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Performance and Activeness of Norwegian Active Mutual Funds

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Abstract

This paper aims to investigate the performance and activeness of active open-end mutual funds in Norway in the time period 2010 to 2020. The study uses a dataset free of survivorship bias by including delisted funds in the period. Using R^2 and tracking error as measurements of activeness, we identify 98 active mutual funds of which seven are presumed closet indices. Our findings are in line with previous literature, suggesting active fund's ability to outperform the index gross of fees is present, but not with expenses taken into consideration. Further, our analysis implies that a more significant share of active funds outperforms the global market over the domestic market. These results deviate from previous Norwegian literature in one area: previous research favors active management invested domestically, while our model suggests they perform better globally than domestically. This may be due to different sample periods or the new cost structure of funds after the introduction of the MIFID-II law.

Further, funds operate with different minimum investments and expenses. We found a correlation regarding minimum first-time deposit and expenses for each fund - minimum deposits increase, causing the average fees to decrease. Our models suggest the performance is close to equal for funds with high and low minimum deposit, gross fees. This indicates that retail investors (i.e., investors with less than NOK 500.000 to investment) have less to gain by choosing active funds, over institutional investors, because of the increase in the expenses. Finally, to measure managers' risk-adjusted return, we apply a Sharpe ratio to evaluate the risk associated with each fund's return. This shows how much additional return an investor earns by taking additional risk. We conclude that the average fund is able to deliver satisfying ratios; only 11,2% of our fund sample underperform on this measurement. Overall, we cannot conclude that Norwegian active mutual fund’s either outperform or underperform the index regarding risk-adjusted excess returns net fees because of the lack of sufficient significant alphas.

Key words: Mutual fund performance, Tracking Error, R^2, Factor Models,

Preface

This thesis is the final part of our Master of Science in Economics and Business Administration with major in Finance at Oslo Business School at Oslo Metropolitan University. The work on our master's thesis has been intensive, demanding and educational. It has given us much motivation working on such a comprehensive project in these times. We have throughout the work acquired new understanding of statistical methods and how economic studies is conducted. Working with large amounts of data and information tested our patience and structure as we handled these with great care.

It has been an exceptionally educational period, providing us with personal and academic development. The Covid-19 pandemic made the work challenging as we all have had to adapt to more digital cooperation regarding the Covid-19 pandemic.

We would like to thank our supervisor Danielle Zhang for invaluable insight, input and discussion along the way with the thesis. Her availability and short response time in these challenging times, and knowledge has been deeply appreciated throughout our work. We would also like to thank our close friends and family for support and encouragement during both the thesis and our last two years in the master's degree.

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1. Introduction

In this paper, we examine the performance of Norwegian active mutual funds compared to their index. According to (Verdipapirfondenes Forening, 2020), there has been an increase in monthly savings in funds for the population in Norway over the last seven years, making it a current topic. Additionally, many leading financial institutions have in recent times changed their fund pricing due to new legislation. Our motivation for this study is to give investors a better understanding of Norwegian mutual active funds and their performance and see if they are sufficiently managed.

Our first hypothesis is that our fund sample will outperform the index regarding the excess risk-adjusted return, net fees, as what (Forbrukerrådet, 2018) concluded in their study. To test this hypothesis, we apply a set of different methods. We first did an equally weighted fund performance regression to see if we find evidence that active funds can generate excess risk-adjusted returns compared to the index. We later compare the different factor loadings through multiple factor models.

Further, we calculated the R^2 and tracking error to see if the funds are sufficiently actively managed and see if closet indexing is widespread among Norwegian mutual funds. Closet indexing is funds that claim they are actively managed with prices equivalent to active funds when they, in reality, are index funds, which cause unnecessary investor expenses. There has been increased focus on this in recent times, which brings us to our second hypothesis; that closet indexers are infrequent among our fund sample. Later we calculated the Sharpe ratio for each fund. We get a better understanding of how much additional return an investor earns by taking additional risk on the individual funds. We did a further analysis by adding robustness checks to distinguish institutional and retail investors, which brings us to our third hypothesis: that funds with a minimum deposit of more than NOK 500.000 will outperform funds with a minimum deposit of NOK 500.000 or less, net fees.

By analyzing the performance of the equally weighted portfolio, we get no significant results. Hence, we cannot draw any conclusions. Our model indicates that active funds – on average – are able to surpass their benchmarks when applying the global (Fama & French, 1992) three-, and five-factor model and (Carhart, 1997) four-factor model. This holds up both when we

include and exclude costs for the active fund management. Additionally, our model indicates that funds cannot outdo the funds' index when applying the domestic-modified three-factor and four-factor model, net and gross of fees. Nevertheless, our analysis suggests that the globally invested part of Norwegian active managed funds gives an excess risk-adjusted return, while the domestic investments do not.

Secondly, by looking at the factor loadings, we get some significant results that Norwegian mutual managers are able to generate excess risk-adjusted return gross of fees in both markets, with more significant values towards the global factors. Net of fees, the result is mixed towards the global market, but we still get some significant positive values towards the global market. Due to the low significance, we cannot conclude whether active funds generate excess risk-adjusted returns after subtracting fees in any of the markets. When applying the models for R^2 and Tracking Error, we find that closet indexers seem to be infrequent or not existing at all in the Norwegian mutual fund market. Our analysis indicates that seven funds of our total sample are presumed, closet indexers. However, all seven funds have few observations with an average of 16. Compared to a total sample with 132, the results are most likely to suffer from inconsistency and must be interpreted cautiously. We cannot conclude whether these are closet indexers without further studies that are not counted for in this study.

When dividing the funds into two groups; funds with minimum investments at NOK 500.000 or less and funds with minimum investments over NOK 500.000, the second group seems to have more to gain by choosing active funds. The performance of the two groups is close to equal gross expenses. Still, with expenses taken into consideration, the last group is slightly outperforming in respect of returns due to the decrease in expenses.

This thesis will be structured as described: we will introduce our thesis subject in the following section. Section 2 will include prior research on the topic with studies and known theories and our hypothesis selection. This will consist of previous research either similar to or related to what we want to study. Section 3 will include theories. Section 4 and 5 describe the methodology, data collection, and summary descriptive. Section 6 contains the empirical results and interpretation thereof, and section 7 summarizes the result of this study.

Funds have become a popular way of saving for the general population in Norway. With increasing net drawings from private investors over the last seven years, we find it essential to investigate whether active funds achieve excess risk-adjusted returns versus their respective index. Investors can choose between several different options when investing in funds, and it is also possible to invest in various types of funds at the same time. However, two main categories remain clear: active and passive funds. One could expect that the choice of a fund investment depends on individual preferences, such as risk tolerance, beliefs, values, and environment.

However, a primary mindset for all investors is to maximize return given each level of risk, (Markowitz, 1952) Higher excess return is often associated with higher risk taken. (Sharpe, 1991) describes this risk-adjusted relationship as the Sharpe ratio. While active funds have higher costs and an active type of management compared to index funds, (Nordstrøm, 2018) revealed that financial institutions mainly recommend active funds for their customers or disagree on whether or not it is lucrative (Nordea, 2021). Indexing is a form of passive fund management. Index funds follow the market and need very little management. Thus, they have lower fees. After the stocks have been chosen for the index fund portfolio, they do not need that same amount of management as active funds. Therefore, a well-diversified index fund will have close to equal yield compared to the overall stocks in the market. Those adhering to passive funds believe that the market is efficient, meaning that the prices of the stocks in the funds reflect all available information in the market. At the opposite end, there are speculators. Speculators believe the market is inefficient and that it is possible to gain profits by actively managing portfolios. While the passive strategy would generate market returns at a low cost, active portfolio managers set higher fees: it costs investors more to keep their assets within funds managed by them. In order for investors to gain profit, active fund managers have to produce excess returns to compensate for the higher fees of the fund. To be profitable for the investors, the extra return needs to surpass the fees at least. The higher fees of active funds serve as payment for the managers' time and expertise. A possible conflict occurs when active funds grant financial institutions more profit, as the financial institutions might become motivated to recommend active funds over passive funds to investors (Forbrukerrådet, 2018). When or if this happens, it would be unethical since their guidance and recommendations might be based on a conflict of interest. In light of this, we will

examine whether active funds turn out to be beneficial in terms of risk-adjusted excess return and measure how actively managed they are. In this thesis, we will analyze the performance of Norwegian mutual funds issued by Norwegian financial institutions. These funds invest in global and domestic equities, which have different risk profiles than those that invest solely in the global or domestic market. Our sample of Norwegian funds has in common that they are predominant in the domestic market.

By studying the funds' prospectus, the average fund in our sample is only allowed to invest a total of 20 percent in the global markets. Funds are said to be diversifiable compared to one-stock investments as of the elimination of unsystematic risk. By investing part of the funds globally, the portfolio will benefit from the consequent diversification. (Statman, 1987) shows that a well-diversified portfolio of randomly chosen stocks must include at least 30 stocks for a borrowing investor. According to the Norwegian Mutual Fund Association, the total assets in Norwegian mutual funds are valued at NOK 297 billion by March 2021, a sum that has been increasing every year for the past five years (Verdipapirfondenes Forening, 2021a).

In 1982, there existed only one Norwegian mutual fund on the Oslo Stock Exchange. By the end of 1982, (Gjerde & Sættem, 1991) reported that the market value of Norwegian equity funds was merely 290 million NOK. Illustrated in appendix 8, we observe the regular monthly savings in Norway from 2012 - 2020. The average monthly savings agreements were NOK 974 in 2020 for those who save in funds with fixed withdrawals (Verdipapirfondenes Forening, 2021b). The fact that funds have become a popular way to save money and generate profit for private individuals makes it a contemporary topic. In light of the Covid-19 pandemic, the stock market had a fall in February/March 2020. The pandemic may have resulted in more inexperienced investors wanting to join the rise in the stock market. There may also be more investors wanting to support local businesses after the lockdown. When looking into the level of activeness for the individual funds, there are many ways to measure how active a fund is. If the fund is not sufficiently active, an investor would be better off investing in an index fund with lower costs. A strategy somewhat recently disclosed named closet indexing has been practiced by financial institutions. The strategy is to claim that a fund is actively managed when, in fact, it is tracking a benchmark index, meaning the

investors will end up with a portfolio that does not deviate too much from the benchmark index.

While it is marketed as and has expenses equivalent to active funds, a closet fund is more similar to index funds. The question of whether closet indexing is illegal depends on how the fund is described in its promotional material. If it says it is active but invests like a tracker, it is potentially illegal (Powell, 2018). The strategy was particularly exposed in 2017, when Norway's largest bank DNB got targeted by a class action on behalf of 180.000 customers, accusing the bank of selling them an active fund when, in reality, it was a so-called closet index. In 2020 DNB lost the case in the Supreme Court of Norway and had to refund a portion of the assets back to their customers. Due to this case, we find it relevant to investigate performance and how active Norwegian mutual funds are. We expect this to have influenced similar funds with insufficiently managed portfolios to change towards more active management or state them as passive funds. This brings us to our second hypothesis that Norwegian mutual funds have few indications of closet indexing. We do this by regressing each fund to find its respective R^2 and by applying the modified standard deviation measure – the tracking error. Additionally, we decided to look solely at the funds categorized as active, hence omitting all index funds from our analysis, using the standard Norwegian fund OSEFX index as the benchmark.

Our analysis shows that the fund's expenses decrease with increasing minimum deposits. In other words, if investors have much money ready to invest, they can place them all in a high-depository active fund in exchange for a low fee - similar to the fee structure of index funds. One example of this type of investor is institutional investors, who do not use their own money but invest other people's money on their behalf. The institutional investor can get the potential gain from having the funds placed in an active fund under an experienced manager while paying fees similar to an index fund. Investors without extensive capital holdings are forced to save in funds with lower minimum investments, hence funds with more extensive fees. As many people do not have the option to put many millions into a one-time-payment fund saving, these are the relevant funds for the general public, i.e., Retail investors, non-professional investors who buy and sell securities through a brokerage firm. That is why we find it essential to distinguish between the active funds based on their minimum investments.

By distinguishing between small and large minimum deposits, our third and last hypothesis is that funds with a minimum deposit of more than NOK 500.000 will outperform funds with NOK 500.000 or less net fees.

2. Literature and Hypothesis

This thesis aims to study the relationship between Norwegian active fund managers and their performance in generating a risk-adjusted return concerning their index and activeness. To understand whether active portfolio managers can outdo the market with their expertise, we examine previous relevant literature and historical data. Fund performance is a topic that has been discussed and researched several times over the years, with mixed results. While previous literature has concluded that active management can be profitable, a majority conclude otherwise when they consider the fees (Daniel et al., 1997). Recent reports show that many prominent financial institutions and platforms in Norway have decreased prices of active funds and increased their prices on index funds in recent years (Skar, 2020) and (Strzelecki, 2021). The reason behind the change in the fee structure, Nordnet explains, is due to a new law named MIFID-ll (Finanstilsynet, 2020). The legislator's purpose has been to ensure that banks, advisers, and others who sell funds to the public do not have incentives to recommend expensive funds (with a high return commission) instead of cheap funds (with a low return commission). More comprehensive reporting obligations have been introduced to prevent market abuse, increased requirements for the publication of information on orders and trades, and a position limit regime for commodity derivatives. We are analyzing Norwegian funds' performance. Considering the reports mentioned above, we want to see if our results will differ from previous literature on the subject.

2.1 Literature Review

In this section, we start by summarizing previous literature claiming index funds perform better than active funds. Secondly, we summarize literature that supports active fund performance.Most prior research on the field supports the claim that index funds perform better in that they provide excess risk-adjusted returns compared to the alternative active funds. Most previous literature is conducted in the U.S., but expected results conclude that index funds give the highest risk-adjusted returns regardless of the research's origin.
There is literature supporting active fund’s performance. Especially before costs, a majority of studies claim that it is possible to provide an excess return by active management, which contradicts with the strong form of the efficient market hypothesis (Fama, 1970). Further, a Norwegian study by (Forbrukerrådet, 2018) claimed that they found evidence that active Norwegian managers did outperform the index in the domestic market. As most prior research

on fund performance is conducted outside of Norway, we will continue this section with previous literature on this field, followed by literature inside of Norway.

2.1.1 Performance of active funds outside of Norway

One of the first to research the topic was (Jensen, 1968). He sought to measure if portfolio managers could outdo the market and reduce risk through diversification. His research introduced the unit of measurement Jensen's Alpha, which was described to measure mutual funds' performance. With a sample of 115 funds, he concluded that the average active fund could not beat the index. This result did not account for the fees, which means that investors would lose profit on the funds' performance alone and the additional fees. (CUMBY & GLEN, 1990) studied global mutual funds' performance in the U.S. They wanted to see if U.S. global mutual funds performed better or worse than domestic and global benchmark indices. They included 15 global funds in their analysis. They used both The Morgan Stanley World Index and The Morgan Stanley US Index to make the comparison. The study was conducted from 1982 to 1988, and they used alpha to measure portfolio performance. Their findings were that fund managers were taking more risk when the market was going downwards and less risk when the markets were rising. The main finding from the analysis was that the U.S. global fund did not outperform their respective benchmark over this time. Based on this research, (Droms & Walker, 1994) increased the sample size to get more reliable results while also adding a time series regression. They found that funds benefited from global diversification, where the internal portfolios' rate of return commensurate with their risk exposure.

