think it is going to go down. They can also adjust the beta of their portfolio to be high when they think the market is going to go up and lower the beta when they think the market is going to go down.

There also exists funds with passive asset management strategies. These differ from the actively managed funds in the way that they do not try to beat the market or their benchmark. Passive asset managers want to hold well-diversified portfolios and not spend time on trying to improve the performance by analyzing and picking “winners” that will beat
the market. By holding the same shares as an index, the passively managed fund only needs to rebalance its portfolio when the index changes. Because active management requires a lot more work, buying actively managed funds usually are and should be more expensive than passive funds.

For index funds, bigger is better. Because portfolio management is relatively easy, the bigger the fund is, the easier it is to spread the operating expenses. If the fund is larger the expense ratio gets smaller. On the other hand, bigger is not always better for equity funds with an active investment strategy. The reason for this is for example if the fund wants to invest in a very specific or small industry it might be hard to invest all assets they want to without affecting the price of the selected stock. This leads to more research and work to find suitable investment alternatives which increase costs. It is not uncommon for an actively managed mutual fund to grow so big that it struggles to find good investment opportunities and end up holding a portfolio that strongly resembles the index and hardly deviates from it. The term “closeted index funds” is used by investors to describe a fund that claims to be actively managed and charges fees as if they were actively managed, but in reality they strongly resemble an index fund and deliver returns accordingly.

Because active funds require more work and are more expensive, they should also deliver higher returns, but do they really deliver on this? This is the question that inspired me to write this paper and I hope to find the answer to it.

3 Literature review

In this section I will give a short presentation of research done on mutual fund performance in different markets that I find relevant for this thesis.

3.1 Framework

Existing literature about mutual funds is mainly focused on performance, which is what I am analyzing in this paper. The most common is to test a fund performance up against a benchmark in order to see if there is a significant difference in the obtained return. If there is
a significant difference in the return of the fund compared to the benchmark this says something about the managers’ ability to pick stocks.

After money invested in the mutual fund industry increased, research on mutual funds and their performance also increased by a great deal. After understanding the contribution of the Capital Asset Pricing Model (CAPM), Treynor (1965), Jensen (1968) and Sharpe (1966) all developed their own models to measure fund performance. Jensen’s alpha (1968) is arguably the most significant and the most relevant out of these. It is still widely used in research on fund performance today. Jensen’s alpha is the concept of how Jensen measured performance. It is directly derived from the CAPM. By regressing a fund’s excess returns above the risk free rate, on the markets excess returns, Jensen developed a method to compare actual returns with returns predicted by the CAPM.

Even though it is still widely used today, Jensen’s alpha has been criticized, Especially by Roll (1978). He argues that because Jensen’s alpha is derived directly from the CAPM it has the same flaws. This is primarily the problem with an observable market portfolio because a true market portfolio should include all investable assets, for example art, real estate and so on, not just financial instruments. No one is able to know the exact composition of a true market portfolio including all assets that are possible to invest in. He also argues that the alpha is very sensitive to the choice of market portfolio or benchmark. This claim has also been backed up by Grinblatt and Titman (1989) and Elton, Gruber, Das & Hlavka (1993). They saw that the alphas in their studies were highly sensitive to different choices of a market portfolio.

Another factor of Jensen’s alpha that has been a victim of critique is the assumption that the beta is constant over time. Fama (1972) argues that a fund manager’s forecasting abilities can be divided into two separate categories where one is micro forecasting and the other is macro forecasting. Micro forecasting is forecasting the movement of the price of individual stocks while macro forecasting is forecasting the movement of the stock market in general. This means that a manager can outperform the market in different ways, either by picking individual stocks that are winners or by his abilities to go in and out of the market at the right time, or both. He argues further that Jensen’s alpha is only a measure of a managers micro forecasting skills and that managers that are successful in macro forecasting and market timing is not acknowledged by Jensen’s alpha. Jensen (1968) argues that using a
constant beta estimate, when market timing abilities are present should lead to a downward biased beta estimate and an upward biased alpha estimate. He then argues that being successful in market timing should be reflected in a higher alpha. While Grant (1977) on the other hand claimed that he found evidence that the beta estimate would be upward biased and that the alpha estimate would be downward biased when market timing abilities were present.

Because of these disagreements several methods of measuring market timing have been developed. A solution presented by Treynor and Mazuy (1966) involved adding a squared term of the market’s excess return to the standard index model. This would make the Security Characteristic Line (SCL) to be non-linear instead of linear. With this they tried to capture the fact that managers with market timing abilities would decrease their beta in bear markets and increase their beta in bull markets and therefore make the SCL non-linear.

Thanks to Ferson and Schadt (1996) the more recent studies relaxes the assumption of a constant beta by allowing the beta estimate to vary with some predetermined information variables. Their point is that the return of securities and bonds are to some degree time varying and possible to predict by looking at variations in interest rates, the corporate bond market, dividend yields and so on.

Even though it is not perfect and it has been on the receiving end of some critique Jensen’s alpha is still one of the most used methods of measuring performance in portfolios. People have tried to develop methods by for example not assume a constant beta, but a replacement for Jensen’s alpha has yet to be seen.

3.2 Findings in the U.S.

The U.S market is where the majority of studies have been done and this is where research on portfolio performance measurements started. Even though the subject has been studied thoroughly since the 1960s the question of whether or not portfolio managers are able to outperform their benchmark is still of relevance.

In Jensen’s (1968) study of 115 funds, he generally found under-performance both net and gross of costs and he was only able to find a single significant positive performance. No
conclusive evidence of portfolio manager’s stock picking skills was found by Treynor and Mazuy (1966) or Henriksson (1984) either. Treynor and Mazuy (1966) found statistically significant positive returns in only one out of all the 57 funds they were looking at. Similar results were obtained by Henriksson (1984) almost two whole decades later. He had developed his own method, but was only able to find 3 funds where the managers displayed significant macro forecasting skills out of 116 funds in total. However, Grinblatt & Titman (1989) did find significant positive alphas generated by managers of aggressive growth funds and generally in funds with limited assets under management. The same year Ippolito (1989) found 12 out of 143 funds with significantly positive alphas between 1965 and 1984. These results pointed towards managers actually demonstrating stock picking skills to some degree, but they were later discarded in a paper written by Elton et al. (1993). In the article they argued that Ippolito had used a faulty benchmark, and when they corrected this, they actually found underperformance instead.

While researching 93 different funds, Lee and Rahman (1990) found evidence that pointed to managers having some degree of micro forecasting skills in 17 of the funds. They also found significant market timing abilities. Ten years later while utilizing an adjusted Merton and Henriksson model, Goetzmann, Ingersoll & Ivkovic (2000) found no evidence to support market timing abilities among American mutual fund managers. Even though no real agreement on whether or not American fund managers possess market timing skills has been reached, there seems to be more evidence backing timing skills compared to stock picking abilities (Wagner, Shellans & Paul, 1992), (Broncanto & Chandy, 1994), (Graham & Harvey, 1996), (Chance & Hemler, 2001). Especially when macroeconomic factors are corrected for (Ferson & Schadt, 1996).

During the earlier years the main focus of these kind of research papers was to determine if managers possessed micro or macro forecasting abilities, but during the later years the focus changed to whether or not there is any persistence in their performance. Something that has received a lot of attention in the U.S market is the phenomenon of “hot hands”. This is the phenomenon in which a portfolio manager is able to consecutively outperform his or her benchmark. Greenblatt and Titman (1992) presented evidence that there is in fact persistence among good performers and Carhart (1997) claimed that persistence exists among bad performers as well and suggested that there is a “cold hands” phenomenon.
Malkiel (1995) found persistence amongst both bad and good performers while performing a survivorship bias controlled test. Although he did find persistence among the good performers, it is important to note that this was only a minority of the sample. Malkiel concludes that funds generally produce lower returns than their benchmarks even before you subtract the costs of operation. There seems to be a general agreement about the existence of a persistence phenomenon in the mutual fund market (Dahlquist, Engström & Söderlind, 2000).

Stocks being held by mutual funds do not typically outperform stocks that are not held by mutual funds, but stocks that the mutual funds are heavily invested in tend to outperform stocks they are not that heavily invested in. This is only true for a short time horizon though, mainly the first year. This is because mutual funds tend to keep stocks in their portfolio for a longer time than only one year, this might be because of the transaction costs that follows a constant rebalancing of the portfolio or because managers are simply not able to find undervalued stocks or “winners” often enough (Chen, Jegadeesh & Wermers, 2000).

3.3 Findings in Europe

Compared to the literature on fund performance in the US, there has been relatively little research on the subject in Europe. What both markets have in common is the disagreement of whether or not managers possess stock picking abilities. The research that has been done is varied in results and it is therefore difficult to form a general opinion of performance in the European market.

Otten and Bams (2002) did research on mutual fund performance in The Netherlands, Italy, France and the UK. Their sample was controlled for survivorship bias and consisted of 506 different mutual funds. Their results were mixed, but they found that small funds in general tend to outperform their benchmark. Even though the alphas for all the countries except for Germany was found to be positive, the only significant results for net returns was in the UK. In the other countries they found outperformance gross of costs which means that in the other countries the costs of active managements are too high compared to the returns they produce. When it comes to evidence of persistence they only found weak evidence except for in the UK. Blake and Timmermann (1998) also did research on the UK and only found
evidence of underperformance. While the studies were both done on the UK market it is important to note that the sample data is not from the same period as Otten and Bams (2002). The most comprehensive test on the UK market was probably done by Cutherton, Nitzsche & O’Sullivan (2008). Their study consisted of a test-sample from 1976 to 2002 and they also tested if the performance was caused by skill or by luck. They found positive alphas and over-performance, but found that funds who perform well are likely doing so because of luck and not because of skill. They also found that under-performing funds are usually caused by the managers being unlucky, so they found a general lack of skill and concluded that it is extremely hard to separate funds that have positive returns because of skill from the funds who have positive returns caused by luck.

Cesari & Panetta (2002) researched the market in Italy and found no significant positive alphas when looking at returns net of fees, but they did find some when looking at gross returns. This is in line with the research done in the UK and is another indicator of equity funds charging to high fees. They also tested for positive timing abilities but were unable to find any both gross and net of costs.

There has been some research in Scandinavia done by Christensen (2005), (2003) and Dahlquist, Engström & Söderlind (2000). Christensen looked at the Danish market and found that almost half of the Danish fund managers exhibited significantly negative performance while the rest had neutral performance. He found little evidence of managers having any market timing abilities and no evidence at all for persistence in performance. However, in Sweden, Dahlquist et al. (2000) found significantly positive performance in small equity funds, funds with a high trading activity and in funds with low fees. These findings in the Swedish market was somewhat backed up by Wallander (2012) who also found evidence of positive performance that was significant, but he was unable to find any evidence of persistence in the performance.

