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Master thesis

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Luck or ability among Norwegian mutual fund managers?

- Empirical analysis of 53 actively managed Norwegian equity funds

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Abstract

This paper studies whether mutual fund managers have skill to pick up stocks by applying the measure from Berk and Binsbergen (2013). My sample is 53 actively managed Norwegian equity funds over 10 years, period February 2004 – January 2014. My main findings are that Norwegian actively managed equity funds adds kr.0.35 million per month on average and 71,7% of these funds has an estimated positive value added over sample period. And only 10^{th} decile range, where I had most confidence that the actual value added in the sorting period is positive, has a significant positive performance in measurement horizon and this performance exists as far as 7 year. Therefore, I can conclude that there is evidence of skill among Norwegian mutual fund managers. I find also that investors recognize this skill and reward it by investing more capital with great performance funds.

Acknowledgements

I would like to express my sincerest gratitude and appreciation to my supervisor, Helge Nordahl, for giving me generous support and guidance, particularity in light of his demanding schedule.

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1. Introduction

Mutual fund managers are among the highest paid members of society and earn economic rents because they have a competitive advantage which is in short supply. So the purpose of this study is to investigate whether actively managed Norwegian equity funds outperformance their benchmark and does superior performance persist in the future?

This paper follows Berk and Binsbergen's (2013) working paper, which shed new light on various aspects of U.S mutual funds. That includes using the value that a mutual fund extracts from capital markets as the measure of skill, selection of benchmark instead of risk factor model and comparison of top decile beats bottom decile. Those mentioned above, are the main points that my paper follows.

To obtain the value that a mutual fund extract from capital market, I used the abnormal return of actively managed funds multiplied corresponding to their size adjusted by inflation with a base year 2010. The abnormal returns are computed by sum of returns of actively managed funds plus the percentage fee, in excess of net returns of their benchmark. I benchmark managers against the investment opportunity set faced by a passive investor that holds one or more index funds, in this case Aksjefond Pluss Indeks Fund. Finally, I obtain the measure the skill of mutual funds managers, the product of gross excess return over its benchmark and their asset under management, what Berk and Binsbergen (2013) term the *value added* of the fund.

Unlike Berk and Binsbergen's (2013) working paper in which they used two approaches to identify benchmark. First, they constructed a benchmark by picking up eleven Vanguard index funds. In addition to testing performance of actively managed mutual funds, they also tested performance of diversification service of Vanguard funds by using gross returns of these index funds. Second, they adopted the Fama-French-Carhart (FFC) factor portfolios to construct a benchmark. However, they pointed out the limitation of this benchmark and suggested that such an approach is only valid when the factors are tradable portfolios.

It is worth to notice that "Performance" and "Persistence" are defined by the following in this paper: estimated value added and continued occurrence of positive added valued on average created mutual fund managers in the long run. If the persistence in performance exist, it can lead us to conclude that the skilled mutual fund managers exist.

To test persistence in performance, I sort funds into 10 decile based on skill ratio during a sorting period (3 years) and then examine the persistence in performance in the measurement horizon. First, I observed these 10 decile in the measurement horizon based on their tendency. Then I used t-statistic and p-value to observe them further. Because of my sample is not normal distribution. I also used non-parametric test by adopting a relative performance comparisons in order to get more reliable conclusions.

My main findings are that Norwegian actively managed equity funds adds kr.0.35 million per month on average and 71,7% of these funds has an estimated positive value added. And only 10^{th} decile range, where I had most confidence that the actual value added in the sorting period is positive, has a significant positive performance in measurement horizon and this performance exists as far as 7 year. Therefore, I can conclude that there is evidence of skill.

The rest of the paper is organized in the following way: Section 2 contains a review of the relevant literature on the actively managed mutual funds. Section 3 presents the methods I used to test fund managers' skill and the underlying hypotheses I will test. Section 4 introduced my database including its issues. The empirical results are presented and analyzed in Section 5. A robustness test is used in Section 6. The last Section I reserved for my concluding remarks and discussing the limitation of this paper.

2. Literature review

2.1 Performance and persistence in performance

Jensen (1968) introduced the alpha-measure to exam a fund manager's forecasting ability. He examined 115 open end mutual fund performance from 1955 to 1964 with annual returns. He found that they were on average not able to predict security prices well enough to outperform market. In additional, mutual fund performance is unpredictable. These results hold with both net and gross return (before fees). He concludes that fund managers have no skill. Fama and French (2010) examine aggregate portfolio of actively managed U.S. equity mutual funds by the three factor model of Fama and French (1993) and four-factor model of Carhart (1997) from 1984 to 2006. They found that mutual fund investors in aggregate get net returns that underperform benchmarks of CAPM, three factor, and four factor. The average fund managers do not have enough skill to produce benchmark adjusted expected returns that cover costs. They conclude that the average manager lacks skill. In additional, based on an estimate of gross alpha, they conclude that this skill is economically small.