(Malkiel, 1995) did another study on funds in the period 1971–1991. The results were the same as Jensen's: active funds underperformed in terms of returns. Malkiel also introduced a measure of survivorship bias. By including funds that were discontinued or closed, he would get more accurate data. He suggested that studies that favored active mutual funds were likely to suffer from survivorship bias, and therefore their data was wrong. He found that funds have underperformed benchmark portfolios both after management expenses and even gross of expenses.

(Daniel et al., 1997) studied 125 passive funds to see if portfolio managers could pick stocks that outperformed simple strategies, such as book-to-market and momentum. They included a

new measurement that matched the characteristics of the component shares in the funds. Their results show that there were funds that were able to identify over-performing stocks. However, for those funds that gave profitable results, the fees were approximately equivalent to the returns, so they did not pay off in the end. Moreover, their results suggest that increased risk gave higher returns but at a higher cost. This bears a resemblance to the findings of (Grossman & Stiglitz, 1980). They concluded that some portfolio managers could outperform the market, but only to the extent of their higher expenses.

(Bogle, 2002) wrote the paper An Index Fund Fundamentalist, where he states that the index benchmark will perform better than actively managed portfolios in most cases. By looking at fund performance from 1992 to 1996, he showed the superiority of low-cost funds over high-cost alternatives. His research was based on the Morningstar Style Box, a nine-square grid representing an investment style. From 1992 to 1996, he found that index funds outperformed actively managed counterparts in eight of the nine style boxes. He repeated the study in 2001 over a ten-year period and found that index funds outdid active funds in all nine boxes.

A bootstrapping technique introduced by (Kosowski et al., 2006) was introduced to distinguish whether the fund's managers were high performing by pure luck or by skill and expertise. Their research included open-end, domestic equity mutual funds over the period 1975 to 2002 in the U.S. They suggested that most active fund managers are not able to provide sufficient returns after fees are included. Their findings differ from the previous studies that superior alpha persists. (Fama & French, 2021) did a similar analysis to see if fund managers could generate risk-adjusted excess returns over index funds and if it was due to luck or skill. One of their hypotheses was that the average active fund should give the same excess return as an index, but without fees, become slightly less profitable. Theoreticians argue that active management is a zero-sum game (Fama & French, 2021), (Malkiel, 2003) Instead of looking at each fund independently like Kosowski, they modified the procedure to include sample funds of returns jointly. The motivation for the study was to see what distribution the cross-section of alpha in active funds was expected to be if alpha is zero in every fund. Their findings were similar to that fund managers were not able to generate returns after fees. Without fees and using the bootstrapping method, they found evidence that fund managers did perform better than index funds, hence a nonzero true estimate of alpha.

(Carhart, 1997) researched by including all diversified equity funds from January 1962 till December 1993 monthly. Because he included all funds, it was free of survivorship bias. He wanted to examine the perseverance in mutual fund performance. He based his research on the already established 3-factor model by (Fama & French, 1993). Then he added a momentum effect by (Jegadeesh & Titman, 1993) as an extra explanatory variable. This was based on persistence, meaning that funds with high returns today would have high returns in the future. The conclusion was clear: the transaction cost will cover profit gained by following trends for most mutual funds if you exclude the most significant outliers. He also found evidence that funds with an above-average 4-factor alpha have an increased return in subsequent periods. This suggests that there would exist short-term persistence by skilled fund managers that are well informed.

(Chen et al., 2000) found that the shares of active managers did not necessarily perform better than all the shares included in the market portfolio. On the other hand, they find evidence that managers can pick shares because the shares managers actively bought had significantly higher returns than the shares they sold, measured over one year from the trading day, but not in subsequent years. The value active funds achieve based on price-sensitive information is at its side relatively short-term, according to (Chen et al., 2000) as the trustees tend to hold the shares in the portfolio for longer than it turned out to be profitable. They claim that the managers held the shares for too long to avoid transaction costs or that the managers had not identified new underpriced stocks to invest in.

Similar to (CUMBY & GLEN, 1990), (Shukla & Singh, 1997) wanted to evaluate US-based global funds' performance instead of performance on US-based domestic funds. However, their findings did not support Cumby and Glen's. Instead, they found that U.S.-based global funds were superior to the global MSCI benchmark, suggesting that American investors would get better pay-offs by investing domestically rather than globally since it provides better returns adjusted for risk. If investors were to succeed at forecasting when the market would go downwards, the global funds could provide excessive returns in these months. (Amihud & Goyenko, 2013) is a more recent study. They conducted an analysis where they introduced R^2. They wanted to see if they could succeed at explaining returns as an alternative performance parameter. The advantage of this measure is that it does not rely on holding data.

To evaluate whether R^2 was able to predict alpha, they used a combination of the 3-factor model of Fama and French (1993) and the 4-factor model of Carhart (1997). They were then analyzing how well R^2 was an indicator of explaining returns by including several risk factors. Their findings, as intended, were that R^2 was a sufficient predictor of performance.
Using tracking error and active share, (Petajisto, 2013) sorts mutual funds into various categories of active management. According to his research, the most active mutual funds were superior in returns, whereas index funds underperformed. Fees were taken into consideration. Furthermore, he discovered an increase in the popularity of index funds, and about one-third of funds in the U.S. are in the form of index funds.

(Petajisto, 2013) sorted mutual funds into various categories of active management. According to his research, the most active mutual funds were superior in returns, whereas index funds underperformed. (Amihud and Goyenko, 2013) is a more recent study. They conducted an analysis where they introduced R^2 as a measurement for the activeness of the active fund. They found this to be a suitable measurement. (Gottesman et al., 2013) Found that investors did not reward outperformance in down markets with higher flows. They concluded that active managers have an incentive to follow the index in down markets. The current consensus is that, while there is evidence of skill and persistence for a subset of mutual fund managers, typical active funds do not produce a persistent risk-adjusted excess return (i.e., positive alpha) after fees, and hence average investors will be better off using passive strategies (Busse et al., 2010, 2013; Charlo et al., 2015; Doshi et al., 2015)

(Sun, 2014) Researched how the competition from low-cost index funds has affected the fees in the money management industry. The results showed that for actively managed funds, the fees decreased in the low-price end of the market, while it increased in the high-price end of the market. Additionally, the study found that especially active managed closet indexers shift away from holding the index portfolio.

(Cremers et al., 2016) underlines how closet indexers in the U.S. harm the investors through high costs and low returns. A major concern is how the investors fail to avoid closet index funds because of a lack of information regarding the story of funds' closet indexing activities.

The article suggests that an active share disclosure regime would reduce the closet indexing problem's scope and help investors spot funds with a low active share, which in turn will make the market more competitive, more transparent, and could more credibly deliver on active management promises. The study examined the relation between indexing and active management in the mutual fund industry worldwide. They found that about 20 % of the worldwide active funds were closet indexers, with increasing popularity after the financial crisis in 2008. They also conclude that the average alpha generated by active fund management is higher in countries with more explicit indexing and lower in countries with more closet indexing. Overall, their evidence suggests that explicit indexing improves competition in the mutual fund industry. A recent study from 2020 conducted by (Liu & Sinha, 2021) shows that U.S. fund managers lost sizable market share against their index. According to this report, fund managers over the last ten years fell short of their S&P 500 benchmark by 82 %. This study result fits well with most previous literature, favoring index funds over active fund management.

2.1.2 Performance of active funds in Norway

A study conducted by (Sørensen, 2009) on all mutual funds on Oslo Stock Exchange between 1982 and 2008 showed a statistically significant difference in active return of minus 3,1 %. This result was free of survivorship bias because he also included those funds that ceased to exist during this time. With bootstrapping methods, disentangling skill from luck finds only weak signs of skill in the right tail of the cross-sectional distribution of alphas but several inferior fund products in the left tail. He found no persistence in the performance of either winners or losers, meaning the performance is random the next period. His conclusion was clear that there was no evidence of any abnormal returns for an equally weighted portfolio in actively managed funds compared to index funds, using the Fama and French 3-factor model. Similar to the study of Cremers et al. (2016), Smørgrav and Næss (2011) did a Norwegian study to evaluate how active Norwegian funds are. Smørgrav and Næs measure active management with active share in the period 2003-2010. They got the same result that almost 20% of Norwegian equity funds are closet indexers. They further showed that the most active portfolio (high active share) generates a 0.67% higher return than the least active portfolio (low active share), although the results were insignificant.

(Eckbo & Ødegaard, 2015) did empirical research regarding alpha and active Norwegian management. They found that in large funds, on average, the alpha is negative and often equivalent to the fund's costs. Eckbo and Ødegaard can also tell those alpha values have low persistence over time. That is, if a given fund had a positive alpha in a measurement period, it is random if it is also positive in the next period. Furthermore, according to (Ferson, 2010), Negative alpha tends to have a greater degree of persistence over time than positive ones.

Forbrukerrådet is a Norwegian state administration that guides consumers and mediates in disputes between consumers and businesses and conducts interest policy work. They wrote the report "*choose active mutual funds or index funds"* (Forbrukerrådet, 2018). On behalf of the Norwegian population, their goal was to uncover the differences in risk-adjusted returns of active vs. index funds after fees were subtracted. A total of 157 equity funds were surveyed. The measurement period was from and including 1998 up to and including 2017. They excluded funds with over NOK 500.000 in minimum deposits. This makes the study only relevant for retail investors. They also included delisted funds to count for survivorship bias. They concluded that global, European, Scandinavian, and Norwegian actively managed funds did not outperform the average index funds. Norwegian funds were the only category in which the average active funds were to outperform the average index fund by approximately 0,86 percent yearly.

2.1.3 Other factors that affect performance

Followed by the new MIFID-ll law discussed in section 2, many of the leading financial institutions, among others Nordnet and DNB, announced that they would increase the prices of the average index fund and decrease the price of the average active fund (Skar, 2020; Strzelecki, 2021). Secondly, there is a relation between minimum deposit and expenses for each fund. This is later described in section 5.3. If performance is equal between the funds, this information will indicate that institutional investors have more to gain by choosing active funds than retail investors because of the decrease in the expenses. Thirdly, some active funds have a hybrid fee, to us - a new method of pricing funds - which we will name as "progressive-fee".

This fee structure offers a relatively initial low fee in exchange for increasing expenses if the fund provides excess return compared to the index. If the fund does not provide an excess return, the investor will only pay the initial fee. A disadvantage associated with this thesis is that the finance institutions do not reveal historical fees, and with that, we do not know the correct charge. The low initial fee (without the progressive part) will make the analyses weakly biased in favor of active funds for these funds.

2.2 Hypothesis development

As most previous research, both global and domestic, tend to favor index funds, the change in legislation and fee structure and choice of sample period may affect our results in the opposite direction. As discussed in section 2.1.2, Sørensen (2009) found Norwegian index funds to give excess risk-adjusted returns for an equal-weighted portfolio compared to active funds. For global- and Scandinavian-invested funds, Forbrukerrådet (2018) came to the same conclusion. However, they found managers to outperform the index domestically - this holds both gross and net of fees. As our fund sample mainly invests domestically without considering the new information, we should expect similar results based on this information, hence positive excess return for our sample. This brings us to our first hypothesis that our fund sample will outperform the index regarding an excess risk-adjusted return, net fees.

Secondly, unlike Cremers et al. (2016) and (Smørgrav & Næss, 2011) we expect closet indexing to be infrequent among active Norwegian funds, especially after the conviction against DNB in 2020. This brings us to our second hypothesis. That closet indexing is infrequent among Norwegian funds. Thirdly, the fund's expense structure is related to investment size, and performance is a measurement after risk and expenses are considered. If they were to give the same risk-adjusted excess return, funds with higher minimum deposits would be superior due to the decrease in expenses. Our last hypothesis will therefore be that funds with a minimum deposit of more than NOK 500.000 will outperform funds with NOK 500.000 or less, net fees.

Hypothesis 1:

H0: Our fund sample will not outperform the index in respect to excess risk-adjusted return, net fees.

H1: Our fund sample will outperform the index in respect to excess risk-adjusted return, net fees.

Hypothesis 2:

H0: Closet indexers are frequent among our fund sample.

H1: Closet indexers are infrequent among our fund sample.

Hypothesis 3:

H0: Funds with a minimum deposit of more than NOK 500.000 will not outperform funds with NOK 500.000 or less, net fees.

H1: Funds with a minimum deposit of more than NOK 500.000 will outperform funds with NOK 500.000 or less, net fees.

2.3 Contribution to the literature

Concerning the new information regarding regulations and prices on Norwegian mutual funds, even reasonably new Norwegian literature might be outdated. Our study will contribute to the field with the same approaches and methods as previous literature, but with new data and a more recent time period. In addition, we will see if closet indexing is infrequent, illuminate the differences between fund deposit size and fee structure, and look at the individual funds' respective risk-related returns.

3 Theory

A popular extension of modern portfolio theory is named the Capital Asset Pricing Model (CAPM) by (Lintner, 1956; Mossin, 1966; Sharpe, 1964; Treynor, 1961). While MPT only is capable of pricing portfolios, CAPM describes the relationship between risk and return for a given asset. Its formula is defined as:

$$ER_i = r_f + \beta_i(ER_m - R_f) \quad (1)$$

Where:

ER_i = Expected return of investment

r_f = Risk-free rate

β_i = Beta of the investment

$(ER_m - R_f)$ = Market risk premium

The formula implies that the expected return of investment is equal to the risk-free rate plus the market risk premium times beta. Beta is given by the formula:

$$Beta\ coefficient(\beta) = \frac{Covariance(R_e, R_m)}{Variance(R_m)} \quad (2)$$

Where:

R_e = The return on an individual stock

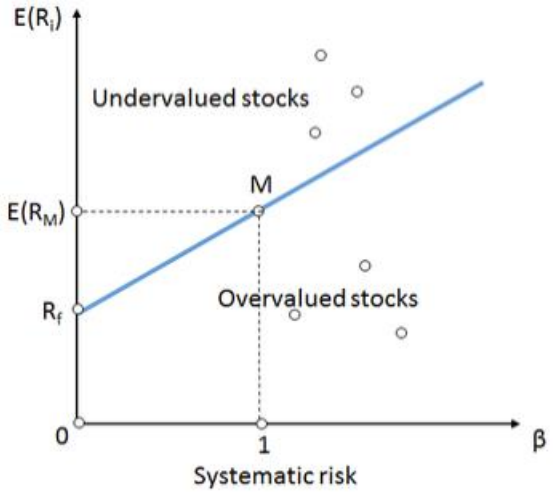
R_m = The return on the overall market

Covariance = How changes in a stock's return are related to changes in the market's returns

Variance = How far the market's data points out from their average value

Beta is a measure of the volatility of a stock compared to the systematic risk of the whole market. Higher beta means higher volatility. Graphically it is visualized as a slope made from the average distance between regression points, representing the different individual stocks return.

Figure 1: Security Market Line



The security market line (SML) shows combinations of market risk levels and levels of expected return. If there were perfect market equilibrium, all pricing would lie precisely on the line. According to SML, if the asset deviates from the line, mispricing of the stock and investors could gain profit by selling or buying the stock depending on the deviation. If the asset is above the line, it is underpriced and will provide an expected return greater than what the SML predicts, given its beta. If the asset is under the line, it is overpriced. Hence it will provide less expected return than what SML predicts. CAPM also states that investors, or fund managers in our case, only should be rewarded for systematic risk because you could get rid of the unsystematic risk yourself by diversification.