3.4 Findings in Norway

Research done on the Norwegian market about mutual fund performance is even scarcer than research on the European market. There is really not much research on the market at all.
The first real contribution is a research paper by Gjerde and Sættem (1991). In their study they evaluate the performance of Norwegian Mutual funds in the period 1982-1990. They used the models developed by, Jensen, Merton and Henriksson, and Treynor and Mazuy. In their study they did not find any evidence that points to managers having any stock picking skills. Even though they found no evidence of stock picking skills, all the funds outperformed their benchmarks in the years from 1982 to 1984. After these years had passed by, the observations were typically below the market index benchmark value. When it comes to managers possessing positive market timing abilities, they did in fact find that several funds displayed significant market timing coefficients. The authors were concerned with the stability of their results and stresses the importance of this. They state that the scores on performance measures of all the funds turned out to be very unstable and that the declining ability of portfolio managers to outperform the market may be a significant signal for future investments.

By examining performance persistence among individual investors Che, Norli and Priestley (2009) were able to find that some investors do have persistence in their positive performance. Building on this research, Sørensen (2009) wanted to see if the same thing was true for the Norwegian market. Contrary to the study he based his research on, he was not able to find evidence of persistence or positive performance. He actually told a Norwegian newspaper that the stock picking abilities of Norwegian fund managers were equal to those of a blindfolded monkey throwing darts at the financial pages.

I wrote a paper with three of my classmates for a class last semester where we looked into the performance of a Norwegian mutual fund (Burneikaite, Hafskjær, Kanestrøm & Røstadstuen 2015). We found no evidence of the fund managers being able to significantly outperform their benchmark even when looking at returns gross of costs.

Even though there has not been a lot of research on the subject in Norway, the general idea about the Norwegian market seems to be that there is little to none significant outperformance and that Norwegian fund managers charge too much for the service they provide.
4 Theory

In this section, I will present the fundamental theories, models and measures that my thesis is built upon.

4.1 The Efficient Market Hypothesis

The whole point of active management is to beat the market, this is done by exploiting inefficiencies in the market either by purchasing stocks that are undervalued or shorting stocks that are overvalued. A theory that is not only one of the most important and debated theories in all of the social sciences, but also directly contradicts active management is The Efficient Market Hypothesis (EMH).

The EMH was developed by Fama (1965) and Samuelson (1965). The EMH states that security prices reflect all available information and that they because of this are always correct. This implies that finding under- or overvalued stocks is impossible and therefore there is no point in trying to outperform the market. Henriksson (1984) states in his paper that managers will not be able to have any forecasting abilities and that they should just follow a passive investment strategy instead of trying to outperform the market by spending time on active management.

The level of efficiency is usually divided into three different forms (Malkiel and Fama, 1970).

The weak form of efficiency: prices reflect all historical information. This implies that prices in the past are not an indication of future prices and that attempting to create excess returns by observing patterns in historical data is not possible. Technical analysis which consists of observing patterns and trends in historical data does not work, however fundamental analysis has some potential in this form.

The semi-strong form of efficiency: In addition to all historical data, in this form the stock prices also reflect all information that is currently available to the public. This public data includes, but is not limited to fundamental data on the firm’s product line, balance sheets, forecasts of earnings, the quality of management etc. Both Technical and fundamental analysis serves no purpose in this form. The only information that can be used to get an edge is insider information which is illegal to use for trading.
The strong form of efficiency: In this form the stock prices reflects all information whether it is public or not. This means that not even insider information is able to provide you with the opportunity to produce excess returns, because absolutely all information is accounted for in the price. It is in other words impossible to outperform the market in this form. This form is extreme and seems unlikely, but even though it is extreme, one might argue that this form would be the most convenient for private investors. This is because in a market with strong efficiency the investors would be guaranteed a fair price and compensation for the risk they take no matter what they buy. And of course on the other hand for fund managers who aim to outperform the market this form is not as convenient.

The theory of efficient markets has received a lot of attention and criticism, especially from academics studying behavioral finance. The criticism is mainly aimed towards the assumption that humans are fully rational. While trying to keep my own opinions to a minimum I think it is fair to say that all humans are probably not fully rational creatures, especially when it comes to money and investment decisions. I think the mere existence of gambling somewhat proves this.

Another weakness of the hypothesis is that if the market truly is efficient, there is no possibility to produce excess returns by using an active investment strategy. If no one can outperform the market, then everyone should be profitable. This is of course not the case in reality. There are some funds who have outperformed the market and there are other funds who have underperformed the market.

Out of all the three different forms, the most plausible in Norway and most other developed financial markets seems to be the semi-strong form (Bodie, Kane & Marcus, 2011). As insider information or non-public information is the only possibility you have of beating the market in this form, the best investment decision seems to be to go with a passive index fund. Even though it might be the most plausible form, there has been found data that is inconsistent with a semi-strong efficiency. Basu (1997) tested if the P/E (price-earnings) ratio was fully reflected in prices of different securities. He found that high P/E securities were prized inappropriately compared to low P/E securities. He was however, not able to reject the hypothesis of a semi-strong form because the costs of finding these securities and taking advantage of the prices would offset the gain.
Testing the EMH is extremely hard or even impossible. This is because a test has to involve an equilibrium asset pricing model. Some of the anomalies that you might think is caused by the market not being efficient, might actually be caused by an incorrect model (Banz, 1981). Measuring abnormal returns without using asset pricing models to predict expected returns is impossible.

Grossman and Stiglitz (1980) claimed that perfectly efficient markets were impossible, because if markets are truly efficient there is no gain in gathering information and therefore no reason to trade. They meant that this was impossible because the markets would eventually collapse if this was the case. They introduced a new theory that implies that while all information might be available to investors, it is costly to get access to some of this information. They claimed that it is possible to make gains sufficient to compensate investors who are willing to collect this information. Black (1986) discusses noise in his paper. People trading on what he calls noise are traders that think that what they are trading on is information, but in reality it is just noise. Later studies have confirmed the efficient market hypothesis with costly information (Grinblatt and Titman, 1989).

Fama (1991) later introduced a modified version of the original EMH where he states that some temporary mispricing may occur in the market. Further he claims that Investors can profit from inefficiencies within a shorter period of time, but the arbitrage effect will eventually eliminate the inefficiencies.

Pedersen (2015) wrote a book where he introduces the idea of a market that behaves in a way he calls Efficiently Inefficient.

To give a brief summary of the EMH one could say that if markets were truly efficient, everyone would only buy index funds or apply other passive strategies and if everyone did this the market would not be efficient as no one would be willing to gather information.

4.2 Measuring performance.

To be able to compare the performance of different funds, we have to define some kind of performance measurement. There are different ways of measuring performance. I will in this section, write about a few of the possible ways of doing this.
Most if not all existing performance measurements are either the original Capital Asset Pricing Model (CAPM) or derived from it. These measurements rely on the same assumptions and therefore also have the same weaknesses.

4.2.1 The Capital Asset Pricing Model.
When comparing funds to each other one could simply look at the returns and rank them by size without adjusting for the difference in risk taken. The problem with this approach is that for the ranking to be fair and not misleading, we would have to find funds with truly similar risk levels and compare them to a similar benchmark. Because this is rather impractical, academics have tried to come up with an alternative that will estimate the performance of a portfolio while adjusting for the portfolio’s level of risk. The model that first succeeded in doing this is the well-known CAPM, developed by the brilliant minds of William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966). They argue that there has to be some compensation for investors to be willing to increase the risk-level in their portfolios. The CAPM describes the relationship between risk and expected return and tries to explain the equilibrium prices in the security market. The equation looks like this:

\[
E(r_i) = r_f + \beta_i [E(r_m) - r_f]
\]

Where

\[
\beta_i = \frac{cov(r_i, r_m)}{\sigma_m^2}.
\]

\(r_f\) = The risk free rate of return.

\(E(r_i)\) = The expected return of portfolio i.

\(E(r_m)\) = The expected return of the market portfolio.

The Beta of the CAPM is a measurement of the systematic risk. Because the risk of a single firm, also called the idiosyncratic risk, can easily be diversified away by the investor. This
implies that the expected return is linear related to the covariance of the return of the market portfolio. This is shown in the Security Market line (SML).

From the CAPM we can derive the SML. The SML graphs individual asset risks premiums as a function of asset risks. In other words, it shows what required rate of return needed by investors to compensate for different levels of risk. The slope of the SML is equal to the market premium, which is the same as the expected return of the market portfolio after subtracting the risk free rate.

The CAPM was built on the foundation of the efficient frontier. This is the set of optimal portfolios that offers the highest expected return for a given level of risk, or the lowest level of risk for a given return. The idea behind the efficient frontier is that investors should hold a mean-variance efficient portfolio. This means a portfolio that gives the highest expected return for a given level of variance. By drawing a tangent line from the intercept point of the efficient frontier to the point where the expected return is equal to the risk free rate, we get the Capital Market line (CML). The CAPM is a direct implication of the mean-variance efficiency of the market portfolio.

The CAPM has also received critique for some of its assumptions, the main ones are:

- All investors are risk-averse, and every one of them are price-takers. This means that they act as though prices of securities are not affected by their own trades. In addition to this all investors are mean-variance optimizers.
- All investors plan for an identical holding period and they all receive the same information at the same time.
- There is no limit on capital that can be borrowed at the risk-free rate.
- Assets are infinitely divisible, implying that anyone can take any position in any investment, no matter their wealth or size.
- No transaction costs, taxes or inflation.

I am using this model as a starting point when assessing the relative performance measure. By doing this I can compare the performance of the different funds without making any risk adjustments. It is worth mentioning that the validity of the CAPM relies on the true market portfolio, which is very difficult to find.
4.2.2 Jensen’s Alpha

Jensen’s alpha is a performance measurement developed and named after Jensen (1968). The $\alpha_i$ is a measure of absolute performance. It measures the abnormal return and is used to evaluate a portfolio or fund manager’s stock picking abilities. The model looks like this:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i (r_{m,t} - r_{f,t}) + \epsilon_{i,t}$$

Where

- $r_{i,t} - r_{f,t}$ = excess returns
- $r_{f,t}$ = risk-free rate
- $\beta_i$ = beta of the asset/portfolio.
- $r_{m,t}$ = market return.
- $\beta_i = \frac{\text{Cov}(r_i, r_m)}{\text{Var}(r_m)}$

Based on the CAPM the portfolio’s returns should be fully explained by the risk of the portfolio, measured by the beta. By subtracting the risk free rate which is the constant in the CAPM, our constant, the alpha should now be equal to zero. If the alpha is different from zero, the portfolio has abnormal returns. The alpha can either be positive or negative. A positive alpha shows positive outperformance and good stock picking skills while a negative alpha shows underperformance and poor stock picking skills.

After Jensen published his study, Jensen’s alpha has been the most commonly used estimate to measure portfolio performance (Bodie et al, 2011). Even though it has been used a lot it is not flawless. Levering a portfolio can scale alphas up. This means that a higher alpha does not necessarily imply a higher value on other measures, for example the Treynor-ratio. The popularity of Jensen’s Alpha is actually declining. The reason for this seems to be that even though managers possess stock picking skills, the alpha of their portfolios tend to be small.
This makes it hard to statistically prove that the alphas are significantly positive. In addition to this the choice of benchmark also affects the size of the alpha (Lehmann & Modest, 1987).

4.2.3 The Fama-French three-factor model.

The CAPM has been heavily criticised for not being able to explain the expected return to sufficient extent (Stattman, 1980), (Banz, 1981), (Bhandari, 1988). The CAPM is using the beta as the only explanatory variable for the systematic risk, but empirical studies have shown that there must exist additional factors that explain expected returns. Eugene Fama and Kenneth French developed a model with two additional factors to better explain the anomalies that critics have pointed out. Their model has been proven to be a better model to explain expected returns because it captures other factors that have shown to be important such as macro events. The two new factors are called HML and SMB which stands for high minus low and small minus big. The model takes the size and book-to-market anomaly into consideration, which means that value stocks and small stocks are riskier since they are more sensitive to macroeconomic factors, while growth stocks and large stocks on the other hand are less risky since they are hedged against recessions to a higher extent. The explanation for this is that growth stocks can in an easier way postpone investments in recessions, while value stocks have less flexibility and presumably have capacity surplus when demand decreases.

The statistical model is defined as:

\[ R_t - r_{ft} = a + \beta_m (R_{mt} - r_{ft}) + \beta_S [SMB_t] + \beta_H [HML_t] + \epsilon_t \]

Where

\[ SMB_t = R_{S,t} - R_{B,t} \]
\[ HML_t = R_{H,t} - R_{L,t} \]

It is important to emphasize that this model is based on the arbitrage pricing theory. The no arbitrage model does not say anything about the expected returns of individual assets, it only considers well diversified portfolios. Furthermore, we do not subtract the risk free rate.
from the SMB and HML terms because this is just long/short strategies where the portfolios sum to zero.

By using this model, we are reducing the possibility of getting misleading alphas. As with Jensen’s alpha we want to test if alpha is significantly different from zero which would indicate an under- or outperformance.

### 4.2.4 The Sharpe ratio

This measurement was introduced by William Sharpe after the release of the Treynor ratio. The simplicity of calculating the Sharpe ratio makes it the most common risk adjusted performance measure. The ratio accounts for both systematic and unsystematic risk. The ratio gives an indication of how high the returns are compared to how risky the portfolio is. A high ratio indicates that the fund has performed well relative to the risk it has taken. A high ratio is not equivalent with a low volatility, but an improvement of the risk/return relationship. Volatility is measured in an absolute term and can therefore be advantageous over an alpha measure.

\[
Sharpe\ ratio = \frac{r_p - r_f}{\sigma_p}
\]

It is however important to remember that it disfavors less diversified portfolios regardless of the portfolios return. Another problem with the Sharpe ratio is that it does not take leverage into account.

### 2.4.5 The Sortino ratio

The Sortino ratio is a modification of the Sharpe Ratio were we calculate the standard deviation by only using negative asset returns. This is called the downside deviation and is considered to be a more accurate measure because we associate losses with negative volatility. This type of volatility is undesirable compared to the positive volatility that creates
higher returns. A large Sortino ratio is a good indication that the fund is performing well and means that the portfolio is usually not facing large losses. The ratio can be calculated as:

\[ \text{Sortino} = \frac{R - rf}{\sigma_d} \]

Where

\[ \sigma_d = \text{Standard deviation of Negative asset returns.} \]

2.4.6 The Information ratio

The information ratio calculates the investor’s ability to generate excess return relative to a benchmark. When the mutual fund outperforms similar funds in a chosen population we get a higher ratio.

Since the nominator is calculated as the excess return compared to an index or benchmark instead of the risk-free rate it is not uncommon to receive a negative ratio. A positive information ratio indicates that the fund has performed in the top 50% of the population, whiles a negative return implies that the fund has performed in the bottom half. The ratio provides good insight to how well the fund managers are performing with respect to the chosen benchmark. It is important to remember the possible upward biased caused by the transaction cost, and be aware of misleading result caused by a negative excess return (Blatt, 2004). The ratio is typically annualized and is read as:

\[ \text{Information Ratio} = \frac{\tau_p - \tau_b}{\sigma_{p-b}} \rightarrow \frac{\alpha_p}{\sigma_{p-b}} \]

Were

\[ \alpha_p = \text{difference between fund return and index return. (excess return)} \]

\[ \sigma_{p-b} = \text{Standard deviation of the excess return} \]
It is important to note that there are no indexes that perfectly reflects the composition of a given portfolio and the choice of benchmark is very important to get an accurate estimate.

4.2.7 The Treynor ratio

After the CAPM was introduced, Treynor (1965) developed a measure of performance called the Treynor ratio. The Treynor ratio is calculated by dividing the excess return by the portfolios beta. The beta value is a risk measure based on the systematic risk of the portfolio. The ratio measures the excess return per unit of systematic risk. A high Treynor measure implies that the fund has a higher risk adjusted return compared to a fund with a lower Treynor ratio. Generally speaking, the higher the Treynor ratio is, the better the manager of the portfolio has performed.

\[ \text{Treynor} = \frac{r_p - r_f}{\beta_p} \]

The Treynor ratio is often used as an indication of performance compared to other portfolios, because it is relatively easy to both calculate and understand. It is derived directly from the CAPM and thus contains the same flaws.

2.4.8 Market timing

A fund manager can outperform the market in several ways. Not only by picking the best stocks, but also by market timing abilities. After predicting either a bull or a bear market a mutual fund manager can adjust their portfolio to fit their prediction of the market.

In practice there are two ways to do this, either by adjusting the equity weights of the portfolio, or by adjusting the beta of the portfolio by changing holdings in securities with high and low beta to minimize the downturn and maximize the upturn.

To test if a portfolio manager has market timing abilities one can run a regression on the returns of a fund and the market at various time periods. If a fund manager tries to time the market, his or her beta will be non-stationary. A manager who on the other hand does not care about timing will have a beta that is constant (Elton, Gruber & Blake, 2012). Treynor and Mazuy (1966) developed a model to evaluate market timing derived from the CAPM.
\[ r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \gamma_i(r_{m,t} - r_{f,t})^2 + \varepsilon_{i,t} \]

By adding a squared term of the excess market return, the new gamma coefficient estimates market timing ability. The alpha is still present and measures the same stock picking skills as in Jensen’s model. This model therefore measures both stock picking skills and market timing abilities.

Later Henriksen (1984) developed his own model. It is very similar to the model developed by Treynor and Mazuy, but instead of the squared term of the excess return, he added a dummy variable \( D \). The variable has the value 1 if the market return is larger than the risk free rate and 0 if the market return is less than or equal to the risk free rate.

\[ r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \gamma_i(r_{m,t} - r_{f,t})D + \varepsilon_{i,t} \]

In this model the timing ability is interpreted as a put option on the market portfolio with an exercise price equal to the risk-free rate. This means that the payoff of the market timing ability is the maximum of \( [0, -(r_{m,t} - r_{f,t})] \).

Just like the Treynor and Mazuy model, this model also includes the intercept with the same interpretation as in Jensen’s model. So these two models can be seen as improvements of Jensen’s model because it accounts for both micro and macro forecasting abilities.

### 2.4.9 Persistence

An important aspect of mutual fund management is performance persistence. Even though fund managers are very fond of telling investors that past performance is no indicator or guarantee of future performance, the truth is that investors do not really have a lot else to look at when choosing a specific fund.

During the more recent years, academics have been trying to test performance further than just whether or not managers possess macro- and micro forecasting abilities. Persistence has been explored with several methods. The question that we want answered is: “are managers that have been outperforming their benchmark able to continue doing so in the future?”.

Researchers are of course interested not only in persistence in good performance but also in funds that have underperformed.
In indicator of a fund’s persistence is whether or not there is significant autocorrelation in the returns. A significant autocorrelation in the returns implies persistence (Hendricks, Patel & Zeckhauser, 1993). An alternative approach developed by Goetzmann and Ibbotson (1994) and later pursued by Malkiel (1995) is to look at different funds’ returns and define winners and losers by looking at whether their returns over a year is above or below the median return. If there is no persistence present, there should be a 50% chance for a “winner” firm to continue winning or start losing when using the median as the benchmark. The same is true for a fund performing below the median. A random variable that represents the number of losing or winning firms has a binomial distribution. With a large enough sample, the distribution can be displayed as normal with a mean of 0 and variance of 1. You can then test if the chance of a winner continuing to be a winner is 50% or significantly different to see if there is persistence.

A third method was developed by Blake and Timmerman (1998). What they did was identify abnormal returns in the funds over the last two years. Then they split and ranked their sample based on the performance. After ranking them they put together two equally weighted portfolios consisting of the top 25% and one consisting of the bottom 25%. These portfolios are held for one month before being rebalanced. When enough data had been gathered they ran the two portfolios through Jensen’s regression and expected the top performers to produce a positive alpha and the worst performers to produce a negative alpha.

2.5 Unconditional and conditional models

An underlying assumption when using unconditional models such as Jensen’s alpha is that the risk level is constant. This might not always be true, the means and variances can change over time. This is where conditional models become relevant. Even though I have not decided to use one, it is worth mentioning that they exist.

Ferson & Schadt (1996) developed a conditional model where they allowed the beta estimate to vary over time. What was done is adding some information variables into the model so that the market excess return is no longer the only explanatory variable. These
new variables allow the beta to change with time and the economic environment. They proposed these five lagged information variables:

- A dividend yield.
- A measure of the slope of the term structure.
- A level of the one-month Treasury bill rate.
- A quality spread in the corporate bond market.
- A dummy variable for the month of January.