This thesis analyzes the performance of active mutual funds in Norway to compare them to an index benchmark later. Hence, we find it necessary to define active and passive portfolio management. (Bodie et al., 2010) describe passive fund management as buying a well-diversified portfolio to mirror a market index without attempting to search for mispriced securities. An active portfolio, they define, attempts to improve performance either by identifying mispriced securities or forecasting broad trends in the market. Further, they say that an active portfolio in the context of the Treynor Black model is a portfolio that is formed by mixing analyzed stocks of perceived non-zero alpha values. The portfolio is ultimately mixed with the passive index portfolio.

(Sharpe, 1991) states that active and passive management styles have in common that it must be the case that 1) before cost: the return on the average actively managed dollar will equal the return on the average passive managed dollar, and 2) after cost; the return on the average actively managed dollar will be less than the return on the average passively managed dollar. With this said, Sharpe categorizes the market as efficient, so passive investment strategies would include all investment opportunities and that all investors have the same objective.

First introduced by (Fama, 1970) is the Efficient Market Hypothesis (EMH). This hypothesis suggests market efficiency is divided into three groups; strong, semi-strong, and weak form. Fama defines the market as efficient when stock prices fully reflect all available information and that the same information is available to everyone. The strong form hypothesis suggests that stock prices reflect relevant information to the firm, even information that is only available for insiders. The semi-strong form hypothesis states that stock prices reflect all publicly available information. The weak form hypothesis states that prices reflect available information in the historical prices and that it is impossible to predict future prices. Adherents of the efficient hypothesis believe that active management is instead a wasted effort and unlikely to achieve profits. According to EMH, it would be more rational to invest in low-cost index funds than in more expensive actively managed funds because excess returns are impossible or not profitable.

However, the market cannot always be perfectly efficient, a point emphasized by Grossman and Stiglitz (1980). If so, there would be no incentives for active managers to engage in the costly process of acquiring information; price discovery requires some degree of expertise and active management. Therefore, there must be an equilibrium degree of disequilibrium, in the words of Grossman and Stiglitz. One may reasonably conjecture that there is less competition in the market for information in Norway than, for example, in the U.S. The comparable Oslo Børs is a small exchange and is less extensively studied than the U.S. market. Therefore, professional mutual fund managers are perhaps, a priori, more likely to do well on the Oslo Børs because inefficiencies are more likely to be present. According to (Shleifer & Vishny, 1997), no asset price reflects all available information.

4. Methodology

4.1 Model selection

To explain mutual fund's return and to what degree they can measure performance, we will apply different multifactor models. The main goal of multifactor models in evaluating funds is to compare the return generated from the respective factor model by mutual fund performance. With this said, we can see to what extent the exposure of each risk factor included in the model attributes to the fund's performance. The profit is not calculated directly but captured by the intercept, also known as alpha. To find the value of alpha, we run different time-series regression on each fund. Additionally, we do the same on an equally weighted portfolio (EWP) of the funds that we have included in our sample.
Our funds invest in domestic and international stocks. By reading the funds' respective prospects, we find that all funds in our sample predominantly invest domestically and that, on average, about four-fifths of their portfolio is invested domestically. We find it interesting to distinguish the performance to see if managers achieve different excess risk-adjusted returns in one of the markets. We are using different factors for each model to distinguish the domestic and global markets. However, we do not consider strategies for the different funds, such as being socially responsible or environmentally friendly.

4.1.1 Equally weighted portfolio

In order to test hypothesis 3, we carry out robustness checks on the equally weighted portfolio. During our analysis, we have understood that there is a connection between the minimum deposit size one must pay to be allowed to invest in individual funds and how much investors pay in yearly fees. Most financial institutions offer to decrease management fees in exchange for increased deposits and vice-versa. Plyakha, Uppal, Vilkov (2012) found that the equal-weighted portfolio with monthly rebalancing outperforms the value- and price-weighted portfolios in total mean return, four-factor alpha, Sharpe ratio, and certainty-equivalent return, even though the equal-weighted portfolio has greater portfolio risk. Another downside of using an EWP is that all funds count with equal values. To address this issue and remove bias between retail- and institutional investors, we divide the funds into two groups. One consists of funds with minimum deposits of NOK 500.000 or less, and one with a minimum deposit of more than NOK 500.000. The results are shown later in section 6.2.2.

4.1.2 Jensen's Alpha

Until today alpha is still a sufficient measure of fund performance, popular among analysts, it was created by (Jensen, 1968) to find a unit of measuring performance. To see if investors are rightfully compensated for the benefit of managers to actively and continuously replace stocks in their portfolio in the hope of excess returns. A fund with a statistically significant alpha suggests it can generate abnormal returns. The formula of the single-factor model of alpha is described as:

$$Alpha = r_i - r_f + \beta(r_m - r_f) \quad (3)$$

Where:

r_i = The realized return of the portfolio or investment

r_m = The realized return of the appropriate market index

r_f = The risk-free rate of return for the same period

β = The beta of the portfolio of investment with respect to the chosen index

A positive alpha implies that the fund outperforms the market with better risk-adjusted returns. In contrast, a negative alpha means that the funds underperform and give less returns to the investor adjusted for risk. The alpha generated from the single-factor model is only exposed to market proxy. It is later proven insufficient to include reliable market anomalies, such as book-to-market and momentum factors. Therefore, we will use the three-factor model by Fama and French (1992), the four-factor model by Carhart (1997), and the reasonably new five-factor model of Fama and French (2014). For the three- and four-factor model, we use additional domestic factors by Odegaard, specially developed for the Norwegian market.

4.1.3 Fama-French Three-Factor Model

Introduced earlier in the thesis, (Fama & French, 1992) three-factor model is an extension to CAPM by (Lintner, 1956; Sharpe, 1964). The extension was to capture the factors small minus big (SMB) and high minus low (HML), which CAPM does not account for. SMB suggests smaller companies outperform bigger companies in the long term. HML is another factor that says value stocks perform better than growth stocks. Further, value stocks are classified as undervalued stocks that will generate a greater return than what it is currently being traded for. Growth stocks are stocks that have a better potential to overperform in the market in the long-term run. The Fama and French three-factor model is defined as:

$$R_{i,t} - R_{ft} = \alpha_{it} + \beta_1\left(r_{Mt} - r_{ft}\right) + \beta_2(SMB_t) + \beta_3(HML_t) + \varepsilon_{it} \quad (4)$$

Where:

$R_{i,t}$ = Total return of a stock or portfolio *i* at time *t*

r_{ft} = Risk-free rate of return at time *t*

r_{Mt} = Total market portfolio return at time *t*

$R - R_{ft}$ = Expected excess return

$R_{Mt} - R_{ft}$ = Excess return on the market portfolio (index)

SMB_t = Size premium (small minus big)

HML_t = Value premium (high minus low)

1,2,3 = Factor coefficients

ε_{it} = Idiosyncratic return.

The model implies that the expected excess return is equal to the excess return on the index times a factor coefficient, plus the size and value premium, plus the risk. Using thousands of random stock portfolios, Fama and French found that the model explained as much as 95 % of the return in a diversified portfolio.

4.1.4 Carhart Four Factor Model

The four-factor model by (Carhart, 1997) is an extension of the three-factor model, which includes a momentum factor that aims to capture winners and losers in the market through persistence. The model suggests that stocks that have performed well in the past will perform well in the future and vice-versa. The model can be defined as:

$$R_{i,t} = \alpha_{it} + \beta_1(mkt_t) + \beta_2(SMB_t) + \beta_3(HML_t) + \beta_4(WML_t) + e_{it} \quad (5)$$

Where:

$R_{i,t} = R_{it} - R_{ft}$ and $mkt = R_{Mt} - R_{ft}$.The new variable included in the model is Winners Minus Losers (WML), which is the average return on portfolios long on stocks with high stock returns and portfolios long on stocks with low stock returns.

4.1.4.1 Modified Carhart Four Factor Model

The modified four-factor model is calculated as Carhart four factor model using Norwegian data from the Ødegaards website. The modified four-factor model replaced WML with PR1YR, where PR1YR is the difference between the average return of the top and the bottom portfolios. It is interpreted the same way. The difference is the data input to distinguish global and domestic performance. It is the equivalent of saying domestic Fama and French three-factor model and domestic Carhart four-factor model.

$$R_{i,t} = \alpha_{it} + \beta_1(mkt_t) + \beta_2(SMB_t) + \beta_3(HML_t) + \beta_4(PRI1YR_t) + \varepsilon_{it} \quad (6)$$

Where:

$R_{i,t} = R_{it} - R_{ft}$ and $mkt = R_{Mt} - R_{ft}$

4.1.5 Five-factor model

(Fama & French, 2015) found it sensible to extend the three-factor model by adding two new variables to the equation; investment and profitability factors. The two factors consider securities of firms with high operating profitability to perform better and those with high total asset growth tend to perform below-average returns. The model is defined as:

$$R_{i,t} = \alpha_{it} + \beta_1(mkt_t) + \beta_2(SMB_t) + \beta_3(HML_t) + \beta_4(RMW_t) + \beta_5(CMA_t) + \varepsilon_{it} \qquad (7)$$

The two new variables are Robust Minus Weak (RMW) which is the difference between returns on diversified portfolio stocks with robust and poor profitability, and Conservatively Minus Aggressively (CMA), which is the difference between returns of firms that invest conservatively minus those that invest aggressively.

4.2 Measuring the activeness of funds

When calculating whether funds are being actively managed, we must look into what degree the portfolio deviates from its comparable benchmark index (Sørensen, 2009). Two familiar and well-used measures for this are R^2 and Tracking Error measure. The goal for managers is to gain excess risk-adjusted return and low R^2 values, and high tracking error.

4.2.1 R^2 measure

When R^2 is calculated, we will get a value between 0 and 1. In our case, it shows the percentage of variability in fund performance that is explained by variability in benchmark performance. High R^2 means the fund is close to index and low R^2 means more active management. The R^2 measure can be calculated by the following formula:

$$r^2 = \frac{\sum_{i=1}^{n}(y_i - \hat{y})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} \qquad (8)$$

Where:

$\sum_{i=1}^{n}$ = Is the sum of the *i* periods for *n* observations

y_i = Is the actual monthly return

$\hat{y}$ = Is the estimated monthly return

$\bar{y}$ = Is the average monthly return

4.2.2 Tracking Error

Tracking error is defined as the difference between the portfolio performance and performance of the corresponsive benchmark. It can also be used to measure how active a portfolio is and its corresponding risk level. A portfolio with a high tracking error means it deviates a lot from its benchmark, while a low tracking error means it follows its index closely. However, a high tracking error does not necessarily determine the portfolio as poor. Hence a high tracking error fund can still outperform the index in respect to excess return. Tracking error can be calculated by the following formula:

$$TE = \frac{\sqrt{\sum_{i=1}^{n}(R_p - R_b)^2}}{N-1} \quad (9)$$

Where:

$\sum_{i=1}^{n} =$ Is the sum of the *i* periods for *n* observations

R_p = Is the monthly returns of the portfolio

R_b = Is the monthly index returns

N = Is the number of observations

The calculated R^2 value and tracking error for all individual funds is shown in appendix 2.

4.2.3 Range

The European Securities and Market Authority (ESMA) is a European Union that contributes to safeguarding the financial system's stability around the world. They have provided a range to the extent of funds potentially being closet indexers. It can be used as a starting point to distinguish whether a fund is being actively or passively managed. Their public statement report (European Securities and Markets Authority, 2016) defines funds with tracking errors lower than 4 % and an R^2 of more than 95 % as potentially being closet indexers. In our analysis, we have used this information to determine whether funds are being sufficiently actively managed or if they should be defined as closet indexers.

4.2.4 Sharpe Ratio

Developed by (Sharpe, 1966). The desired effect of taking more risk is to acquire a great profit in a short amount of time. The Sharpe ratio compares the excess return to a risk-free asset after adjusting for risk. It is calculated by taking the excess portfolio return minus risk-free rate divided by the standard deviation of the portfolio. It represents the additional amount an investor gets for investment for each extra unit of increased risk. The higher the ratio, the better the investment compared to the risk taken. A rule of thumb is that a Sharpe ratio less than 1 is considered bad, between 1-2 is normal, and above 2 is considered good. The Sharpe ratio formula is calculated as follows:

$$Sharpe\ ratio = \frac{(R_p - R_f)}{\sigma} \quad (10)$$

Where:

R_p = The portfolios return

R_f = The risk-free rate

σ = The standard deviation of the portfolio return

5 Sample and data

5.1 Sample

The sample period we want to study is monthly observations that range from January 2010 to December 2020 and include 98 active funds. Due to the pandemic Covid-19, we expect a fall in returns during February/March 2020. From appendix 1, we can observe that 44 funds have been established, and 17 funds have ceased to exist during our sample period. This find may indicate finance institutions to find active fund management as economically viable. To obtain funds and data to include in our sample, we used Thomson Reuters Eikon (TRE) available at Oslomet computers. This platform preserves financial data, among those monthly historical time series and cross-sectional statistics relevant to our fund analysis. We did the following criteria when extracting NAV values:

Criteria 1: Fund Type was set to "Open-End Funds," Exchange was set to "Oslo Stock Exchange," and Lipper Classification Scheme was set to "Equity Norway." Fund selection was set to "All-funds" to include both alive and delisted funds. The period was set to format DD.MM.YYYY in the period 01.12.2009-31.12.2020, one month before our study to calculate NAV values. A total of 118 funds were extracted in Microsoft Excel.

Criteria 2: Two funds turned out to be duplicated during the extraction from TRE to excel and were removed from the sample. This is likely due to technical errors in TRE or during the conversion process.

Criteria 3: Twelve funds fell into the passive category and were removed from the sample. Our study is focused on active fund performance. Therefore, passive funds were removed from the sample.

Criteria 4: Six funds with less than twelve months of data were excluded from the sample. This is because funds with insufficient data in terms of few observations will not detect reasonable-size effects with good power (Steyerberg et al., 2001).

Criteria 5: We have included those that fall into the category delisted to count for survivorship bias. Delisted funds have ceased to exist during the period, maybe due to bad management, closet indexing, or similar causes, and it is crucial to include to get correct results. Further, a total of six funds in our sample have progressive fees and are included in our sample with their initial fee (without the progressive part).

The last stated fees in TRE are used in our analysis. We have adjusted the omitted data by using the Morningstar website. Further, we have used Verdipapirfondenes Forening (VFF) to validate the data. After a careful selection, we find these sites to be the most credible, providing historical data relevant for our study.

5.2 Data

As Norwegian funds invest in global and domestic stocks. We have used two different websites to get the data. Data for the global Fama and French three- and five-factor and Carharts four-factor model is extracted from Kenneth R. French website. We use data from Bernt A. Odegaard's website for the Norwegian market, particularly developed for the Norwegian market. These are equivalent and can be compared, quoted Odegaard. From these factors, we can construct a domestic-modified three-factor and four-factor model. The last five-factor model cannot be constructed for the Norwegian market due to the lack of Norwegian accounting data. To distinguish between the global and domestic models, we will name the domestic-modified model with Odegaard's factors as the domestic factors.

5.2.1 NAV

Net Asset Value (NAV) is commonly used as a per-share value of mutual funds. By subtracting the value of intangible assets and taking away short and long liabilities, we get the funds net total assets, NAV. This value is net of operating expenses and gross of taxes. From NAV values, we can provide a monthly net return of each fund. We got our NAV values from the Thomson Reuters Eikon database. The NAV value period starts one month before our sample period before calculating the monthly return. The formula is defined as:

$$R_{i,t} = \frac{NAV_{i,t}}{NAV_{i,t-1}} - 1 \quad (11)$$

Where:

$NAV_{i,t}$ = Net asset value for period *t*

$NAV_{i,t-1}$ = Net asset value for period t-1

After calculating the NAV values, we want to calculate the gross return. As previously mentioned, Morningstar is one of the leading finance databases in Norway. Morningstar states that gross return is what investors would be paid if they did not have any expenses. The assumption that fees are based on ending net assets comes from the following equation:

$$EGR_i = \frac{(r_i+1)}{(1-\frac{ER_j}{12})} - 1 \quad (12)$$

EGR_i is the gross return for one month, *r* is the actual return for one month after expenses, ER_j is the expense ratio for the tax year that covers one month.

5.2.2 Expense Ratio

The fee for each fund in our analysis is the fund's last stated price found with the Thomson Reuters Eikon database available at Oslomet computers. For funds with omitted fees stated in this database, we have used the Morningstar website to fill in the gaps. Unfortunately, we do not have access to the historical change in fees for the funds. Using the last stated price may lead our result to differ from the previous analysis. This study is restricted to the extent that the active fee is consistent roughly around the average from the start to the end of our period. However, a correct result would be gained by considering fluctuations in the fees. While some funds may have increased their fee over the period, others have become cheaper, which may dilute little difference. A good manager should absorb expenses and gain persistent excess returns on their investments compared to their benchmark. While the type of benchmark can be manipulated, we use a common benchmark for all our funds. According to Morningstar, there are three types of expenses. These are 1) management fees, 2) advertising fees, and 3) administrative fees. The management fee is the payment to the portfolio manager that ensures that he actively manages the portfolio. The second one, the advertising fee, is linked to making the portfolio known to potential investors. The last one, administrative fees, are costs

that do not go to the manager or advertising, like transaction fees for buying and selling shares.

To find gross return, we need to add all these expenses from NAV because NAV is without operational costs. When calculating the mutual fund expense ratio, a well-known drawback is not to include the trading cost to find its value. These costs vary from fund to fund and also in specific funds over more extended periods. The trading cost is often associated with how active the funds are being managed. We cannot collect data on the trading cost, which is unfortunate in our calculation of gross return.

5.2.3 Risk-free Rate

The risk-free rate of return is the theoretical rate of return for an investment with no risk. We would need to make a proxy for that purpose when calculating funds risk.(Carhart, 1997; Fama & French, 2021; Kosowski et al., 2006) have in common that they all used one-month treasury bills as their proxy estimate of the risk-free rate. As our fund data is extracted in USD, we have chosen to follow their method as well. We have used the Kenneth R. French Data Library, where we obtained the one-month treasury bill rate used for the factor models on the global market. We obtained the one-month treasury bill rate from Bernt Arne Ødegaards Library for the risk-free rate used for the factor models on the Norwegian market. Our sample consists of Norwegian mutual funds that invest in both global and domestic markets, and this exposes investors to exchange risk between domestic (NOK) and foreign (USD) currencies. Some of the funds have chosen hedging strategies, while others take on more risky investments in hopes of higher profits.

5.2.3 Benchmark

The most common benchmark for Norwegian mutual funds is the OSEFX, and the index returns are downloaded from investing.com, a financial market platform. This benchmark index follows the movement of all mutual funds in Norway. Funds in Norway have other regulations and guidelines than foreign countries, and we find it reasonable to use this benchmark for our sample.

5.3 Summary descriptives

Table 1: Summary of descriptive statistics of the fund and its benchmark return

Panel A: Entire sample 2010M01 - 2020M12 Net returns							
	Mean	Std.dev	Min	Max	Skewness	Kurtosis	Obs
OSEFX	0,78 %	4,57 %	-17,11 %	14,05 %	-0,63	2,26	1
All funds	0,68 %	4,53 %	-18,34 %	15,69 %	-0,55	2,94	98
Delisted	0,42 %	4,03 %	-10,83 %	10,82 %	-0,43	-0,43	17
Alive	0,71 %	4,52 %	-18,34 %	15,69 %	-0,55	2,98	81
Panel B: Entire sample 2010M01 - 2020M12 Gross return							
	Mean	Std.dev	Min	Max	Skewness	Kurtosis	Obs
OSEFX	0,78 %	4,57 %	-17,11 %	14,05 %	-0,63	2,26	1
All funds	0,88 %	4,53 %	-18,14 %	15,89 %	-0,55	2,94	98
Delisted	0,62 %	4,03 %	-10,63 %	11,02 %	-0,43	0,94	17
Alive	0,91 %	4,52 %	-18,14 %	15,89 %	-0,55	2,98	81
Panel C: Robustness Checks 2010M01 - 2020M12 Net returns							
	Mean	Std.dev	Min	Max	Skewness	Kurtosis	Obs
NOK < 500K	0,70 %	4,47 %	-18,11 %	14,05 %	-0,53	2,76	67
NOK =/> 500K	0,71 %	4,52 %	-18,34 %	15,69 %	-0,57	2,88	31

The table shows the mean return, standard deviation, minimum and maximum, skewness, kurtosis, and several funds included for the following categories: 1) OSEFX index benchmark, 2) All funds, 3) Delisted and, 4) Alive. Delisted are funds that are no longer operative by the end of 2020. Alive are funds that still sustain by the end of 2020. Common for all factors is the assumption of an equally weighted portfolio. Panel A shows the monthly net return. Panel B shows the monthly gross return. Panel C shows Robustness Checks with minimum deposit as the dependent variable.

The equally weighted portfolio has a lower mean net return for all funds compared to its benchmark OSEFX. Gross fees alive funds have a higher mean compared to the index with 0,88 % over 0,78 %. The delisted funds are still unable to obtain a greater mean gross of fees which may be why they ceased to exist. A slight decrease in mean return from Alive to All funds indicates that delisted funds are in the minority. We can confirm this by the number of observations. By looking closer into min and max values, we observe larger gaps for Alive funds compared to the OSEFX. This is related to greater volatility and risk. This statement is also supported by the following higher standard deviation and kurtosis. A skewness further from zero for OSEFX indicates the probability distribution to be less symmetric.

The Robustness Checks in Panel C give a slightly higher mean for the funds with a minimum deposit over NOK 500.000. This indicates that the fund's excess return does not deviate much based on minimum deposit and that the difference may be due to the extra expenses for funds in the second group.

Table 2: Summary of descriptive statistics of Fama and French 5-factor and Odegaard's 4-factor returns

Panel A: Entire sample 2010M01 - 2020M12 Global Factor Returns						
	Mean	Std.dev	Min	Max	Skewness	Kurtosis
Rm-Rf	0,88 %	4,27 %	-13,77 %	13,34 %	-0,36	1,22
SMB	-0,02 %	1,41 %	-4,44 %	3,96 %	-0,10	0,18
HML	-0,42 %	2,06 %	-9,30 %	4,39 %	-0,40	2,10
WML	0,26 %	3,46 %	-12,26 %	10,29 %	-0,27	1,37
RMW	0,30 %	1,13 %	-2,77 %	2,73 %	-0,17	-0,17
CMA	-0,11 %	1,11 %	-3,18 %	2,75 %	-0,08	0,23
Panel B: Entire sample 2010M01 - 2020M12 Domestic Factor Returns						
	Mean	Std.dev	Min	Max	Skewness	Kurtosis
Rm-Rf	0,64 %	4,27 %	-14,79 %	16,33 %	-0,20	2,00
SMB	0,53 %	3,33 %	-8,84 %	11,45 %	0,01	0,53
HML	-0,80 %	4,65 %	-19,64 %	13,95 %	-0,48	2,02
PR1YR	1,26 %	3,55 %	-10,38 %	12,05 %	0,13	1,10

Panel A shows the mean, standard deviation, minimum and maximum return, skewness, and kurtosis for the global factors in the Fama and French 3- and 5-factor model and Carhart 4-factor model. The model includes market factor (Rm-Rf), Small Minus Big (SMB), High Minus Low (HML), Winners Minus Losers (WML), Robust Minus Weak (RMW), and Conservatively Minus Aggressively (CMA). Panel B shows the domestic 4-factor with PR1YR as a replacement of WML

Figure 2: The cumulative net fund's performance

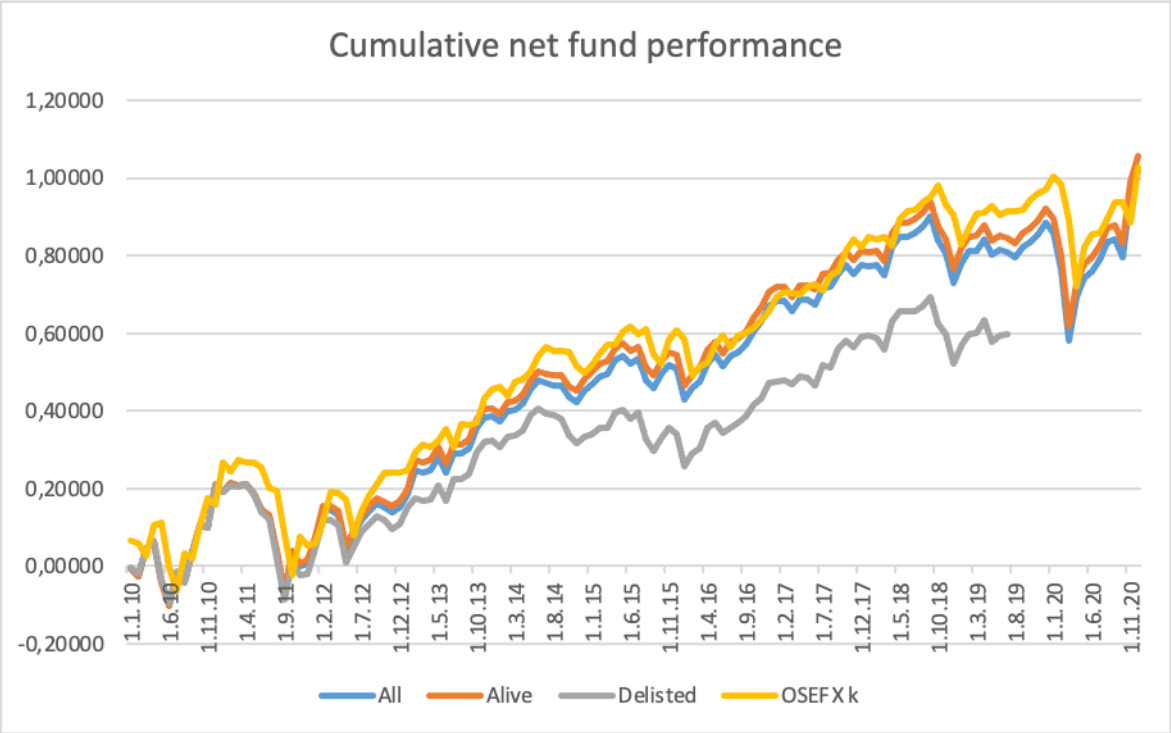
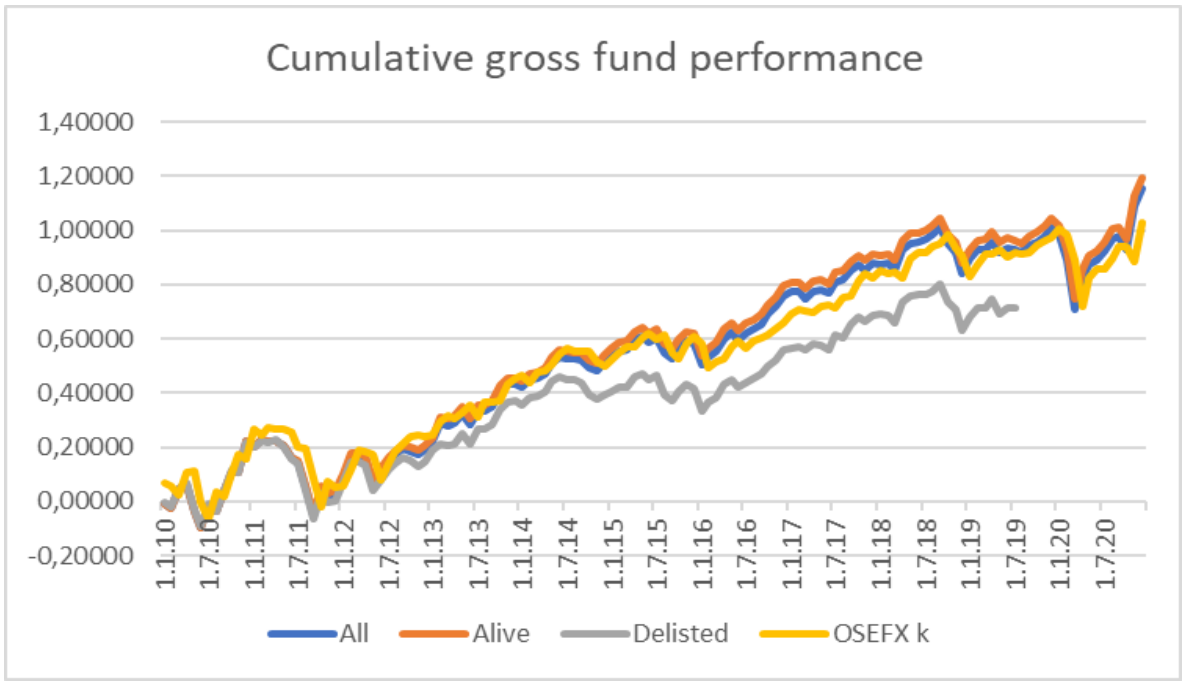


Figure 3: The cumulative gross fund's performance



Comparing the cumulative distribution net and gross of fees, we can see that Alive funds outperform the OSEFX index gross of fees for most periods, while we find the opposite when including the fees. However, we can see a slightly better performance in the last months of our sample period. This is interesting as it suggests that investing in active funds during this period would increase the chances of excess return, even after fees. This find may indicate that funds have performed better in picking stocks than the index after the Covid-19 pandemic, which affected the stock market in February/March 2020. On the other hand, one must not take for granted that the results of an equally weighted portfolio can be used as a conclusive denominator for all funds. It would be interesting to look at a value-weighted portfolio, but it turns out to be difficult due to survivorship- bias. Delisted funds do not provide assets under management, so including them in a value-weighted portfolio could provide misleading results.

Further, we can see delisted funds to have fewer returns than the index gross and net of fees. Previous research on mutual funds has shown the importance of including all funds to account for survivorship bias. Both surviving and non-surviving funds should be included in the analysis to secure reliable results. (Elton et al., 2015) explain that delisted funds mostly are taken down because of the lack of return and have poor performance over time. If we had excluded these funds, there would be an overestimate of overall mutual fund's performance. The fact that survivorship bias occurs by not including delisted funds and affects our results are illustrated. Mutual fund portfolios show a superior return in the results where we omit delisted funds regarding mutual fund portfolios with both delisted and listed portfolios included. In order to not get biased results, we, therefore, include all funds existing for the whole period studied. Graphically we can observe delisted funds to reflect the index movement more closely than active funds, which indicates closet indexing.