Even though adding these values resulted in a more precise estimate of the alpha value according to them, hypothesis testing for relevance has revealed that both the quality spread in the corporate bond market and the dummy variable for January was not able to prove significance in predicting beta. The Treasury bill rate and the dividend yield as well as the slope of the term structure however, proved to be significant.

In the conditional model, $Z_{t-1}$ is a vector of the lagged variables. It assumes a linear relationship between the information variables and the output. The beta is calculated like this:

$$\beta_{i,t} = \beta_{i,0} + \beta_i'Z_{t-1}$$

When we add this expression to the standard single index model, the new conditional Jensen regression is:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i,0}(r_{m,t} - r_{f,t}) + \beta_i'Z_{t-1}(r_{m,t} - r_{f,t}) + \epsilon_{i,t}$$

The information vector is multiplied with the excess market return. This means that it does not rely on only the market excess return, but also uses the information variables to explain the returns.

5 Methodology and data

I have collected fund data from DataStream, this is also where I got my data for the risk-free rate and the benchmark. The only data I did not use DataStream for is the SMB and HML
factors used in the Fama-French three-factor model. Professor Bernt Arne Ødegaard at BI Norwegian Business School has collected data and calculated the values of the SMB and HML factors at the Oslo Stock Exchange. These numbers are published on BI’s web pages, I found daily values here and converted them into weekly numbers so they would fit the rest of my data.

I have gathered weekly data for 19 actively managed Norwegian equity funds and four passive funds from January 2006 to January 2016. I used these numbers to calculate each funds geometric return. I calculated the returns like this:

\[ \text{Geometric return} = \ln \left( \frac{NAV_t}{NAV_{t-1}} \right) \]

Where \( \ln \) is the natural logarithm and \( NAV \) is the net asset value. I chose to use the geometric return instead of the arithmetic return because the geometric return is more conservative and therefore preferred.

### 5.1 Sample construction

The sample chosen had to meet certain criteria. As Cesari and Panetta (2002) states, the sample of funds have to be classified into a homogenous category for the study to give any valid results. This is why I have chosen to only look into Norwegian equity funds that are similar in their investment strategies. The Oslo Stock Exchange categorizes equity funds in the following four groups:

- Norwegian equity funds
- Norwegian/international equity funds
- International equity funds
- Sector equity funds

My focus is on the first group. I have however chosen to include three funds in my sample who are allowed to invest from 15% to 20% of their total capital outside of Norway. I chose to include them because they still use the same benchmark as all the other funds and I think it would be interesting to see if the opportunity to invest a small bit outside of Norway could contribute to creating excess returns. I did not want to look at other funds as it would be difficult to adjust for the different risks and to compare funds that operate in different
markets and also because the benchmark chosen would be inaccurate for funds investing the majority of their funds in different countries than Norway.

All the funds I have chosen are located in Norway and they are all trading in the Norwegian Krone (NOK). Including funds that are trading in different currencies could bias my results because of differences such as changes in exchange rates or different tax systems in different countries. I also only chose to look at that funds have to comply with the EU directives set forth in UCITS. This is because I want the funds to be as similar as possible. Funds operating under different rules or applying strategies not following the UCITS-regulations would also be hard to compare to funds that do follow the UCITS-regulations because of differences in how they are allowed to operate.

There are indeed quite a few of selection criteria, but this is necessary to get valid results. These criteria and the fact that the data had to be obtainable resulted in choosing the 19 active and the four passive funds that I have chosen.

My sample consists of weekly data over a period of roughly 10 years. This means that I have 522 observations for all the funds as well as the benchmark, the risk-free rate and the SMB and HML factors. This should be more than enough observations to get statistically valid results.

All of the funds I have chosen to include in this study have existed for the whole 10-year period. It is important to note that this might lead to my sample containing some degree of survivorship bias, I will write more on that later.

5.2 The chosen funds

Following is a list of all the funds I have chosen to include in the study:
These funds are all very similar. All of the funds are actively managed and they all have the same goal of outperforming the Norwegian market. They all use the OSEFX as their benchmark. Most of the funds invest all their capital in the Norwegian market, but three of the funds are allowed to invest from 15% to 20% in other countries.

### 5.3 Benchmark

When evaluation performance, there needs to be something to compare the returns to and this is where the benchmark becomes relevant. Ideally it would be possible to compare the returns to the “true” market portfolio. This is a portfolio covering all tradable assets in the market. As Roll (1978) states, this is rather difficult to achieve in practice.

The choice of benchmark is very important to produce valid results. This is because the choice of benchmark is likely to influence the performance results (Grinblatt & Titman, 1994). So it is extremely important to be able to have a benchmark that as close as possible resembles the environment the funds are investing in.
In this study I have chosen to look at funds that are restricted to investing only in Norwegian securities listed on the Oslo Stock Exchange and conveniently enough, all of these funds use the same benchmark. This makes choosing the benchmark a whole lot easier for me. The benchmark of choice is of course the Oslo Stock Exchange Mutual Fund Index (OSEFX). The OSEFX is a weight and dividend adjusted version of the Oslo Stock Exchange Benchmark Index (OSEBX). The OSEBX is an index consisting of 57 different Norwegian securities. The problem with the OSEBX is that it is incredibly top heavy. The four largest companies in the index amount for over half of the total value of the index. This means that for a fund that is following the UCITS directive it is almost impossible to beat the OSEBX index if the four largest companies deliver high returns. This makes the OSEFX a much better choice.

The OSEFX has to meet the requirements of the UCITS-regulation when it comes to diversification. This means that similar to the funds in the sample, the index has to spread out its investments in a minimum of 16 companies. In addition to this the weight in any given security cannot exceed 10% of the portfolios total value. The equity proportion of Norwegian mutual funds must be at least 80%. This means that a maximum of 20% of the funds value can be invested in non-equity holdings. Because the funds use a benchmark that has all its investments in equities, the funds tend to have a very small portion of their assets in non-equity holdings. Jensen (1968) states that funds are usually not fully invested. He found that the funds in his sample on average had about 2% of their holdings in cash.

There are of course other indices than the OSEBX and the OSEFX that could have been used as the benchmark in this study, such as the Oslo Stock Exchange ALL Share Index (OSEAX) for example. I believe that the OSEFX is the best choice and this is mainly because all the funds actually use it themselves to measure their performance and because the goal of these funds is to deliver higher returns than the OSEFX.

Something else to consider is whether to use only a single index model or a multifactor model. Treynor & Mazuy (1966), Henriksen (1984), Jensen (1968) and others used a model containing only a single risk factor. They believed that the variation in the market return could be explained by only a single factor. After Fama and French (1993) and Carhart (1997) presented different models with additional factors, people have not really been able to agree on what model is best able to measure performance.
I have chosen to try both. I was going to use Jensen’s alpha, but after I found data for the additional factors in the Fama French Three-factor model, I decided to include that as well. Fama and French introduced the Small minus big (SMB) and the high minus low (HML) factors. The SMB factor is the returns of securities that have a small market capitalization minus the returns of securities that have a big market capitalization. The HML factor has to do with book-to-market ratio. It takes securities with a High ratio and subtracts securities with a low book-to-market ratio. Even though I will not look further into it, it is worth noting that Carhart (1997) extended the three-factor model with an additional factor known as monthly momentum (MOM).

I am using the OSEFX as the market portfolio in all my models.

5.4 Timeframe

I am going to evaluate the sample over a ten-year period. I am using weekly close NAV from January 2006 to January 2016. This timeframe includes times where there was a bull market and other times where there was a bear market. This timeframe for example includes the financial crisis in 2008. I believe this ten-year period covers a range of different markets.

A study that only analyzes performance in a bull or a bear market could be interesting, but there is a drawback of conducting studies of shorter periods. The reason most performance studies are done over a longer period is because of statistical skewness and noise which can make the results less valid. Like many others before me I have in this thesis chosen not to include any periods that are shorter than ten years. I chose to do so to hopefully get valid results. One might argue that the longer the time-frame the better and this might be true, but there are limited number of Norwegian funds operating over a longer period of time and increasing the timeframe could lead to an increase in survivorship bias.

The Norwegian market is relatively young compared to other markets such as the one in the US. If I had chosen to look at an even longer timeframe there might not have been enough data to form a big enough sample of funds.

Below is a graph that illustrates how my benchmark has developed over the last 10 years.
5.5 Risk-free rate of return

I will test each fund’s returns in excess of the risk-free rate. This means that I am of course going to need data for a risk-free rate of return. The risk-free rate plays an important role in many economic models and especially in the CAPM and the Fama-French three-factor model. For the risk-free rate of return there are a couple of viable options. One choice is the three-month Treasury bill rate. Another choice could be the one month Norwegian Interbank Offered Rate (NIBOR). The Treasury bill rate is the return received on a three-month Norwegian government bond. The NIBOR is the rate of which Norwegian banks lend to each other. None of them are perfect. The NIBOR might contain some degree of credit risk and the Treasury bill might contain some convenience yield.

The risk contained in the three-month Treasury bill yield for a given country is marginal and this is the rate that is usually used as the risk-free rate of return in research papers.

Naturally, for my risk-free rate I chose the 3-month Norwegian Treasury bill rate.

I got the Treasury bill rate on DataStream given in yearly figures. I used these and converted them into weekly numbers using the following equation:

\[
\text{Weekly risk-free rate of return} = \frac{\ln(1 + r_t)}{52}
\]
In my ten-year sample between January 2006 and January 2016, the average risk-free rate of return on a yearly basis was about 2.4%

It is worth mentioning that the risk-free rates are forward looking. They indicate how much return you receive for the coming year or in my case the coming week. This is opposite for the realized stock returns. Stock returns tell you how much you got the previous week. I therefore adjusted for this in my analysis by comparing the fund returns at time t with the risk free rate of return at time t – 1. In other words, this week’s fund returns are being compared to last week’s risk-free rate of return as that rate is the one you would have gotten this week.

5.6 Fund expenses

When evaluation fund performance we have to separate the returns in two different kinds of returns. We need to look at gross and net returns separately. Gross returns are the total returns the managers are able to produce; these are the returns before any kind of fees are subtracted. On the other hand, we have the net returns. The net returns are the returns calculated after fees are subtracted. The net returns are usually the return Investors are interested in, as these are the returns they are left with after paying the management fees.

The Total Expense-Ratio (TER) reflects all the costs connected with investing in a given fund. The TER includes not only the management fee, but also transaction costs and other fees such as entry and exit fees.