6 Results and analysis

The following section will include a presentation of the empirical result of our study. First will look at the level of activeness of the funds with help from R^2 and tracking error regression. Secondly, we will investigate the performance of the funds using alpha estimates. This is done by doing a regression of each fund individually of an equally weighted portfolio, distinguishing between gross and net fees. Then we will separate the funds into two categories based on their minimum deposits due to their different cost structure. For the last part, we will do a Sharpe-ratio analysis of each fund.

6.1 Activeness of funds

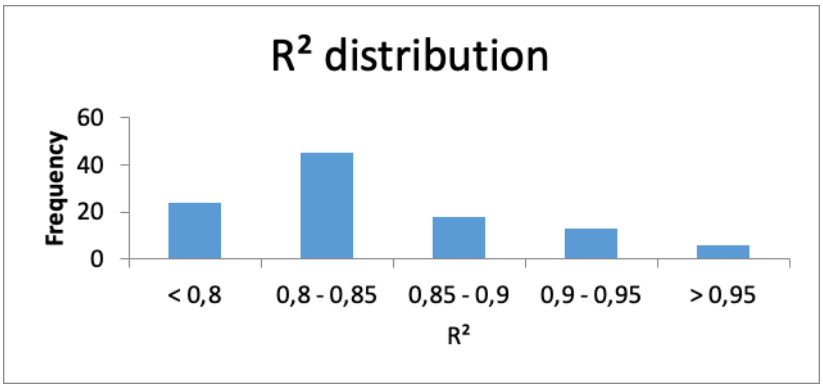
6.1.1 R^2

From individual regression for our sample in table 4, we can observe the average obtained R^2 for the funds on the right side. We get slightly higher R^2 values with the four-factor model for both the global and domestic factors by respective values of 0,78 and 0,83. These numbers are relative to explaining the variations in returns for funds in our sample.

The distribution in figure 5 shows a histogram that helps differentiate the number of funds to their level of activeness measured by R^2—ranging from the most active funds on the left side to the least active funds on the right side, in the direction of closet indexing. The figure indicates most of our funds to be more than sufficiently actively managed with a larger proportion on the left side distribution. On the far-right side, we have seven funds with an R^2 value of more than 0,95, thus found not to be sufficiently active in the tracking error of these funds also turn out to be below 4 percent. All individual fund's R^2 values and tracking error of all funds are listed in appendix 2; DNB provides the seven funds below desired values with five observations, followed respectively by Storebrand and Nordea. This amounts to 7,07 % of the total number of funds in our dataset. The number of observations for each fund is listed in appendix 1, where each period equals one month. The table shows that all seven funds without sufficient R^2 values have less than 20 observed periods. Compared to funds with all 132 observable periods, the high R^2 must therefore be observed with caution, as a result, may be biased and inconsistent due to few observations. Further, a total of 15,15 % of funds in our sample have R^2 values between 0,9 - 0,95. While this is sufficient, they may be on the verge

of not being sufficiently actively managed. This includes funds with observations of the whole sample period and with high R^2 values

Figure 4: R^2 distribution



6.1.2 Tracking error

The top ten most and least active funds ranked by R^2 and tracking error can be seen in table 3. As observed in Appendix 2, we have 60 funds with a tracking error of less than 4 % and thus below the value of sufficient active management if the R^2 values of these funds are less than 0,95. This deviate from the proportion of the sufficient R^2 values distribution where only seven funds were below the desired value, and of these, all had potential bias because of few observations. Looking at the tracking error and the R^2, our analysis suggests that all seven funds mentioned in section 6.1.1 also have less than 4 % tracking error, thus presumed to be closet indexers. The indicators of ESMA calculate this. Due to few observations and possible untrustworthy results, we keep the funds in our sample for further analysis. On the other side, we find DNB SMB A and Storebrand Vekst A on the top 10 most active funds in both charts. This indicates that these two funds have largely actively managed portfolios.

Table 3: Fund activeness

Most active

Ranking	Fund name	R^2	Fund name	Tracking error
1	FORTETronder	0.588	DNB SMB A	7,34 %
2	FORTENorge	0.611	FIRST Generator S	7,21 %
3	Storebrand Optima Norge A	0.613	FIRST Generator A	6,04 %
4	Storebrand Vekst A	0.621	Pareto Investment Fund A	5,85 %
5	Arctic Norwegian Equities D	0.625	Storebrand Vekst A	5,42 %
6	Arctic Norwegian Equities A	0.653	Delphi Norge	5,25 %
7	Alfred Berg Gambak	0.661	Fondsfinans Norge	5,22 %
8	Arctic Norwegian Equities I	0.664	DNB Norge Selektiv E	5,09 %
9	Arctic Norwegian Equities B	0.664	DNB Norge Selektiv C	5,07 %
10	DNB SMB A	0.675	DNB Norge Selektiv A	5,07 %

Least active

Ranking	Fund name	R^2	Fund name	Tracking error
89	SR Bank Norge C	0.939	SR-Bank Norge D	2,72 %
90	DNB SMB R	0.940	SR-Bank Norge C	2,71 %
91	DNB Norge R	0.941	SR-Bank Norge A	2,71 %
92	Storebrand Norge B	0.951	SR-Bank Norge B	2,68 %
93	Nordea Norwegian Stars Fund A	0.956	Storebrand Verdi N	2,54 %
94	DNB Norge A	0.957	Storebrand Norge Fossilfri A	2,51 %
95	DNB Norge C	0.957	Landkreditt Utbytte I	2,43 %
96	DNB Norge N	0.957	Nordea Norwegian Stars Fund A	2,26 %
97	DNB Norge Selektiv N	0.980	Storebrand Norge Institusjon	2,24 %
98	DNB SMB N	0.991	Verdipapirfondet Norse Utbytte	1,76 %

The table shows the 10 most active and the 10 least active funds measured by R^2 and tracking error. The upper table shows the most active, and the lower table shows the least active funds.

6.2 Performance

6.2.1 Equally weighted portfolio regression results

To obtain a fair overview of the overall performance of active Norwegian mutual funds, we have generated an equally weighted portfolio of excess risk-adjusted returns (i.e., alpha) in table 4 below with all models, gross and net of fees.

Table 4: Equally weighted fund performance

		α	Mkt	SMB	HML	WML	PRI1YR	RMW	CMA	*N*	R^2	adj. R^2
Fama & French 3-Factor Model	Net Fees Global market	0.00229 (0.00197)	0.877*** ((0.0453))	0.414*** (0.135)	0.217** (0.0958)					131	0.777	0.772
	Gross fees Global market	0.00295 (0.00197)	0.878*** (0.0452)	0.426*** (0.135)	0.221** (0.0952)					131	0.779	0.774
	Net Fees Norwegian market	-0.0008 (0.00116)	1.0300*** (0.0362)	0.0605 (0.0464)	0.0270 (0.0300)					131	0.924	0.923
	Gross fees Norwegian market	-0.0002 (0.00117)	1.0320*** (0.0363)	0.0635 (0.0465)	0.0280 (0.0300)					131	0.924	0.922
Carhart 4-factor model	Netfees Global market	0.00221 (0.00197)	0.896*** (0.0465)	0.438*** (0.136)	0.276** (0.107)	0.0851 (0.0609)				131	0.780	0.773
	Gross fees Global market	0.00287 (0.00196)	0.897*** (0.0464)	0.450*** (0.137)	0.282*** (0.107)	0.0886 (0.0609)				131	0.782	0.775
	Net fees Norwegian market	-0.00115 (0.00116)	1.015*** (0.0276)	0.351*** (0.0804)	-0.0740 (0.0556)		0.0409 (0.0347)			131	0.935	0.933
	Gross fees Norwegian market	-0.000485 (0.00115)	1.016*** (0.0273)	0.364*** (0.0808)	-0.0700 (0.0558)		0.0415 (0.0347)			131	0.935	0.933
Fama & French 5-factor model	Net fees Global market	0.00259 (0.00207)	0.861*** (0.0491)	0.387*** (0.139)	0.270* (0.148)			-0.102 (0.215)	-0.209 (0.219)	131	0.779	0.771
	Gross fees Global market	0.00322 (0.00206)	0.863*** (0.0491)	0.401*** (0.139)	0.273* (0.148)			-0.0871 (0.214)	-0.197 (0.218)	131	0.781	0.772

*The table is the outcome of individual regression of an equally weighted portfolio for all funds concerning the different factor models. The sample period from 2010 to the end of 2020 with R^2 measures the model's fit compared to the equally weighted fund regression. Results differentiate gross and net of fees. *** is significant at a 1 % level, ** is significant at a 5 % level, * is significant at a 10 % level. N represents the maximum number of monthly observations for each fund where months without observable data are left out.*

We observe none of the alphas to be significant in any of the models. With that said, we cannot conclude that our alphas are credible for estimating excess risk-adjusted returns with the given market factors. Throughout all models, the table shows non-significant positive values for the global factors and negative values for the domestic factors, gross and net of fees. Positive values indicate active funds being able to generate risk-adjusted excess return.

Negative values indicate active funds not being able to generate risk-adjusted excess returns. With this said, our model indicates but does not conclude that Norwegian funds do perform better compared to the global factors. The domestic markets tend to have higher R^2 values meaning it captures a greater variation in monthly returns, with the four-factor model being slightly higher than the three-factor model. A higher fit for the domestic model is logical considering the fund's investment style in which they have an overweight of stocks in the domestic market. For the global factors, the four-factor also displays the highest fit slightly. Due to the slight differences in R^2 values within the domestic and global models, we cannot conclude whether this signifies that the four-factor model is superior to the Fama and French models. However, comparing domestic and global to each other, we find domestic factors have the best fit.

In particular, we find that the equally weighted portfolio has a lower market beta (βmkt) using the global market factors compared to their domestic counterparts. Using the four-factor models, we have 0,89 for the global and 1,01 for the domestic market. The market beta (βmkt) for the domestic market is closer to one, which is in line with the R^2 fit being higher. The reason why funds correlate close to 1 can be explained by the fact that funds are well diversified in the stock market and correlate well with the market. For the global part of the funds, the active portfolio has significantly higher exposure to size (βsmb) and growth stocks (βhml) than the domestic one.

In contrast, the active domestic fund portfolio shows significantly lower exposure to foreign markets and size than the global one. The growth stocks (βhml) are non-significant with both models up to the ten-percent level for the domestic fund portfolio. Thus, we cannot draw any conclusions by comparing growth stocks. However, growth stocks (βhml) are significant for the global models, suggesting these factors should be included in our analysis. Positive (βhml)

suggests that growth stocks have generated excess returns compared to book-to-market stocks. For size (βsmb), domestic funds are only significant using the four-factor model. Positive (βsmb) suggests that small companies have generated excess returns versus more prominent companies over our sample period. The rest of WML, PRI1YR RMW, and CMA are non-significant at the 10 % level. This indicates they are not a good fit for the model and will not be further discussed in this analysis. One must be aware that this find is based upon the equally weighted portfolio. To address this issue and make fund investing relevant for different investors, we have constructed table 5 below. We separate our fund sample into two groups based on their minimum deposit.

6.2.2 Robustness Checks

With most investments in domestic stock and the following highest fit for the domestic four-factor model in table 4, we will continue the regression analysis with this model. Table 5 below shows the equal-weighted portfolio separating funds with a minimum deposit of NOK 500.000 or less from those with more than NOK 500.000.

Table 5: Equally weighted portfolio more and less than NOK 500K minimum deposit

Panel A: Equally weighted portfolio consisting of funds with minimum deposit of more than 500 000 NOK									
		α	OdeMkt	SMB	HML	PRI1YR	*N*	R^2	adj. R^2
Ødegaard 4- factor	Net of fees	-0.0010 (0.0011)	1.029*** (0.0389)	0.0252 (0.0464)	0.0168 (0.0303)	0.0533* (0.0321)	131	0.935	0.933
	Gross of fees	-0.0003 (0.0011)	1.030*** (0.0389)	0.0252 (0.0464)	0.0167 (0.0303)	0.0533* (0.0321)	131	0.935	0.933
Panel B: Equally weighted portfolio consisting of funds with minimum deposit of less than 500 000 NOK									
		α	OdeMkt	SMB	HML	PRI1YR	*N*	R^2	adj. R^2
Ødegaard 4-factor	Net of fees	-0.0015 (0.00135)	1.049*** (0.0359)	0.0868* (0.0477)	0.0339 (0.0299)	0.0334 (0.0385)	131	0.920	0.917
	Gross of fees	-0.0002 (0.00135)	1.049*** (0.0359)	0.0867* (0.0477)	0.0339 (0.0299)	0.0335 (0.0385)	131	0.920	0.917

Odegaard's Norwegian 4-factor model equally weighted portfolio separating minimum deposit at a NOK 500K amount for the sample period 2010M01 - 2020M12. The selection consists of 31 funds for Panel A and 67 funds for Panel B. The average fee for Panel A is 0,86 %, and the average fee for Panel B is 1,47 %.

We observe no significant alpha values in any of the groups. Hence, we cannot conclude whether fund managers can generate excess risk-adjusted returns or not. In similarity to table 4, we get negative alpha values for both groups with the domestic factors, indicating managers cannot generate risk-adjusted excess returns compared to the index in the domestic market, gross and net of fees. The model suggests that investors in both groups would be better off investing in an index fund compared to an active fund. Without expenses, we observe a close to equal performance for the two groups. The performance deviates more net fees with higher negative alpha for Panel B, which indicates it is even less lucrative for retail investors to enter active funds due to the increased expenses, which is in line with our third hypothesis.

6.2.3 Individual fund regression results

Appendixes 3-6 show the top and bottom 10 performing funds, ranked by the funds alpha on the global and domestic Carhart four-factor model. We use these models as they have the highest fit in respect to the global and domestic markets. Using gross fees, we observe all funds to have higher alpha values which are logical. In the modified-domestic model, we observe 6 significant values at a 5- and 10% level, and no significant values on the bottom 10, gross fees. Net fees, we observe 4 significant positive and 2 significant negative values. This is similar to what we find in the global model. Here we get 4 significant values at 5- and 10% level for the top 10 funds and no significance for the bottom 10. For the bottom, gross fees. Net fees, we observe 4 significant positive values and 1 significant negative value. A majority of the funds observed in these tables have few observable periods. Thus, results must be interpreted with caution due to potential inconsistency.

Table 6: Factor loadings for the domestic and global market; gross fees

	Factors for Norwegian Market		Factors for Global Market		
	Fama & French 3-Factor	Carhart 4-Factor	Fama & French 3-Factor	Carhart 4-Factor	Fama & French 5-Factor
A. Summary statistics for α					
Minimum	-0,0110	-0,0063	-0,0087	-0,0077	-0,0181
Median	0,0002	-0,0002	0,0031	0,0030	0,0031
Maximum	0,0126	0,0104	0,0112	0,0128	0,0130
Mean	0,0008	0,0004	0,0024	0,0026	0,0025
Std.Dev	0,0030	0,0028	0,0034	0,0035	0,0039
No. Of funds	98	98	98	98	98
Total significant α					
At 10%	14	8	18	20	22
At 5%	8	4	8	9	7
At 1%	1	0	0	0	0
No. Of positive α					
At 10%	12	8	17	19	22
At 5%	7	4	7	9	7
At 1%	1	0	0	0	1
No. Of negative α					
At 10%	2	0	1	1	0
At 5%	1	0	1	0	0
At 1%	1	0	0	0	0
B. Mean factor loadings for ß and R2					
ßMkt	1,043	1,050	0,892	0,922	0,885
ßSMB	0,139	0,142	0,529	0,558	0,520
ßHML	0,061	0,063	0,189	0,266	0,200
ßWML		0,011		0,089	
ßRMW					-0,116
ßCMA					-0,129
R2	0,879	0,882	0,762	0,769	0,767

Panel A presents the summary statistics for the alpha generated by Fama French, Carharts, and Odegaard's model for the five groups. The Norwegian market contains Odegaard's domestic factors. The global market uses K. French and Carhart's global factors. Panel B presents the mean factor loadings in the different models.