In this study I will look at both net and gross returns. The reason for this is because when you look at just one or the other it might not give you all the information you want. If you choose to analyze only the net returns you can see if the managers are able to generate returns for their investors or not, but if they are not able to generate excess returns you cannot know if this is because they are not able to beat the market or because of something else like too high management fees. They might be producing excess returns compared to the market but might simply be charging too high management fees. When looking at gross
returns I can see if the managers are able to beat the market and when looking at the net returns I am able to see if they produce anything of value for their investors.

The data I collected for the funds from DataStream are NAV, this means that the TER has already been subtracted. So for the calculations on net returns, no adjustments had to be made. For calculations on the gross returns on the other hand I had to add the TER. Unfortunately, the TERs were not available on DataStream so I had to get them from Morningstar. The TERs from Morningstar includes all annual expenses, except for trading costs as these constantly vary.

There was no historical data on the TERs, so I assume that the current TER can be used for the whole period. For the actively managed funds the lowest TER in my sample is 0.5% and the highest is 2%. The average TER of the active funds is 1.3%. For the passive funds; the highest TER is 0.8%, the lowest is 0.2 and the average is 0.47%

To convert the net returns into gross returns I used the yearly figures given by Morningstar and added $1/52^{th}$ to my weekly numbers. This is the same method used by Fama and French (2010).

5.7 Information variables

For the Fama French Three-factor model, I need data for the SML and HML factors. These factors are calculated and published on BI Norwegian Business School’s web page by professor Bern Arne Ødegaard. These numbers are given in either monthly or daily data. I extracted the daily data and converted it into weekly to fit my data set.

5.8 Survivorship Bias

As I am only looking at funds that are in existence over whole ten-year period, survivorship bias is something that has to be mentioned.

A fund that is willing to take higher risks than others will have a higher probability of failure. On the other hand, a fund that is willing to take higher risks and does not fail is more likely to survive and outperform the market. Funds who are taking big bets and high risks and lose
will also lose popularity. This leads to the funds with the worst performance disappearing and this is what creates an environment where the highest performers are the only survivors, thereby the name survivorship bias.

Studies confirm that poor performance is the most common reason for funds to be discontinued (Carhart, Carpenter, Lynch, Musto, 2002). As I am not looking at any funds that are discontinued the results might be biased. Survivorship bias has the most influence when testing for persistence. Carhart, et al (2002) found that survivorship bias is significantly larger over a longer time period than a short time period. Even though Patel et al (1991) reach conclusions that survivorship bias is not important when testing performance, the general perception is that if you ignore discontinued funds you might end up with over-estimating the performance of the funds you are testing (Malkiel, 1995). I think the role of survivorship bias in this study is marginal. It is true that excluding the worst performers will damage the accuracy when estimating averages, it does not really affect the performance figures for each individual fund and these are the ones I am most interested in. There are different conclusions drawn about survivorship bias, but it should be kept in mind when reading my results and conclusions that it might be present.

5.9 Robustness

In my tests I am using Ordinary Least Squares (OLS) to estimate the parameters that minimize the sum of squared vertical distances between the observed returns and the returns predicted by the linear regression. This model estimates parameters with the least variance possible for observed error terms. $R^2$ is a measure that tells us something about the proportion of the variance in the dependent variable that is being explained by the independent variable or variables.

The consistency of the coefficient estimates is not affected when using OLS, but it could introduce heteroscedasticity (opposite of homoscedasticity) because the alphas are being measured with a varying degree of precision (Dahlquest et al, 2000).

For the OLS estimator to be the best linear unbiased estimator (BLUE), several assumptions must hold. To obtain unbiased estimates the two most important things we want are homoscedasticity and no autocorrelation. The reason for this is that autocorrelation and
heteroscedasticity might lead to incorrect standard errors and this will have an effect on the t-statistic and the p-value.

Heteroscedasticity does not change the unbiasedness or consistency properties of the OLS estimator, but if there is heteroscedasticity the estimator is no longer efficient or of minimum variance (Gujarati, 2011). This would lead to both t- and F-tests not being reliable anymore and leading to wrong conclusions regarding the statistical significance of the coefficients.

Another assumption for the OLS to be valid is that there is no correlation in the error terms. If the error terms are correlated with each other the estimator is no longer efficient.

5.10 Hypothesis testing

To investigate whether or not fund managers do possess stock picking skills or not, I am testing if the alpha values are different from zero. In such a test there are two different outcomes in addition to the coefficient being zero. It can be significantly greater than zero, or less than zero. This means that the tests are two-sided. My null hypothesis is formulated such that the coefficient is being tested equal to zero and the alternative hypothesis is that the coefficient is different from zero. If the coefficient is not statistically significant different from zero, I cannot reject the null hypothesis. If on the other hand the coefficient turns out to be significantly different from zero, I reject the null hypothesis and claim that the alternative is more likely.

I am applying a 5% significance level for my tests. With two-sided tests this means that it is the 2.5% of the tail on each side that is the rejection region.

It is worth noting the type 1 and type 2 errors when hypothesis testing. A type 1 error is the incorrect rejection of a true null hypothesis. The probability of committing a type 1 error is equal to the significance level, in my case 5%. This means that out of my 23 funds one fund could turn out to have significant results caused by nothing but chance. A type 2 error is the failure to reject a false null hypothesis.
6 Empirical findings

In order to find out whether or not managers possess stock picking skills, I have chosen to use Jensen’s alpha and the Fama French three-factor model. In addition to these I am doing a T-test on excess returns and calculating 4 different ratios: The Sharpe, Sortino, Information and Treynor ratio.

6.1 General findings

In the sample period from 2006 to 2016, there was a steady uptrend until the financial crisis hit hard in 2008, followed by moderate growth until today. The average yearly net return of the active funds was 5.69%. This is a little bit higher than their benchmark, the OSEFX had a yearly return of 4.6%. Compared to the risk-free rate of 2.36% this is not bad at all. The passive funds had a yearly return of 4.8%.

Net average estimates:

<table>
<thead>
<tr>
<th>Fund</th>
<th>Yearly return</th>
<th>Std</th>
<th>TER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFRED BERG GAMBAK</td>
<td>8.03 %</td>
<td>25.16 %</td>
<td>1.80 %</td>
</tr>
<tr>
<td>ALFRED BERG AKTIV</td>
<td>6.52 %</td>
<td>25.65 %</td>
<td>1.50 %</td>
</tr>
<tr>
<td>ALFRED BERG NORGE</td>
<td>6.79 %</td>
<td>25.15 %</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ATLAS NORGE</td>
<td>4.59 %</td>
<td>27.19 %</td>
<td>0.50 %</td>
</tr>
<tr>
<td>CARNEGIE AKSJE NORGE</td>
<td>5.88 %</td>
<td>26.71 %</td>
<td>1.20 %</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE I</td>
<td>6.78 %</td>
<td>25.10 %</td>
<td>1.75 %</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE VEKST</td>
<td>3.13 %</td>
<td>22.69 %</td>
<td>1.75 %</td>
</tr>
<tr>
<td>HOLBERG NORGE</td>
<td>1.55 %</td>
<td>22.23 %</td>
<td>1.50 %</td>
</tr>
<tr>
<td>PLUSS MARKEDSVERDI</td>
<td>6.64 %</td>
<td>24.92 %</td>
<td>0.90 %</td>
</tr>
<tr>
<td>KLP AKSJE NORGE</td>
<td>5.53 %</td>
<td>25.48 %</td>
<td>0.75 %</td>
</tr>
<tr>
<td>NORDEA AVKASTNING</td>
<td>4.91 %</td>
<td>26.18 %</td>
<td>1.53 %</td>
</tr>
<tr>
<td>NORDEA KAPITAL</td>
<td>5.90 %</td>
<td>26.06 %</td>
<td>1.00 %</td>
</tr>
<tr>
<td>NORDEA NORGE VERDI</td>
<td>6.36 %</td>
<td>19.97 %</td>
<td>1.50 %</td>
</tr>
<tr>
<td>PARETO AKSJE NORGE I</td>
<td>3.97 %</td>
<td>22.22 %</td>
<td>0.50 %</td>
</tr>
<tr>
<td>FONDSFINANS NORGE</td>
<td>7.70 %</td>
<td>26.67 %</td>
<td>1.00 %</td>
</tr>
<tr>
<td>HANDELSBANKEN NORGE</td>
<td>8.36 %</td>
<td>26.74 %</td>
<td>2.00 %</td>
</tr>
<tr>
<td>EIKA NORGE</td>
<td>5.19 %</td>
<td>24.74 %</td>
<td>2.00 %</td>
</tr>
<tr>
<td>PLUSS AKSJE</td>
<td>6.69 %</td>
<td>24.00 %</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ALFRED BERG HUMANFOND</td>
<td>3.55 %</td>
<td>25.70 %</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ALFRED BERG INDEKS</td>
<td>4.82 %</td>
<td>25.97 %</td>
<td>0.19 %</td>
</tr>
<tr>
<td>CARNEGIE NORGE INDEKS</td>
<td>4.47 %</td>
<td>26.75 %</td>
<td>0.80 %</td>
</tr>
<tr>
<td>KLP AKSJE NORGE INDEKS</td>
<td>4.90 %</td>
<td>26.06 %</td>
<td>0.20 %</td>
</tr>
<tr>
<td>PLUSS INDEKS</td>
<td>4.97 %</td>
<td>26.46 %</td>
<td>0.70 %</td>
</tr>
</tbody>
</table>
We can see that all the funds have positive returns. Some are below, but the majority of the active funds have delivered a mean return above their benchmark. These numbers are in net values so if you invested in one of the funds that delivered a higher return than the benchmark, you would have gotten a higher net profit than the market in general.

Almost all of the funds have similar standard deviations and are below the standard deviation of the benchmark which is 27.16. There are only two exceptions. Only one fund has a higher standard deviation than the benchmark, not by a lot, but still higher. There is also one fund that seems to have a lower standard deviation than the rest. While most of the funds have a standard deviation from around 22% to 26%, one fund is below 20 with a standard deviation of 19.97%.

Following are two histograms I made by subtracting the benchmark’s weekly returns from all the funds weekly returns. First one for the active funds and one for the passive index funds.

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Yearly return</th>
<th>Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSEFX</td>
<td>4.60 %</td>
<td>27.16 %</td>
</tr>
</tbody>
</table>
These might look slightly overwhelming at first. This is why I included the bins and frequencies on the left. These charts show how often weekly returns between certain values occur. What is interesting is that they look somewhat normally distributed and the mean is above zero. Not just for the active funds, but also for the passive ones!

Converted into yearly returns the average of the active funds is 1.1%. While not as high, but still positive, the average for the passive funds is 0.19%.