Table 7: Factor loadings for the domestic and global market; net fees

	Factors for Norwegian Market		Factors For Global Market		
	Active		Active		
	Fama French 3-factor	Carhart 4- factor	Fama & French 3-Factor	Carhart 4-Fact	Fama & French 5-Factor
A. Summary statistics for α					
Minimum	-0,0126	-0,0079	-0,0103	-0,0091	-0,0194
Median	-0,0005	-0,0014	0,0020	0,0019	0,0021
Maximum	0,0120	0,0098	0,0096	0,0111	0,0113
Mean	-0,0003	-0,0006	0,0013	0,0015	0,0015
Std.Dev	0,0030	-0,0012	0,0034	0,0035	0,0039
No. Of funds	98	98	98	98	98
Total no. significant α					
At 10%	18	11	9	9	6
At 5%	7	5	2	3	3
At 1%	1	0	1	0	0
No. Of positive α					
At 10%	7	4	7	8	5
At 5%	2	2	1	2	3
At 1%	0	0	0	0	0
No. Of negative α					
At 10%	11	7	2	1	1
At 5%	5	3	1	1	0
At 1%	1	0	1	0	0
B. Mean factor loadings for ß and R^2					
ßMkt	1,043	1,050	0,892	0,922	0,885
ßSMB	0,139	0,142	0,529	0,558	0,520
ßHML	0,061	0,063	0,189	0,266	0,200
ßWML		0,011		0,089	
ßRMW					-0,116
ßCMA					-0,129
R^2	0,879	0,882	0,762	0,769	0,767

Panel A presents the summary statistics for the alpha estimated generated by Fama French and Carharts model for the five groups. The Norwegian market contains Odegaard's factors, the global market use K. T. French factors. Panel B presents the mean factor loadings in the different models.

Table 6 and 7 shows the factor loadings generated from individual regressions on the different factor models, with both factors generated for the Norwegian and Global market. Table 6 Is gross of fees. The different models show that at a 10% significance level, between 8 and 22 of the funds produce positive alphas. This is reduced to between 4 and 9 of the funds at a 5% significance level. There are also very few negative significant alpha-values. This indicates that some active funds can generate positive risk-adjusted returns domestically and globally compared to the index without fees. Combining this to our result of robustness checks may entail that active fund managers with low fees (i.e., often correlated with high minimum deposits) are superior to the index terms of performance. Institutional investors can indeed get added value by choosing active funds. We also observe that the mean is higher for the global factors than the domestic counterparts.

Further, the difference in the standard deviation of the alpha is higher for the global factors. This implies that Norwegian fund managers take greater risk in the global market but that it pays off. The R^2 is greater, and the exposure to market beta (βmkt) is closer to one for domestic funds, which is logical as they mainly invest domestically. We also see that small-cap stocks (βsmb) and growth stocks (βhml) have a much higher exposure for the global models. In table 7 net fees, our results indicate a more even distribution with significant values. We still have a weak overweight in positive alpha's for the global factors, but less than half of what we had before. For the domestic factors, the results are mixed. We now get 11 negative vs. 7 positive, significant alpha values at a ten-percent level for the modified three-factor model. This indicates that Norwegian funds cannot generate excess risk-adjusted return domestically, but still, weak significance towards active funds outperforming the index globally after fees.

To summarize, our models suggest that only a few of the active Norwegian funds can outperform the index before fees but not after fees. However, with an overweight in domestic stocks for our sample, the overall profit will most likely not surpass the index. This supports most previous literature on the field by, among others, (Bogle, 2002; Sørensen, 2009) that active funds cannot gain excess profits net fees, compared to the alternative index fund. Further, our results are in contrast with what (Forbrukerrådet, 2018) found in their study. While they found Norwegian fund managers to perform better domestically, we find them to perform better globally. This may be due to the new cost structure or the different sample period.

6.2.3 Sharpe Ratio

All individual Sharpe ratios are calculated and listed in appendix 7. The average Sharpe ratio is 1,99 for our sample. This is considered normal but very close to what is defined as good. This result indicates that Norwegian funds are taking acceptable risks compared to the return of their investments. We have 11 funds located below one, thus not satisfying the desired Sharpe ratio. In contrast, two funds have values above 4 which can be categorized as exceptionally good. The rest have a value between one and three, indicating most funds to maintain sufficiently satisfying or better risk-adjusted returns.

7 Conclusion

Our analysis finds that 7,14 % of our sample selection are presumed closet indexers, categorized as active management with high fee structure but are not sufficiently managed. This is based on the measurement of activeness, R^2 value over 0,95, and tracking error of 4%. Further, all seven funds have few observations. Hence the results may be inconsistent, and we cannot draw any conclusions. The cumulative gross performance on delisted funds combined with previous literature and news indicate that closet indexing was more frequent in times before this study. A major of Norwegian investors can be confident that their active funds are sufficiently managed. The Sharpe ratio shows that the average fund also has sufficient or better levels of risk-adjusted returns.

The general equally weighted portfolio regression did not provide significant values. Hence, we cannot draw any conclusion. Our model suggests that the average active fund succeeds in generating positive risk-adjusted return globally. When it comes to the domestic market, the model suggests that fund managers cannot make risk-adjusted returns. Both suggestions hold gross and net of fees. As Norwegian funds have an overweight in domestic stocks, this finding pulls in the direction of a loss in risk-adjusted excess returns compared to the index. We still do not get any significance when separating the funds into two groups based on the minimum deposit size solely on the domestic factors. This model indicates that investors with NOK 500.000 or more to deposit have greater incentives of investing in active funds due to a decrease in fees, but that they still would lose money compared to the index even before fees, indicating both groups would be better off investing in an index fund.

The factor loadings gross fees give some significant evidence that funds can generate an excess risk-adjusted return at the ten-percent level for global and domestic markets. In addition, we find close to zero significance for negative alpha values. A clear overweight of significant positive values in the factor loadings gross of fees would indicate that a bigger share of the funds can generate risk-adjusted return before fees than after fees. When including fees in the factor loadings, we get slightly overweight of significant negative values for the domestic factor models. We still have an overweight of significant positive values with the global factors, but less than half of what we had before. Our significant results agree well with most previous literature that active fund management can outperform the index gross of

fees, but not net of fees (Daniel et al., 1997). Due to the few significant values, our study cannot reach any conclusions. Our results show that Norwegian mutual fund managers seem to perform better compared with the global market factors. The find differs from the existing Norwegian literature, which favors domestic mutual fund management, (Forbrukerrådet, 2018). A possible explanation may be the new cost structure of active funds in Norway after the new MIFID-II law and the different time periods. Further, our model suggests that investors would be better off investing in a passive index fund when fees are taken into consideration.

For further research, one could investigate the same as us but with global and Scandinavian funds, as Norwegian funds seem to outperform the benchmark in this market through our analysis. One could also use a different time period. A possibility would be to include the financial crisis in 2008-2009 or to not include 2020 due to the Covid-19 pandemic. It would also be interesting to dig deeper into the progressive fee structure to study if this fund type provides excess risk-adjusted return compared to index funds.

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9 Appendix

Appendix 1:

*A list of all 98 funds in our sample with numbers of observations. *** is funds that have both arisen and ceased during the period. ** is funds that have ceased to exist during the period. * is funds that have been established during the period.*

Fund name	Date Span	Obervations
DNB SMB A	2010M01 - 2020M12	132
Alfred Berg Aktiv	2010M01 - 2020M12	132
Alfred Berg Aktiv II **	2010M01 - 2012M09	33
Alfred Berg Gambak	2010M01 - 2020M12	132
Alfred Berg Humanfond	2010M01 - 2020M12	132
Alfred Berg Norge [Classic]	2010M01 - 2020M12	132
Alfred Berg Norge [INST] *	2015M05 - 2020M12	80
Alfred Berg Norge + **	2010M01 - 2014M03	51
Alfred Berg Norge Etisk **	2010M01 - 2014M03	51
Arctic Norwegian Equities A *	2011M01 - 2020M12	120
Arctic Norwegian Equities B *	2010M12 - 2020M12	121
Arctic Norwegian Equities D *	2013M03 - 2020M12	94
Arctic Norwegian Equities E *	2016M03 - 2020M12	58
Arctic Norwegian Equities I *	2010M12 - 2020M12	121
Arctic Norwegian Value Creation A *	2014M09 - 2020M12	76
Arctic Norwegian Value Creation B *	2014M09 - 2020M12	76
Arctic Norwegian Value Creation C *	2015M02 - 2020M12	71
Arctic Norwegian Value Creation D *	2017M01 - 2020M12	48
C WorldWide Aksje Norge III	2010M01 - 2020M12	132
C WorldWide Norge	2010M01 - 2020M12	132
Danske Invest Norge I	2010M01 - 2020M12	132
Danske Invest Norge II	2010M01 - 2020M12	132
Danske Invest Norge Vekst	2010M01 - 2020M12	132
Danske Invest Norske Aksjer Institusjon I	2010M01 - 2020M12	132
Danske Invest Norske Aksjer Institusjon II	2010M01 - 2020M12	132
Delphi Norge	2010M01 - 2020M12	132
Delphi Vekst **	2010M01 - 2013M09	45
DNB Norge **	2010M01 - 2019M07	115
DNB Norge (Avanse I) **	2010M01 - 2014M02	50
DNB Norge (Avanse II) **	2010M01 - 2014M09	57
DNB Norge (I) **	2010M01 - 2014M02	50
DNB Norge (III) **	2010M01 - 2019M07	115
DNB Norge A *	2019M09 - 2020M12	16
DNB Norge C *	2019M09 - 2020M12	16
DNB Norge D	2010M01 - 2020M12	132
DNB Norge N *	2019M12 - 2020M12	13
DNB Norge R *	2018M12 - 2020M12	25
DNB Norge Selektiv A	2010M01 - 2020M12	132
DNB Norge Selektiv C	2010M01 - 2020M12	132
DNB Norge Selektiv E	2010M01 - 2020M12	132
DNB Norge Selektiv N *	2019M12 - 2020M12	13
DNB Norge Selektiv R *	2019M02 - 2020M12	23
DNB SMB R *	2010M01 - 2020M12	23
Eika Norge	2010M01 - 2020M12	132
Eika SMB **	2010M01 - 2013M09	45
Eika Spar	2010M01 - 2020M12	132
FIRST Generator A *	2018M02 - 2020M12	35
FIRST Generator S *	2010M10 - 2020M12	123
FIRST Norge Fokus *	2018M12 - 2020M12	25

Fund name	Date Span	Obervations
Fondsfinans Norge	2010M01 - 2020M12	132
FORTE Norge *	2011M04 - 2020M12	117
FORTE Tronder *	2013M02 - 2020M12	95
Handelsbanken Norge (A1 NOK) *	2017M10 - 2020M12	39
Holberg Norge A	2010M01 - 2020M12	132
KLP AksjeNorge	2010M01 - 2020M12	132
Landkreditt Norge **	2010M01 - 2016M05	77
Landkreditt Utbytte I *	2018M07 - 2020M12	30
NB Aksjefond **	2010M01 - 2013M09	45
Nordea Avkastning	2010M01 - 2020M12	132
Nordea Kapital	2010M01 - 2020M12	132
Nordea Norge Pluss *	2011M05 - 2020M12	116
Nordea Norge Verdi	2010M01 - 2020M12	132
Nordea Norwegian Stars Fund A growth NOK *	2019M11 - 2020M12	14
Nordea SMB **	2010M01 - 2015M01	61
Nordea Vekst **	2010M01 - 2015M01	61
ODIN Norge A *	2015M12 - 2020M12	61
ODIN Norge B *	2015M12 - 2020M12	61
ODIN Norge C	2010M01 - 2020M12	132
ODIN Norge D *	2015M12 - 2020M12	61
Pareto Aksje Norge A	2010M01 - 2020M12	132
Pareto Aksje Norge B	2010M01 - 2020M12	132
Pareto Aksje Norge C *	2015M08 - 2020M12	65
Pareto Aksje Norge D *	2015M08 - 2020M12	65
Pareto Aksje Norge I	2010M01 - 2020M12	132
Pareto Investment Fund A	2010M01 - 2020M12	132
Pareto Investment Fund B *	2013M12 - 2020M12	85
Pareto Investment Fund C *	2013M12 - 2020M12	85
PLUSS Aksje	2010M01 - 2020M12	132
PLUSS Markedsverdi	2010M01 - 2020M12	132
SEB 1 Norway Focus C (NOK) *	2016M04 - 2020M12	57
SEF First SMB A NOK *	2017M04 - 2020M12	45
SR-Bank Norge A *	2019M02 - 2020M12	23
SR-Bank Norge B *	2019M02 - 2020M12	23
SR-Bank Norge C *	2019M02 - 2020M12	23
SR-Bank Norge D *	2019M02 - 2020M12	23
Storebrand Aksje Innland	2010M01 - 2020M12	132
Storebrand Norge A	2010M01 - 2020M12	132
Storebrand Norge B *	2019M05 - 2020M12	20
Storebrand Norge Fossilfri A *	2017M05 - 2020M12	44
Storebrand Norge I	2010M01 - 2020M12	132
Storebrand Norge Institusjon ***	2011M01 - 2014M01	37
Storebrand Optima Norge A **	2010M01 - 2019M03	111
Storebrand Vekst A	2010M01 - 2020M12	132
Storebrand Verdi A	2010M01 - 2020M12	132
Storebrand Verdi N *	2018M04 - 2020M12	33
Terra Norge **	2010M01 - 2013M09	45
Verdipapirfondet Norse Utbytte *	2019M04 - 2020M12	21
Vibrand Norden	2010M01 - 2020M12	132

Appendix 2:

The diagrams show the distribution of R^2 and Tracking Error in ascending order from most to least active for all funds in our sample. R^2 is sorted low to high while tracking error is sorted high to low.

Fund name	R^2	Fund name	R^2
FORTE Tronder	0,588	Storebrand Aksje Innland	0,733
FORTE Norge	0,611	Storebrand Norge Fossilfri A	0,735
Storebrand Optima Norge A	0,613	Delphi Vekst	0,736
Storebrand Vekst A	0,621	Arctic Norwegian Value Creation C	0,743
Arctic Norwegian Equities D	0,625	ODIN Norge B	0,745
Arctic Norwegian Equities A	0,653	ODIN Norge A	0,745
Alfred Berg Gambak	0,661	ODIN Norge D	0,745
Arctic Norwegian Equities I	0,664	Nordea Norge Pluss	0,755
Arctic Norwegian Equities B	0,664	Danske Invest Norske Aksjer Inst I	0,756
DNB SMB A	0,675	Danske Invest Norge II	0,759
Pareto Aksje Norge I	0,678	Danske Invest Norske Aksjer Inst II	0,759
Pareto Aksje Norge A	0,678	Danske Invest Norge I	0,760
Pareto Aksje Norge B	0,678	Vibrand Norden	0,772
Alfred Berg Norge [INST]	0,686	KLP AksjeNorge	0,773
Pareto Aksje Norge C	0,688	DNB Norge D	0,775
Pareto Aksje Norge D	0,688	Nordea Kapital	0,777
Danske Invest Norge Vekst	0,696	Nordea Norge Verdi	0,782
DNB Norge	0,698	Nordea Avkastning	0,782
DNB Norge (III)	0,698	Nordea Vekst	0,787
Delphi Norge	0,700	NB Aksjefond	0,788
PLUSS Aksje	0,704	SEF First SMB A NOK	0,789
Alfred Berg Aktiv	0,705	Handelsbanken Norge (A1 NOK)	0,791
Alfred Berg Humanfond	0,708	Landkreditt Utbytte I	0,801
Eika Spar	0,709	FIRST Norge Fokus	0,808
ODIN Norge C	0,709	Alfred Berg Norge +	0,816
C WorldWide Aksje Norge III	0,711	Alfred Berg Norge Etisk	0,816
C WorldWide Norge	0,712	DNB Norge (Avanse II)	0,819
Pareto Investment Fund C	0,714	Arctic Norwegian Value Creation D	0,825
Pareto Investment Fund B	0,714	DNB Norge (Avanse I)	0,828
Eika Norge	0,715	Storebrand Norge Institusjon	0,828
Nordea SMB	0,715	DNB Norge (I)	0,830
Arctic Norwegian Value Cr A	0,716	Terra Norge	0,832
Arctic Norwegian Value Cr B	0,717	Alfred Berg Aktiv II	0,852
Arctic Norwegian Equities E	0,718	FIRST Generator A	0,855
Landkreditt Norge	0,718	Storebrand Verdi N	0,864
Fondsfinans Norge	0,719	Verdipapirfondet Norse Utbytte	0,902
Holberg Norge A	0,723	SR-Bank Norge B	0,931
FIRST Generator S	0,723	DNB Norge Selektiv R	0,935
Storebrand Norge A	0,724	SR-Bank Norge D	0,939
Storebrand Verdi A	0,724	SR-Bank Norge A	0,939
Pareto Investment Fund A	0,725	SR-Bank Norge C	0,939
DNB Norge Selektiv A	0,727	DNB SMB R	0,940
DNB Norge Selektiv C	0,727	DNB Norge R	0,941
DNB Norge Selektiv E	0,727	Storebrand Norge B	0,951
Alfred Berg Norge [Classic]	0,728	Nordea Norwegian Stars Fund A	0,956
PLUSS Markedsverdi	0,728	DNB Norge A	0,957
SEB 1 Norway Focus C (NOK)	0,728	DNB Norge C	0,957
Eika SMB	0,730	DNB Norge N	0,957
Storebrand Norge I	0,731	DNB Norge Selektiv N	0,980

Fund Name	TE	Fund Name	TE
DNB SMB A	7,34 %	Storebrand Optima Norge A	3,92 %
FIRST Generator S	7,21 %	SEF First SMB A NOK	3,89 %
FIRST Generator A	6,04 %	DNB Norge (III)	3,84 %
Pareto Investment Fund A	5,85 %	DNB Norge	3,83 %
Storebrand Vekst A	5,42 %	Landkreditt Norge	3,60 %
Delphi Norge	5,25 %	Pareto Aksje Norge D	3,57 %
Fondsfinans Norge	5,22 %	Pareto Aksje Norge C	3,56 %
DNB Norge Selektiv E	5,09 %	Eika Spar	3,53 %
DNB Norge Selektiv C	5,07 %	Nordea SMB	3,52 %
DNB Norge Selektiv A	5,07 %	Arctic Norwegian Value Creation B	3,42 %
Holberg Norge A	5,05 %	Arctic Norwegian Value Creation A	3,41 %
Nordea Avkastning	5,03 %	Arctic Norwegian Value Creation C	3,40 %
Danske Invest Norge Vekst	5,02 %	Arctic Norwegian Equities D	3,38 %
KLP AksjeNorge	4,92 %	Nordea Vekst	3,34 %
Vibrand Norden	4,84 %	DNB Norge (Avanse II)	3,31 %
Nordea Kapital	4,83 %	DNB Norge (Avanse I)	3,27 %
Pareto Aksje Norge I	4,81 %	NB Aksjefond	3,24 %
Pareto Aksje Norge B	4,78 %	Alfred Berg Norge Etisk	3,20 %
Pareto Investment Fund C	4,78 %	Terra Norge	3,18 %
DNB Norge D	4,78 %	Alfred Berg Norge [INST]	3,16 %
Pareto Investment Fund B	4,77 %	Alfred Berg Norge +	3,16 %
Storebrand Norge A	4,77 %	Eika SMB	3,15 %
FORTE Tronder	4,70 %	Arctic Norwegian Value Creation D	3,12 %
Alfred Berg Aktiv	4,70 %	Delphi Vekst	3,10 %
Alfred Berg Gambak	4,66 %	Alfred Berg Aktiv II	3,08 %
C WorldWide Aksje Norge III	4,65 %	DNB Norge R	3,01 %
C WorldWide Norge	4,64 %	DNB Norge (I)	3,01 %
Eika Norge	4,63 %	ODIN Norge A	2,96 %
Pareto Aksje Norge A	4,63 %	ODIN Norge B	2,96 %
FORTE Norge	4,62 %	ODIN Norge D	2,96 %
Nordea Norge Pluss	4,62 %	Handelsbanken Norge (A1 NOK)	2,95 %
Danske Invest Norge II	4,57 %	Arctic Norwegian Equities E	2,95 %
Danske Invest Norge I	4,57 %	DNB Norge Selektiv R	2,93 %
Danske Invest Norske Aksjer Inst II	4,56 %	FIRST Norge Fokus	2,90 %
PLUSS Markedsverdi	4,53 %	DNB Norge Selektiv N	2,88 %
Danske Invest Norske Aksjer Inst I	4,53 %	SEB 1 Norway Focus C (NOK)	2,87 %
Alfred Berg Norge [Classic]	4,46 %	DNB Norge C	2,81 %
Storebrand Norge I	4,44 %	DNB Norge A	2,80 %
Nordea Norge Verdi	4,43 %	DNB Norge N	2,78 %
ODIN Norge C	4,39 %	Storebrand Norge B	2,77 %
Alfred Berg Humanfond	4,39 %	SR-Bank Norge D	2,72 %
PLUSS Aksje	4,38 %	SR-Bank Norge C	2,71 %
Storebrand Aksje Innland	4,33 %	SR-Bank Norge A	2,71 %
Storebrand Verdi A	4,30 %	SR-Bank Norge B	2,68 %
DNB SMB R	4,25 %	Storebrand Verdi N	2,54 %
DNB SMB N	4,16 %	Storebrand Norge Fossilfri A	2,51 %
Arctic Norwegian Equities B	4,05 %	Landkreditt Utbytte I	2,43 %
Arctic Norwegian Equities I	4,04 %	Nordea Norwegian Stars Fund A	2,26 %
Arctic Norwegian Equities A	3,96 %	Storebrand Norge Institusjon	2,24 %

Appendix 3:

The table shows individual fund regression from the Carhart's 4-factor model used on the Norwegian 4- factors created by Ødegaard, ranking the 10 best and the 10 worst alphas, net of fees.

Rank	Fund	α	Mkt-Rf	SMB	HML	PRI1YR	N	R^2
1	DNB SMB R	0,0097	1,5160	0,8430	0,2410	0,2160	22	0,92
		(0,006)	(0,122)	(0,190)	(0,154)	(0,175)		
2	SRBank Norge D	0,0066**	1,0170	0,3206	0,2200	-0,0078	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
3	SRBank Norge C	0,0063**	1,0161	0,3201	0,2207	-0,0079	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
4	SRBank Norge A	0,0059*	1,0160	0,320	0,2203	-0,0080	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
5	Verdipapirfondet Norse Utbytte	0,0054*	0,6510	0,1231	-0,0102	-0,0529	20	0,95
		(0,002)	(0,053)	(0,049)	(0,042)	(0,054)		
6	Landkreditt Utbytte I	0,0053	0,8180	0,3585	0,1398	0,0563	29	0,88
		(0,003)	(0,095)	(0,145)	(0,139)	(0,112)		
7	DNB Norge Selektiv R	0,0052	1,1066	0,203	0,0805	0,0393	22	0,96
		(0,003)	(0,071)	(0,084)	(0,080)	(0,081)		
8	SRBank Norge B	0,0051	1,0012	0,2642	0,1896	-0,0313	22	0,97
		(0,003)	(0,055)	(0,072)	(0,061)	(0,060)		
9	DNB Norge Selektiv N	0,0049	1,1050	0,2083	0,0936	`-0,0033	12	0,98
		(0,006)	(0,091)	(0,092)	(0,116)	(0,165)		
10	Storebrand Norge B	0,0044	1,0471	0,3214	0,1310	-0,0147	19	0,98
		(0,002)	(0,038)	(0,069)	(0,047)	(0,069)		
Median	DNB Norge Selektiv A	-0,0010	1,0911	-0,0284	-0,0002	-0,0221	131	0,93
		(0,001)	(0,034)	(0,045)	(0,029)	(0,036)		
89	Arctic Norwegian Equities E	-0,0033	0,9474	0,0944	-0,0399	0,0743	57	0,91
		(0,002)	(0,063)	(0,067)	(0,049)	(0,050)		
90	Arctic Norwegian Equities D	-0,0033*	0,9341	0,0682	-0,0121	0,1783	93	0,86
		(0,001)	(0,059)	(0,065)	(0,042)	(0,041)		
91	Handelsbanken Norge A1 NOK	-0,0036	1,0419	0,213	0,0299	0,0507	38	0,95
		(0,002)	(0,050)	(0,073)	(0,053)	(0,070)		
92	Eika Norge	0,0039**	1,0032	0,0497	0,0382	0,0407	131	0,84
		(0,001)	(0,036)	(0,056)	(0,029)	(0,054)		
93	Pareto Investment Fund C	-0,0040	1,2837	0,2229	0,0889	0,1891	84	0,77
		(0,003)	(0,134)	(0,122)	(0,094)	(0,083)		
94	Delphi Vekst	-0,0040	1,1371	0,2027	0,1322	0,0661	45	0,78
		(0,004)	(0,119)	(0,159)	(0,073)	(0,167)		
95	Pareto Investment Fund B	-0,0043	1,2827	0,2223	0,0889	0,1898	84	0,77
		(0,003)	(0,134)	(0,122)	(0,094)	(0,083)		
96	Landkreditt Norge	-0,0046	1,0642	0,1288	0,0503	0,0057	77	0,77
		(0,003)	(0,072)	(0,106)	(0,071)	(0,111)		
97	NB Aksjefond	-0,0051	1,1944	0,1631	0,1813	-0,1542	45	0,85
		(0,003)	(0,084)	(0,153)	(0,081)	(0,184)		
98	Nordea SMB	-0,0079	1,1226	0,3710	0,1435	-0,3024	61	0,68
		(0,005)	(0,103)	(0,128)	(0,098)	(0,160)		

Appendix 4:

The table shows individual fund regression from the Carhar'st 4-factor model used on the Norwegian 4- factors created by Ødegaard, ranking the 10 best and the 10 worst alphas, gross of fees.

Rank	Fund	α	Mkt-Rf	SMB	HML	PRI1YR	N	R^2
1	DNB SMB R	0,0104	1,5162	0,8432	0,2414	0,2161	22	0,92
		(0,006)	(0,122)	(0,191)	(0,154)	(0,175)		
2	SRBank Norge D	0,0072**	1,0173	0,3202	0,2201	-0,0078	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
3	SRBank Norge A	0,0072**	1,0165	0,3203	0,2204	-0,0080	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
4	SRBank Norge C	0,0072**	1,0166	0,3201	0,2201	-0,0079	22	0,97
		(0,002)	(0,046)	(0,053)	(0,049)	(0,053)		
5	Verdipapirfondet Norse Utbytte	0,0071**	0,6512	0,1239	-0,0102	-0,0529	20	0,95
		(0,002)	(0,053)	(0,049)	(0,042)	(0,054)		
6	SRBank Norge B	0,0064*	1,0011	0,2643	0,1894	-0,0313	22	0,97
		(0,003)	(0,055)	(0,072)	(0,061)	(0,060)		
7	Landkreditt Utbytte I	0,0061	0,8184	0,3581	0,1398	0,0563	29	0,88
		(0,003)	(0,095)	(0,145)	(0,139)	(0,112)		
8	DNB Norge Selektiv R	0,0058	1,1069	0,2037	0,0805	0,0393	22	0,96
		(0,003)	(0,071)	(0,084)	(0,080)	(0,081)		
9	DNB Norge Selektiv N	0,0056	1,1054	0,2080	0,0936	-0,0033	12	0,98
		(0,006)	(0,091)	(0,092)	-0,116)	(0,165)		
10	Storebrand Norge B	0,0052*	1,0479	0,3912	0,1314	-0,0147	19	0,98
		(0,002)	(0,038)	(0,069)	(0,047)	(0,069)		
Median	Storebrand Verdi A	-0,0001	0,9620	-0,0051	0,0283	0,0495	131	0,93
		(0,001)	(0,028)	(0,042)	(0,024)	(0,031)		
89	Handelsbanken Norge A1 NOK	-0,0023	1,0408	0,2133	0,0299	0,0507	38	0,95
		(0,002)	(0,050)	(0,073)	(0,053)	(0,070)		
90	Storebrand Norge Institusjon	-0,0026	1,0754	0,0209	0,0064	-0,0253	37	0,96
		(0,001)	(0,051)	(0,060)	(0,039)	(0,075)		
91	Eika Norge	-0,0027	1,0031	0,0497	0,0382	0,0407	131	0,84
		(0,001)	(0,036)	(0,056)	(0,029)	(0,054)		
92	Delphi Vekst	-0,0027	1,1373	0,2022	0,1321	0,0661	45	0,78
		(0,004)	(0,119)	(0,159)	(0,073)	(0,167)		
93	Arctic Norwegian Equities E	-0,0028	0,9475	0,0944	0,0399	0,0743	57	0,91
		(0,002)	(0,063)	(0,067)	(0,049)	(0,050)		
94	Landkreditt Norge	-0,0032	1,0644	0,1288	0,0503	0,0057	77	0,77
		(0,003)	(0,072)	(0,106)	(0,071)	(0,111)		
95	NB Aksjefond	-0,0034	1,1941	0,1631	0,1819	-0,1549	45	0,85
		(0,003)	(0,084)	-0,151)	(0,081)	(0,184)		
96	Pareto Investment Fund B	-0,0035	1,2841	0,2224	0,0889	0,1890	84	0,77
		(0,003)	(0,134)	(0,122)	(0,094)	(0,083)		
97	Pareto Investment Fund C	-0,0035	1,2818	0,2223	0,0889	0,1892	84	0,77
		(0,003)	(0,134)	(0,122)	(0,094)	(0,083)		
98	Nordea SMB	-0,0062	1,1224	0,3710	0,1430	-0,3022	61	0,68
		(0,005)	(0,103)	(0,128)	(0,098)	(0,160)		

Appendix 5:

The table shows individual fund regression from the Carhart's 4-factor model used on the Global 4-factors factors by Fama and French ranking the 10 best and the 10 worst alpha, net of fees.