Even though it is hard to say whether or not the returns are significant or caused by skill rather than luck. At first glance I have to admit that it seems like active managers are performing well. The mean of the returns in excess of the benchmark is positive and the average yearly return of the active funds are higher than both the benchmark and the alternative, passive funds.

<table>
<thead>
<tr>
<th>Bin</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.03805</td>
<td>1</td>
</tr>
<tr>
<td>-0.03553</td>
<td>0</td>
</tr>
<tr>
<td>-0.032</td>
<td>0</td>
</tr>
<tr>
<td>-0.02847</td>
<td>1</td>
</tr>
<tr>
<td>-0.02494</td>
<td>1</td>
</tr>
<tr>
<td>-0.02141</td>
<td>3</td>
</tr>
<tr>
<td>-0.01789</td>
<td>3</td>
</tr>
<tr>
<td>-0.01436</td>
<td>9</td>
</tr>
<tr>
<td>-0.01083</td>
<td>37</td>
</tr>
<tr>
<td>-0.0073</td>
<td>76</td>
</tr>
<tr>
<td>-0.00377</td>
<td>247</td>
</tr>
<tr>
<td>-0.00025</td>
<td>660</td>
</tr>
<tr>
<td>0.003281</td>
<td>631</td>
</tr>
<tr>
<td>0.006809</td>
<td>263</td>
</tr>
<tr>
<td>0.010337</td>
<td>86</td>
</tr>
<tr>
<td>0.013865</td>
<td>30</td>
</tr>
<tr>
<td>0.017393</td>
<td>11</td>
</tr>
<tr>
<td>0.020921</td>
<td>11</td>
</tr>
<tr>
<td>0.024449</td>
<td>9</td>
</tr>
<tr>
<td>0.027977</td>
<td>2</td>
</tr>
<tr>
<td>0.031505</td>
<td>2</td>
</tr>
<tr>
<td>0.035033</td>
<td>2</td>
</tr>
<tr>
<td>More</td>
<td>3</td>
</tr>
</tbody>
</table>
6.2 T-test of excess returns.

I want to investigate if the fund’s returns in excess of their benchmark are in fact significantly different from zero. I calculate excess returns for all the funds in the following way:

\[ e_{t}^{Fund} = R_{t}^{Fund} - R_{t}^{Index}. \]

I want to test if the average of the excess returns is different from zero, so my hypothesis looks like this:

**Hypothesis 1:**

\[ H_0 : \mu_e = 0 \]
\[ H_a : \mu_e \neq 0 \]

Here \( \mu \) is the true mean of the excess returns. If \( H_0 \) is true, then the mean estimator \( \hat{\mu} \) is set to:

\[ \frac{\hat{\mu}}{\hat{\sigma}/\sqrt{n}} \sim t(n - 1). \]

I don’t know the true \( \hat{\sigma} \), so the estimator follows the t-distribution with \( n-1 \) degrees of freedom, in order to adjust for uncertainty.

These are the p-values from the test for both net and gross returns:
The results for the passive funds are not very interesting, just as expected. As their strategy is to follow the index and not outperform it, their excess returns should not really deviate that much from the benchmark. I chose to include them anyway to have something to compare the other p-values to.

The active funds, however, do have some interesting results. When looking at net returns, there is not a single fund with excess returns significantly different from zero. Even though most of them are lower than the passive funds, none of the p-values are low enough for me to reject the null hypothesis on the chosen significance level. This is a little bit surprising to me as the results in the general findings section pointed in a different direction.

When looking at gross returns, there are five out of the 19 active funds with returns that are significantly different from zero. It looks like, from these results, that there are some funds that are able to outperform their benchmark or “beat the market,” but they charge their investors too much so the returns they produce are absorbed by their costs.

<table>
<thead>
<tr>
<th>Fund</th>
<th>Net</th>
<th>Gross</th>
<th>TER</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFRED BERG GAMBAK</td>
<td>0.0938</td>
<td>0.0224</td>
<td>1.80 %</td>
</tr>
<tr>
<td>ALFRED BERG AKTIV</td>
<td>0.1464</td>
<td>0.0307</td>
<td>1.50 %</td>
</tr>
<tr>
<td>ALFRED BERG NORGE</td>
<td>0.0456</td>
<td>0.0045</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ATLAS NORGE</td>
<td>0.5040</td>
<td>0.3613</td>
<td>0.50 %</td>
</tr>
<tr>
<td>CARNEGIE AKSJE NORGE</td>
<td>0.1617</td>
<td>0.0279</td>
<td>1.20 %</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE I</td>
<td>0.0690</td>
<td>0.0038</td>
<td>1.75 %</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE VEKST</td>
<td>0.7061</td>
<td>0.4588</td>
<td>1.75 %</td>
</tr>
<tr>
<td>HOLBERG NORGE</td>
<td>0.8559</td>
<td>0.7056</td>
<td>1.50 %</td>
</tr>
<tr>
<td>PLUSS MARKESSVERDI</td>
<td>0.0454</td>
<td>0.0074</td>
<td>0.90 %</td>
</tr>
<tr>
<td>KLP AKSJE NORGE</td>
<td>0.2773</td>
<td>0.1436</td>
<td>0.75 %</td>
</tr>
<tr>
<td>NORDEA AVKASTNING</td>
<td>0.3776</td>
<td>0.0313</td>
<td>1.53 %</td>
</tr>
<tr>
<td>NORDEA KAPITAL</td>
<td>0.0906</td>
<td>0.0092</td>
<td>1.00 %</td>
</tr>
<tr>
<td>NORDEA NORGE VERDI</td>
<td>0.2987</td>
<td>0.1645</td>
<td>1.50 %</td>
</tr>
<tr>
<td>PARETO AKSJE NORGE I</td>
<td>0.5789</td>
<td>0.5162</td>
<td>0.50 %</td>
</tr>
<tr>
<td>FONDSFINANS NORGE</td>
<td>0.0748</td>
<td>0.0285</td>
<td>1.00 %</td>
</tr>
<tr>
<td>HANDELSBANKEN NORGE</td>
<td>0.0726</td>
<td>0.0129</td>
<td>2.00 %</td>
</tr>
<tr>
<td>EIKA NORGE</td>
<td>0.4041</td>
<td>0.1424</td>
<td>2.00 %</td>
</tr>
<tr>
<td>PLUSS AKSJE</td>
<td>0.1146</td>
<td>0.0294</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ALFRED BERG HUMANFOND</td>
<td>0.7554</td>
<td>0.4607</td>
<td>1.20 %</td>
</tr>
<tr>
<td>ALFRED BERG INDEKS</td>
<td>0.4223</td>
<td>0.3569</td>
<td>0.19 %</td>
</tr>
<tr>
<td>CARNEGIE NORGE INDEKS</td>
<td>0.5357</td>
<td>0.3184</td>
<td>0.80 %</td>
</tr>
<tr>
<td>KLP AKSJE NORGE INDEKS</td>
<td>0.4019</td>
<td>0.3396</td>
<td>0.20 %</td>
</tr>
<tr>
<td>PLUSS INDEKS</td>
<td>0.3976</td>
<td>0.2275</td>
<td>0.70 %</td>
</tr>
</tbody>
</table>
I think it is interesting that it is not only the most expensive funds where the returns are absorbed by management and other costs. The average TER of the funds that have significant results on their gross returns are 1.37%. This is higher than the total average of 1.3% in the active funds, but not by that much. It is hard to conclude from this that the fees are too high, but the results point in that direction at least for the funds that produce significant returns gross of costs but not net.

Another thing I can see is that there are funds with higher TER that don’t have significant results even when considering gross returns. There is not really a notable relationship between TER and significant results. It seems that a more expensive fund is not necessarily more likely to produce better returns than a fund with lower costs.

6.3 Jensen’s alpha

6.3.1 Net returns
My null hypothesis is that alpha does not differ from zero. The alternative hypothesis is that alpha is different from zero. When considering net returns, failure to reject the null hypothesis implies that the managers do not possess stock picking skills that are good enough to be able to add value to their investors.

Hypothesis 2:

\[ H_0: \alpha_t = 0 \]
\[ H_a: \alpha_t \neq 0 \]

The results from this test is presented in the table below.
Somewhat underwhelming results are gotten in this test, at least if you are an investor looking for fund managers with stock picking skills. There is only a single fund I can reject the null hypothesis for or 5.3% of the sample. Out of all the active fund, only one of them has been able to produce an alpha significantly different from zero. While most of the alphas are positive, some are negative, but they are not significantly different from zero so they are rather unimportant.

Most of the other p-values are rather high. Even if I relaxed the confidence level, there still would not be a lot of funds where I would be able to reject the null hypothesis. It seems that in general, fund managers do not create a lot of value for their investors.

The results for the passive funds are as expected and seems to be just as good of a choice as the active funds. The R-squared is high for all the funds which means that the model fits the data rather well.
6.3.2 Gross returns

Here I am doing the exact same thing as I did with the net returns. This means that the null hypothesis is still that alpha is not different from zero and the alternative hypothesis is that alpha is different from zero. Different this time is that failure to reject the null hypothesis says something about the fund managers stick picking abilities on another level. Failure to reject the null hypothesis when looking at gross returns means that the managers do not possess stock picking abilities good enough to beat the market.

Hypothesis 3:

\[ H_0: \alpha_t = 0 \]

\[ H_a: \alpha_t \neq 0 \]

The results from this test are in the table below:

<table>
<thead>
<tr>
<th>Fund</th>
<th>Alpha</th>
<th>P-value</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFRED BERG GAMBAK</td>
<td>0.001056</td>
<td>0.0227</td>
<td>0.91</td>
</tr>
<tr>
<td>ALFRED BERG AKTIV</td>
<td>0.000690</td>
<td>0.0354</td>
<td>0.96</td>
</tr>
<tr>
<td>ALFRED BERG NORGE</td>
<td>0.000687</td>
<td>0.0010</td>
<td>0.98</td>
</tr>
<tr>
<td>ATLAS NORGE</td>
<td>0.000098</td>
<td>0.7075</td>
<td>0.97</td>
</tr>
<tr>
<td>CARNEGIE AKSJE NORGE</td>
<td>0.000489</td>
<td>0.0463</td>
<td>0.98</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE I</td>
<td>0.000793</td>
<td>0.0011</td>
<td>0.97</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE VEKST</td>
<td>0.000140</td>
<td>0.7279</td>
<td>0.91</td>
</tr>
<tr>
<td>HOLBERG NORGE</td>
<td>-0.000203</td>
<td>0.6238</td>
<td>0.91</td>
</tr>
<tr>
<td>PLUSS MARKEDSVERDI</td>
<td>0.000603</td>
<td>0.0008</td>
<td>0.99</td>
</tr>
<tr>
<td>KLP AKSJE NORGE</td>
<td>0.000357</td>
<td>0.1972</td>
<td>0.97</td>
</tr>
<tr>
<td>NORDEA AVKASTNING</td>
<td>0.000371</td>
<td>0.0357</td>
<td>0.99</td>
</tr>
<tr>
<td>NORDEA KAPITAL</td>
<td>0.000462</td>
<td>0.0071</td>
<td>0.99</td>
</tr>
<tr>
<td>NORDEA NORGE VERDI</td>
<td>0.000758</td>
<td>0.0575</td>
<td>0.89</td>
</tr>
<tr>
<td>PARETO AKSJE NORGE I</td>
<td>0.000076</td>
<td>0.8720</td>
<td>0.88</td>
</tr>
<tr>
<td>FONDSFINANS NORGE</td>
<td>0.000810</td>
<td>0.0464</td>
<td>0.94</td>
</tr>
<tr>
<td>HANDELSBANKEN NORGE</td>
<td>0.001134</td>
<td>0.0200</td>
<td>0.91</td>
</tr>
<tr>
<td>EIKI NORGE</td>
<td>0.000552</td>
<td>0.1869</td>
<td>0.92</td>
</tr>
<tr>
<td>PLUSS AKSJE</td>
<td>0.000690</td>
<td>0.0074</td>
<td>0.97</td>
</tr>
<tr>
<td>ALFRED BERG HUMANFOND</td>
<td>0.000058</td>
<td>0.8296</td>
<td>0.97</td>
</tr>
<tr>
<td>ALFRED BERG INDEKS</td>
<td>0.000102</td>
<td>0.6097</td>
<td>0.98</td>
</tr>
<tr>
<td>CARNEGIE NORGE INDEKS</td>
<td>0.000142</td>
<td>0.5993</td>
<td>0.97</td>
</tr>
<tr>
<td>KLP AKSJE NORGE INDEKS</td>
<td>0.000116</td>
<td>0.5881</td>
<td>0.98</td>
</tr>
<tr>
<td>PLUSS INDEKS</td>
<td>0.000224</td>
<td>0.4053</td>
<td>0.97</td>
</tr>
</tbody>
</table>

I am now able to reject the null hypothesis for 5 of the funds or about 26% of the active funds. While the number of funds that are able to produce alphas significantly different from
zero are still low, they are higher than when considering net returns. These results lead me to believe that opposite to the majority, there are some managers that perform rather well, but their investors are not able to enjoy these returns because they disappear in management fees or other costs.

In this test as well, the results for the passive funds are as expected. No significant alphas here either. The R-squared is also high in this test for all the funds so it seems that the model fits rather well also with the data when considering gross returns.

6.4 Fama-French Three-factor model

6.4.1 Net returns

The hypothesis here is the same as the one for net returns using Jensen’s model, here I am just using the Fama-French Three-factor model with 2 additional variables instead. The null hypothesis is that the alpha is not different from zero. The alternative hypothesis is that the alpha is different from zero. Because I’m looking at net returns, failure to reject the null hypothesis implies that managers do not possess good enough stock picking skills for their investors to benefit from it, given the various costs the funds charge.

Hypothesis 4:

\[ H_0: \alpha_t = 0 \]
\[ H_a: \alpha_t \neq 0 \]

Results from the test are in the table below:
The results from this test is completely identical to the results when using Jensen’s model. I am only able to reject the null hypothesis for one of the active funds. This is the same number of funds as when I used Jensen’s model.

The results for the passive funds are as expected, no alphas that are significantly different from zero. The R-squared values are also in this test high so this model also seems to fit the data rather well. The average R-squared for this is 0.93 just like the average when using Jensen’s model on net returns.

This test seems to further back up the results from the previous test. There is little evidence of active equity mutual fund managers having stock picking skills that are good enough for their investors to benefit from.

### 6.4.2 Gross returns

Here I perform the same test as the previous, but now I am looking at gross returns. The null hypothesis is still that the alpha is not different from zero. The alternative hypothesis is that
the alpha is different from zero. Because I am now looking at gross returns, failure to reject the null hypothesis implies that fund managers do not possess stock picking abilities good enough to beat the market, before charging costs.

**Hypothesis 5:**

\[ H_0: \alpha_i = 0 \]

\[ H_a: \alpha_i \neq 0 \]

The results from this test is presented in the table below:

<table>
<thead>
<tr>
<th>Fund</th>
<th>Alpha</th>
<th>P-value</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFRED BERG GAMBAK</td>
<td>0.001007</td>
<td>0.0303</td>
<td>0.91</td>
</tr>
<tr>
<td>ALFRED BERG AKTIV</td>
<td>0.000651</td>
<td>0.0478</td>
<td>0.96</td>
</tr>
<tr>
<td>ALFRED BERG NORGE</td>
<td>0.000684</td>
<td>0.0012</td>
<td>0.98</td>
</tr>
<tr>
<td>ATLAS NORGE</td>
<td>0.000075</td>
<td>0.7762</td>
<td>0.97</td>
</tr>
<tr>
<td>CARNEGIE AKSJE NORGE</td>
<td>0.000477</td>
<td>0.0530</td>
<td>0.98</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE I</td>
<td>0.000800</td>
<td>0.0011</td>
<td>0.97</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE VEKST</td>
<td>0.000124</td>
<td>0.7602</td>
<td>0.97</td>
</tr>
<tr>
<td>HOLBERG NORGE</td>
<td>-0.00261</td>
<td>0.5297</td>
<td>0.97</td>
</tr>
<tr>
<td>PLUSS MARKEDSVERDI</td>
<td>0.000609</td>
<td>0.0007</td>
<td>0.99</td>
</tr>
<tr>
<td>KLP AKSJE NORGE</td>
<td>0.000362</td>
<td>0.1901</td>
<td>0.97</td>
</tr>
<tr>
<td>NORDEA AVKASTNING</td>
<td>0.000368</td>
<td>0.0381</td>
<td>0.99</td>
</tr>
<tr>
<td>NORDEA KAPITAL</td>
<td>0.000459</td>
<td>0.0077</td>
<td>0.99</td>
</tr>
<tr>
<td>NORDEA NORGE VERDI</td>
<td>0.000837</td>
<td>0.0361</td>
<td>0.89</td>
</tr>
<tr>
<td>PARETO AKSJE NORGE I</td>
<td>0.000052</td>
<td>0.9119</td>
<td>0.88</td>
</tr>
<tr>
<td>FONDSFINANS NORG</td>
<td>0.000791</td>
<td>0.0527</td>
<td>0.94</td>
</tr>
<tr>
<td>HANDELSBANKEN NORG</td>
<td>0.001118</td>
<td>0.0224</td>
<td>0.91</td>
</tr>
<tr>
<td>EIKI NORG</td>
<td>0.000531</td>
<td>0.2053</td>
<td>0.92</td>
</tr>
<tr>
<td>PLUSS AKSJE</td>
<td>0.000697</td>
<td>0.0071</td>
<td>0.97</td>
</tr>
<tr>
<td>ALFRED BERG HUMANFOND</td>
<td>0.000052</td>
<td>0.8480</td>
<td>0.97</td>
</tr>
<tr>
<td>ALFRED BERG INDEKS</td>
<td>0.000112</td>
<td>0.5739</td>
<td>0.98</td>
</tr>
<tr>
<td>CARNEGIE NORGE INDEKS</td>
<td>0.000156</td>
<td>0.5645</td>
<td>0.97</td>
</tr>
<tr>
<td>KLP AKSJE NORGE INDEKS</td>
<td>0.000131</td>
<td>0.5431</td>
<td>0.98</td>
</tr>
<tr>
<td>PLUSS INDEKS</td>
<td>0.000242</td>
<td>0.3713</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Again this model produces almost identical results as Jensen’s model. I am now able to reject the null hypothesis for five of the actively managed funds or about 26%. The R-squared is again high so it looks like the model fits the data well.

No surprises here either when looking at the passive funds. No alphas significantly different from zero as expected and I am not able to reject the null hypothesis for any of the passive funds.
These results further back up the already gotten results. There is little evidence of stock picking skills in my sample. There are some positive alphas when looking at gross returns, but almost all of these returns are never seen by investors because of various costs.

6.5 Fund expenses and performance

One might think that the better a fund performed, the higher their fees would be. This does not really seem to be the case in my sample.

The average TER of the five funds where I was able to reject the null hypothesis using both Jensen’s alpha and the Fama-French three-factor model is 1.21%. This is actually slightly lower than the average of all the active funds, which is 1.3%.

The one fund with an alpha significantly different than zero using the two tests for net returns actually has the third-lowest TER of all the actively managed funds in the sample.

I find a weak correlation of about 0.32 on average between the alphas produced by the actively managed funds and their TER.

From these results it looks like expenses are not a reliable measure for performance. The most expensive is not necessarily the best choice.

6.6 Sharpe ratio

Here I have calculated the Sharpe ratio as explained earlier in the paper for all the different funds. Because I have used weekly data for all of my calculations I have adjusted the numbers to yearly figures for them to be easier to interpret.