Rank	Fund	α	Mkt-Rf	SMB	HML	WML	N	R^2
1	DNB SMB R	0,0111 (0,008)	1,2792 (0,145)	2,3814 (0,382)	-0,1631 (0,206)	0,2272 (0,131)	23	0,94
2	Landkreditt Utbytte I	0,0096 (0,005)	0,7587 (0,130)	0,6731 (0,338)	0,4651 (0,245)	0,2923 (0,149)	30	0,82
3	Storebrand Norge Fossilfri A	0,0085** (0,004)	0,6892 (0,106)	0,6582 (0,299)	0,1428 -0,140)	0,1626 (0,123)	44	0,75
4	FORTE Tronder	0,0072* (0,003)	0,9162 (0,128)	0,7078 (0,245)	0,6422 (0,309)	0,1582 (0,158)	95	0,58
5	Pareto Investment Fund C	0,0063* (0,003)	1,1223 (0,113)	1,1331 (0,252)	0,5793 (0,237)	0,2814 (0,138)	85	0,73
6	Pareto Aksje Norge D	0,0061 (0,004)	0,8236 (0,109)	0,5968 (0,236)	0,6589 (0,239)	0,1481 (0,156)	65	0,7
7	Pareto Investment Fund B	0,0059 (0,003)	1,1222 (0,113)	1,1301 (0,251)	0,5781 (0,237)	0,2805 (0,138)	85	0,73
8	Pareto Aksje Norge C	0,0057 (0,004)	0,8238 (0,109)	0,5968 (0,236)	0,6580 (0,239)	0,1481 (0,156)	65	0,7
9	SEB1 Norway Focus CNOK	0,0056 (0,003)	0,7132 (0,090)	0,6891 (0,253)	0,2942 (0,184)	0,1182 (0,121)	57	0,71
10	Arctic Norwegian Value Creation	0,0053* (0,002)	0,8518 (0,086)	0,7179 (0,191)	0,3034 (0,179)	0,2043 (0,102)	76	0,73
Median	Storebrand Norge A	0,0019 (0,002)	0,9221 (0,054)	0,3900 (0,159)	0,2462 (0,107)	0,1344 (0,074)	132	0,73
89	Landkreditt Norge	-0,0036 (0,003)	0,9677 (0,065)	0,5451 (0,202)	0,0056 (0,193)	0,1371 (0,116)	77	0,72
90	DNB Norge N	-0,0039 (0,01)	1,1070 (0,116)	0,3093 (0,576)	0,1855 (0,279)	0,0162 (0,201)	13	0,96
91	Terra Norge	-0,0043 (0,003)	1,0251 (0,068)	0,4378 (0,253)	0,1691 (0,234)	-0,1360 (0,135)	45	0,83
92	Delphi Vekst	-0,0047 (0,004)	0,9268 (0,114)	0,7801 (0,41)	0,1318 (0,283)	0,0342 (0,132)	45	0,72
93	DNB Norge C	-0,0048 (0,007)	1,1013 (0,113)	0,3831 (0,534)	0,1641 (0,215)	-0,0065 (0,175)	16	0,96
94	Eika SMB	-0,0049 (0,004)	0,8432 (0,092)	1,3542 (0,348)	0,4943 (0,244)	-0,0996 (0,197)	45	0,73
95	DNB Norge A	-0,0051 (0,007)	1,1008 (0,113)	0,3019 (0,534)	0,1641 (0,215)	-0,0070 (0,175)	16	0,96
96	NB Aksjefond	-0,0065 (0,004)	1,0235 (0,104)	0,3551 (0,327)	0,1518 (0,264)	-0,1220 (0,165)	45	0,78
97	Nordea Norwegian Stars Fund Agr	-0,0089 (0,009)	0,8811 (0,117)	0,6183 (0,372)	-0,0439 (0,224)	0,0619 (0,152)	14	0,95
98	Nordea SMB	-0,0091** (0,003)	0,9553 (0,079)	1,0531 (0,245)	0,1619 (0,265)	-0,2851 (0,201)	61	0,73

Appendix 6:

The table shows individual fund regression from the Carhart's 4-factor model used on the Global 4-factors factors by Fama and French ranking the 10 best and the 10 worst alphas, gross of fees

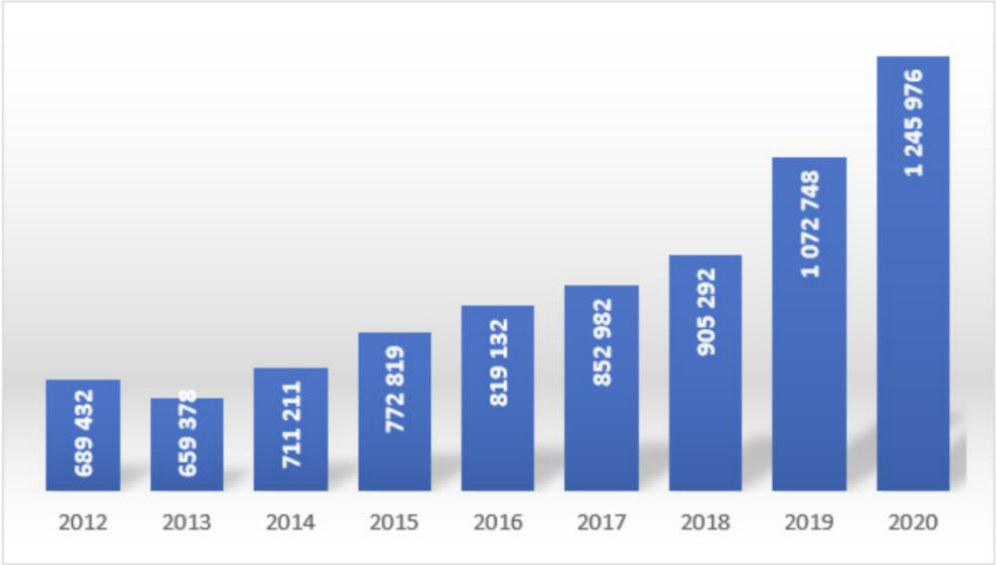
Rank	Fund	α	Mkt-Rf	SMB	HML	WML	N	R^2
1	DNB SMB R	0,0128 (0,008)	1,2793 (0,145)	2,3810 (0,382)	-0,1631 (0,206)	0,2273 (0,131)	23	0,94
2	Landkreditt Utbytte I	0,0107 (0,005)	0,7580 (0,132)	0,6733 (0,338)	0,4653 (0,245)	0,2920 (0,149)	30	0,82
3	FORTE Tronder	0,0088* (0,003)	0,9161 (0,128)	0,7077 (0,245)	0,6421 (0,309)	0,1534 (0,158)	95	0,58
4	Storebrand Norge Fossilfri A	0,0087* (0,004)	0,6803 (0,106)	0,6582 (0,299)	0,1420 (0,140)	0,1626 (0,123)	44	0,75
5	ParetoI nvestment Fund C	0,0071 (0,003)	1,1226 (0,113)	1,1304 (0,252)	0,5798 (0,237)	0,2803 (0,138)	85	0,73
6	Pareto Aksje Norge D	0,0069 (0,004)	0,8230 (0,109)	0,5964 (0,236)	0,658 (0,239)	0,1481 (0,156)	65	0,7
7	Pareto Investment Fund B	0,0067 (0,003)	1,1221 (0,113)	1,1302 (0,251)	0,5785 (0,237)	0,2800 (0,138)	85	0,73
8	Arctic Norwegian Value Creation A	0,0063* (0,002)	0,8503 (0,086)	0,7234 (0,191)	0,2987 (0,181)	0,2024 (0,102)	76	0,73
9	Pareto Aksje Norge C	0,0063 (0,004)	0,8233 (0,109)	0,5968 (0,236)	0,6588 (0,239)	0,1483 (0,156)	65	0,7
10	Arctic Norwegian Value Creation	0,0060* (0,002)	0,8519 (0,086)	0,7171 (0,19)	0,3033 (0,179)	0,2047 (0,102)	76	0,73
Median	Danske Invest Norske Aksjer Institusjon II	0,0030 (0,002)	0,8812 (0,051)	0,2193 (0,136)	0,4102 (0,097)	0,1031 (0,066)	132	0,76
89	Terra Norge	-0,0029 (0,003)	1,0254 (0,068)	0,4371 (0,253)	0,1698 (0,234)	-0,1360 (0,135)	45	0,83
90	Delphi Vekst	-0,0031 (0,004)	0,9261 (0,114)	0,783 (0,410)	0,1312 (0,283)	0,0342 (0,132)	45	0,72
91	Storebrand Norge Institusjon	-0,0031 (0,003)	0,9261 (0,071)	-0,1750 (0,336)	-0,1179 (0,237)	-0,0176 (0,109)	37	0,8
92	DNB Norge N	-0,0032 (0,011)	1,1070 (0,116)	0,3092 (0,576)	0,1854 (0,279)	0,0162 (0,201)	13	0,96
93	Eika SMB	-0,0037 (0,004)	0,8435 (0,092)	1,3548 (0,348)	0,4949 (0,244)	-0,0996 (0,197)	45	0,73
94	DNB Norge C	-0,0038 (0,007)	1,1011 (0,113)	0,3912 (0,534)	0,1643 (0,215)	-0,0065 (0,175)	16	0,96
95	DNB Norge A	-0,0043 (0,007)	1,1004 (0,113)	0,3013 (0,534)	0,1640 (0,215)	-0,00703 (0,175)	16	0,96
96	NB Aksjefond	-0,0060 (0,004)	1,0231 (0,104)	0,3551 (0,327)	0,1512 (0,264)	-0,1222 (0,165)	45	0,78
97	Nordea SMB	-0,0074 (0,003)	0,9554 (0,079)	1,0533 (0,245)	0,1618 (0,265)	-0,2854 (0,201)	61	0,73
98	Nordea Norwegian Stars Fund Agr	-0,0076 (0,009)	0,8818 (0,117)	0,6189 (0,372)	-0,0439 (0,224)	0,0619 (0,152)	14	0,95

Appendix 7:

The table shows the Sharpe Ratio for all individual funds in our sample ranking from the worst to the best.

Fund Name	Sharpe Ratio	Fund Name	Sharpe Ratio
FIRST Generator A	0,35	Landkreditt Utbytte I	2,03
NB Aksjefond	0,38	FORTE Norge	2,04
Eika SMB	0,48	Pareto Investment Fund B	2,04
Handelsbanken Norge Index (A1 NOK)	0,49	Storebrand Indeks - Norge A	2,05
Handelsbanken Norge Index (A9 NOK)	0,53	Alfred Berg Indeks Classic	2,10
Alfred Berg Aktiv II	0,73	DNB Norge Selektiv C	2,11
Handelsbanken Norge (A1 NOK)	0,85	C WorldWide Norge	2,11
Landkreditt Norge	0,90	Pareto Investment Fund C	2,13
Nordea SMB	0,93	KLP AksjeNorge Indeks II	2,13
Terra Norge	0,93	Nordea Avkastning	2,13
DNB Norge R	0,99	Storebrand Aksje Innland	2,14
Delphi Vekst	1,07	KLP AksjeNorge Indeks Acc	2,14
DNB Norge N	1,11	Nordea Kapital	2,15
Storebrand Norge Institusjon	1,24	DNB Norge Selektiv E	2,16
Eika Norge	1,26	Storebrand Norge I	2,16
Nordea Norwegian Stars Fund A growth NOK	1,29	Storebrand Optima Norge A	2,16
Pareto Aksje Norge B	1,34	Alfred Berg Indeks I	2,17
Pareto Aksje Norge A	1,39	Danske Invest Norge II	2,17
FIRST Norge Fokus	1,41	Arctic Norwegian Equities A	2,18
Nordnet Indeksfond Norge	1,57	Danske Invest Norske Aksjer Institusjon I	2,22
ODIN Norge C	1,57	SR-Bank Norge A	2,22
Storebrand Verdi N	1,58	DNB Norge Selektiv N	2,24
DNB Norge A	1,64	Alfred Berg Norge +	2,25
Vibrand Norden	1,65	Danske Invest Norske Aksjer Institusjon II	2,25
FIRST Generator S	1,65	SR-Bank Norge C	2,29
Holberg Norge A	1,66	C WorldWide Aksje Norge III	2,31
Pareto Aksje Norge I	1,67	ODIN Norge B	2,31
DNB Norge C	1,69	ODIN Norge D	2,32
Carnegie Norge Indeks	1,71	Delphi Norge	2,32
DNB Norge	1,76	Storebrand Norge A	2,35
DNB Norge (Avanse I)	1,76	SR-Bank Norge D	2,35
DNB SMB A	1,78	DNB Norge Indeks	2,36
DNB Norge D	1,79	ODIN Norge A	2,38
Alfred Berg Norge Etisk	1,80	Alfred Berg Aktiv	2,42
SEF First SMB A NOK	1,82	Sbanken Framgang Sammen	2,47
Pareto Aksje Norge C	1,84	Arctic Norwegian Equities E	2,47
KLP AksjeNorge	1,85	Arctic Norwegian Value Creation A	2,48
Alfred Berg Humanfond	1,87	Alfred Berg Norge [Classic]	2,48
PLUSS Aksje	1,87	Arctic Norwegian Value Creation C	2,48
Fondsfinans Norge	1,89	Nordea Norge Verdi	2,49
Storebrand Norge B	1,90	Arctic Norwegian Equities B	2,53
PLUSS Markedsverdi	1,90	FORTE Tronder	2,53
PLUSS Indeks	1,92	Arctic Norwegian Equities I	2,55
DNB Norge (III)	1,92	Arctic Norwegian Value Creation B	2,64
Nordea Vekst	1,94	DNB Norge Selektiv R	2,67
Pareto Aksje Norge D	1,95	Arctic Norwegian Equities D	2,77
Nordea Norge Pluss	1,95	Storebrand Vekst A	2,79
DNB Norge Selektiv A	1,96	Alfred Berg Norge [INST]	2,86
Pareto Investment Fund A	1,97	Eika Spar	2,92
DNB Norge (I)	1,97	Verdipapirfondet Norse Utbytte	2,93
Arctic Norwegian Value Creation D	1,98	Danske Invest Norge Vekst	2,99
DNB Norge (Avanse II)	1,98	Alfred Berg Gambak	3,04
SR-Bank Norge B	1,98	SEB 1 Norway Focus C (NOK)	3,13
Storebrand Verdi A	1,99	DNB SMB R	3,42
Danske Invest Norge I	2,00	Storebrand Norge Fossilfri A	4,13
		DNB Spare 100	4,20
Median	2,03		
Average	1,99		

Appendix 8:



The figure shows saving agreements in Norway from 2012 - 2020. This is regular savings in mutual funds through fixed withdrawals from a bank account, normally monthly. On average, NOK 974 a month was saved in the individual savings agreement. This is an increase of NOK 48 from the previous year. Men save an average of NOK 1087 a month, while women save NOK 837. The survey is based on reports from the member companies in the association. (Verdipapirfondenes Forening, 2021b)