The Sharpe ratios of all the funds, calculated with both net and gross returns, are presented below:
If I were to interpret these numbers without comparing them to a benchmark, I would say that they look somewhat low at first glance. When that is said, I guess it makes sense that the Sharpe ratios are relatively low because both the risk-free rate and the volatility of the sample period has been rather high. I have calculated the Sharpe ratio for the benchmark and put it in a small table below:

<table>
<thead>
<tr>
<th>Fund</th>
<th>Net</th>
<th>Gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFRED BERG GAMBAK</td>
<td>0.225</td>
<td>0.297</td>
</tr>
<tr>
<td>ALFRED BERG AKTIV</td>
<td>0.162</td>
<td>0.220</td>
</tr>
<tr>
<td>ALFRED BERG NORGE</td>
<td>0.176</td>
<td>0.224</td>
</tr>
<tr>
<td>ATLAS NORGE</td>
<td>0.082</td>
<td>0.100</td>
</tr>
<tr>
<td>CARNEGIE AKSJE NORGE</td>
<td>0.132</td>
<td>0.177</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE I</td>
<td>0.176</td>
<td>0.246</td>
</tr>
<tr>
<td>DANSKE INVEST NORGE VEKST</td>
<td>0.034</td>
<td>0.111</td>
</tr>
<tr>
<td>HOLBERG NORGE</td>
<td>-0.037</td>
<td>0.031</td>
</tr>
<tr>
<td>PLUSS MARKEDSVERDI</td>
<td>0.172</td>
<td>0.208</td>
</tr>
<tr>
<td>KLP AKSJE NORGE</td>
<td>0.124</td>
<td>0.154</td>
</tr>
<tr>
<td>NORDEA AVKASTNING</td>
<td>0.097</td>
<td>0.156</td>
</tr>
<tr>
<td>NORDEA KAPITAL</td>
<td>0.136</td>
<td>0.174</td>
</tr>
<tr>
<td>NORDEA NORGE VERDI</td>
<td>0.200</td>
<td>0.275</td>
</tr>
<tr>
<td>PARETO AKSJE NORGE I</td>
<td>0.072</td>
<td>0.095</td>
</tr>
<tr>
<td>FONDSFINANS NORGE</td>
<td>0.200</td>
<td>0.238</td>
</tr>
<tr>
<td>HANDELSBANKEN NORGE</td>
<td>0.224</td>
<td>0.299</td>
</tr>
<tr>
<td>EIKA NORGE</td>
<td>0.114</td>
<td>0.195</td>
</tr>
<tr>
<td>PLUSS AKSJE</td>
<td>0.181</td>
<td>0.231</td>
</tr>
<tr>
<td>ALFRED BERG HUMANFOND</td>
<td>0.046</td>
<td>0.093</td>
</tr>
<tr>
<td>ALFRED BERG INDEKS</td>
<td>0.095</td>
<td>0.102</td>
</tr>
<tr>
<td>CARNEGIE NORGE INDEKS</td>
<td>0.079</td>
<td>0.109</td>
</tr>
<tr>
<td>KLP AKSJE NORGE INDEKS</td>
<td>0.097</td>
<td>0.105</td>
</tr>
<tr>
<td>PLUSS INDEKS</td>
<td>0.099</td>
<td>0.125</td>
</tr>
</tbody>
</table>

If I were to interpret these numbers without comparing them to a benchmark, I would say that they look somewhat low at first glance. When that is said, I guess it makes sense that the Sharpe ratios are relatively low because both the risk-free rate and the volatility of the sample period has been rather high. I have calculated the Sharpe ratio for the benchmark and put it in a small table below:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Sharpe ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSEFX</td>
<td>0.082</td>
</tr>
</tbody>
</table>

I chose to calculate the Sharpe ratio for both net and gross returns simply because I had the data for both so I might as well do it. The Sharpe ratio is a little bit higher for the gross returns. I have to say this is exactly as expected because of how the Sharpe ratio is calculated. Given that the returns are normally distributed, adding a fixed number to every single observation of data should not affect the standard deviation, but it will increase the mean. The only somewhat interesting thing I can see when looking at the results from net compared to gross returns is the fact that one fund went from a negative Sharpe ratio to a positive one. A negative Sharpe ratio is never good as you would have to perform worse
than the risk-free rate to get one. What this means is that one fund, after subtracting their fees delivered less returns to their investors than the investor would have gotten if he or she just put his or her money in the risk-free rate, which is obviously less risky.

There is not really a number that I think would make sense to use to convert the data of the benchmark into “gross” returns as the data of the benchmark is not really net or gross. It is just how the benchmark has developed.

As I already said, the difference in Sharpe ratio when considering net vs gross returns is not that exciting. So I chose to only compare the net numbers against the benchmark because the net returns are what investors are left with and I think that is the most interesting to look at.

When comparing the funds against their benchmark their Sharpe ratios does not seem that bad anymore. Even though a few of them are lower than the benchmark, most of them are higher. The average Sharpe ratio of the actively managed funds is 0.132 which is higher than both the benchmarks ratio of 0.082 and the average of the passive funds ratio of 0.092.

There are two things that I think are interesting about this. One is that active funds in general seem to deliver higher returns compared to risk taken than their benchmark. The other is that this is true also for the passive funds. Even though the passive funds are below the active funds, they are still above the benchmark.

6.7 Sortino ratio

I have calculated the Sortino ratio as explained earlier in the paper for all the different funds. Because I have used weekly data for all of my calculations I have adjusted the numbers to yearly figures for them to be easier to interpret.

The Sortino ratios of all the funds, calculated with both net and gross returns are presented below:
This ratio is calculated almost identically to the Sharpe, but the standard deviation used is the one of the negative returns. This leads me to believe that the Sortino ratio not only can be compared to the Sortino ratio of their benchmark, but also to the funds Sharpe ratio. This is because if a fund has a higher Sortino ratio than a Sharpe ratio, it means that the standard deviation of their negative returns is lower than the portfolio as a whole. This should be good as the presence of very big negative returns should be minimal in the above mentioned case.

To get a negative Sortino ratio, one would have to have a lower return than the risk free rate, just like the Sharpe ratio. It makes sense that the number of funds with negative Sortino ratio is only one, just like in the Sharpe ratio results.
The average Sortino ratios of the actively managed funds are 0.152 and 0.212 for net and gross returns respectively. These are both higher than the benchmarks ratio of 0.094. In addition to this they are also higher than the average ratios for passive funds, which are 0.108 and 0.0129.

I would expect the Sortino ratio of the passive funds to be very close to the benchmark because they only aim to replicate the returns of the benchmark and do not really care about beating it. Their Sortino ratio is slightly higher, which makes sense because their Sharpe ratio was also a little bit higher.

The average Sortino ratio both the Active and passive funds are higher than the average of their Sharpe ratios. This is true for both net and gross returns. There are some individual funds that have lower Sortino ratio than Sharpe, but in general the Sortino ratios are higher. This is good because we generally want a low standard deviation in the negative returns.

### 6.8 Information ratio

I have calculated the Information ratio as explained earlier for all the different funds. Because I have used weekly data for all of my calculations I have adjusted the numbers to yearly figures for them to be easier to interpret.

The Information ratios of all the funds, calculated with both net and gross returns are presented below:
Calculating an information ratio for the benchmark makes no sense because of how it is calculated. It would be to divide zero by zero, which makes little sense and really does not give any valuable information. I think the best way to look at these results is to see whether or not they are positive and how far from zero they are. A negative information ratio implies that the fund has produced a return that is lower than their benchmark and similarly a positive ratio implies that the fund did better than the benchmark. The higher the ratio is, the better.

Just like the other ratios, the net numbers make sense compared to the gross numbers, nothing really exciting about this. Something that I think is interesting though is that 5 out of the 19 active funds have a negative information ratio when looking at net returns, implying that they actually did worse than their benchmark, which of course is not good. When looking at gross returns, only one of the active funds have a negative ratio, further backing up the idea that maybe some of these funds charge too high fees.

I would expect the passive funds to have Information ratios very close to zero as they only aim to replicate their benchmark so a low ratio would make sense.
When looking at the results in general and comparing them to the alternative, they do not look that bad at all. The average information ratio for net returns is 0.213 and the average for gross returns is 0.447. The averages for the passive funds are 0.082 and 0.158.

Not only are the averages positive, but they are also higher than the passive funds. If these values were the only variable considered, I would say that fund managers are doing a good job.

When considering the Sortino ratios and comparing them to the benchmark, it seems that the managers are not doing too bad.

6.9 Treynor ratio

I have calculated the Treynor ratio as explained earlier in the paper for all the different funds. Because I have used weekly data for all of my calculations I have adjusted the numbers to yearly figures for them to be easier to interpret.

The Treynor ratios of all the funds, calculated with both net and gross returns are presented below:
Interpreting the Treynor ratio is actually what I find to be the most intuitive of all the ratios. It tells us what return a fund has produced in excess of the risk free rate, divided by the beta. Given that the beta of the benchmark is one, we want to see a Treynor ratio that is higher than the benchmarks excess return on the risk free rate. Adjusted to yearly numbers, we want to see a Treynor ratio higher than 0.022 in my case.

If a fund has a higher Treynor ratio than 0.022, the fund has produced higher returns than the benchmark adjusted for the beta, or fluctuations with the market.

The average Treynor ratios for the actively managed funds are 0.037 and 0.052 for net and gross returns. These are both higher than 0.022 and they are also higher than the Treynor ratios of the passive funds which are 0.025 and 0.03.

Again the numbers for gross and net returns make sense when compared to each other, no surprise here. While only marginally, the Treynor ratio of the passive funds are above 0.022.

To get a negative Treynor ratio, a fund would have to have a return below the risk free rate. It makes sense that this is still only one fund for the net returns.
When looking at the results from the different ratios, it looks like the managers of the active funds are doing a good job.

7 Conclusion

The sample I am using consists of only 19 active funds and four passive funds. This is relatively small compared to the number of funds that are available on the OSE. I am testing the fund managers stock picking abilities using Jensen’s Alpha, the Fama-French Three-factor model, a t-test and four different performance measure ratios.

The results from the statistical models does prove a couple of significant alphas when considering gross returns. This means that there are some fund managers that are able to outperform the market. I cannot however, rule out luck as an explanatory factor for this outperformance. While some funds do outperform the market this is only a small portion of the sample of about 26%. Almost all of the significant outperformance is gone when looking at net returns and only a single fund was able to produce significant results when considering net returns. One single fund with a significant result is not really higher than what one might expect from misinterpretation on a five per cent confidence level in a sample of this size.

When considering the four different performance measures; The Sharpe ratio, Sortino ratio, Information ratio and Treynor ratio, the active funds generally deliver better ratios than both the market and the passive funds.

None of the alphas that are significantly different from zero are negative, this means that while there is little evidence of over-performance, there is no evidence of underperformance when looking at the results from the statistical models.

Even though the ratios of the actively managed funds are better than both their benchmark and the alternative of passive funds, there are some funds that deliver negative ratios. This means that they have performed worse than their benchmark and in some cases even worse than the risk-free rate.
Similar to Grossman and Stiglitz (1980), my findings lead me to believe that over-performance is indeed possible, but there is a cost of gathering information. The return however, is rarely justified by the cost of active management.

So is it worth it to pay for an actively managed fund? I find very little evidence of managers possessing good enough stock picking skills for an investor to benefit from it after management fees and other costs. It seems to me from the results in this study, that investors are generally just as well off by investing their money in a passive fund.
8 Suggested future research

There are a couple of things that I think would be interesting to look further into. Even though I doubt that Carhart’s four-factor model would produce very different results from Jensen’s alpha and the Fama-French three-factor model it could be interesting to test.

Further it could be interesting to look at how Norwegian funds are doing in the global market and not just in Norway.

As I have only tested stock picking abilities I also think it would be interesting to look at market timing abilities as well as performance over periods of different lengths.
Bibliography