However, some literatures reported opposite results of performance. Grinblatt and Titman (1989) were the one of the earliest found evidence of skill among managers by examining gross returns, which do not have transaction costs, fees, or other expenses subtracted from them. In a follow-up paper (Grinblatt og Titman (1993)), these authors have found evidence that for a subset of mutual fund managers, stocks perform better when they are held by the managers than when they are not. In the recent researches Del Guercio and Reuter (2013) found no evidence that actively managed funds underperform index funds.

To distinguish weather the performance is due to luck or skill we need examine its persistence. Bollen and Busse (2005) re-examine (first time 2001) persistence in mutual funds' performance by ranking their risk-adjusted return measured over a three months period, and measure the risk adjusted return of decile of funds over the following three month period. They found statistically significant results at the top decile which leading to conclude that the skill may exist. Mamaysky,

Spiegel, and Zhang (2008) and Berk and Tonks (2007) found also evidence of persistence exists.

Hendricks and Zeckhauser(1993) study mutual fund performance based on quarterly returns in the period 1975-1988. They found that the relative performance of no-load, growth-oriented mutual funds persists in the near future, with the strongest evidence for a one year evaluation horizon. They found also funds that perform poorly in the most recent years continue to be significantly inferior performers in the near future. Carhart (1997) study diversified equity funds with monthly free of survivor bias returns from 1962-1993. He adopt the CAPM and 4 factor model which constructed by himself based on 3-factor model (Fama and French, 1993) and one year momentum anomaly (MOM) (Jegadeesh and Titman, 1993) After controlling for the market return, the Fama-French book-to-market and size factors, and more importantly, momenturm, he concluded that persistence in mutual fund performance does not reflect superior stock-picking skill. Furthermore, his analysis indicates that one year momentum (Jegadeesh and Titman, 1993) accounts for Hendricks, Patel, and Zeckhauser's (1993) hot hands effect in mutual fund performance. He explained funds that made higher one-year returns not because fund managers successfully follow momentum strategies, but because of luck they held relatively larger position in last year's winning stocks. Bollen and Busse (2001) studied 230 domestic equity funds with a "common stock" investment policy and a "maximum capital gains," "growth," or "growth and income" investment objective and more than $15 million in total net asset. His analysis is based on daily returns taken from Busse (1999). Busse pointed out those monthly returns can not fully capture the higher frequency dynamics that characterize the day to day activities of actively managed mutual funds. The most existing studies of mutual fund market timing analyze with monthly returns found little evidence of timing ability. Even though the results showed mutual fund exhibit significant timing ability more often in daily tests than in monthly tests. But they still concluded that manager have no timing ability on average.

2.2 Measurement of managers' skill

Berk and Binsbergen (2013) demonstrate that Carhart (1997) uses the net alpha earned by investors to measure managerial skill and conclude that there is no evidence of skilled. In details, Carhart (1997) study diversified equity funds with monthly free of survivor bias returns from 1962-1993. He adopt the CAPM and 4 factor model which constructs by himself based on 3-factor model (Fama and French, 1993) and one year momentum anomaly (MOM) (Jegadeesh and Titman, 1993) After controlling for the market return, the Fama-French book-to-market and size factors, and more importantly, momentum, he concluded that persistence in mutual fund performance does not reflect superior stock-picking skill. Furthermore, his analysis indicates that one year momentum (Jegadeesh and Titman, 1993) accounts for Hendricks, Patel, and Zeckhauser's (1993) hot hands effect in mutual fund performance. He explained funds that made higher one-year returns not because fund managers successfully follow momentum strategies, but because of luck they held relatively larger position in last year's winning stocks.

Kosowski, Timmermann, Wermers, and White (2006) use alpha measures to examine the performance of the U.S. open-end, domestic equity mutual fund industry over the 1975 to 2002 period. Their finding indicates that the performance of these best and worst manager is not just due to luck.

Berk and Binsbergen (2013) demonstrate that Fama and French (2010) use alpha measure to obtain a cross-sectional distribution of managerial talent. They conclude that managers have no skill on average. In details, Fama and French (2010) examine aggregate portfolio of actively managed U.S. equity mutual funds by the three factor model of Fama and French (1993) and four-factor model of Carhart (1997) from 1984 to 2006. They found that mutual fund investors in aggregate get net returns that underperform benchmarks of CAPM, three factors-, and four factors model. The average fund managers do not have enough skill to produce benchmark adjusted expected returns that cover costs. They conclude that the average manager lacks skill. In additional, based on an estimate of gross alpha, they conclude that this skill is economically small.

2.3 Value Added

Berk and Binsbergen (2013) demonstrate traditional measurement the gross and net alpha fail to measure managerial skill. He argued the net alpha measures the abnormal return offered to investors in the fund. It does not measure the skill of the manager of the fund. And the gross alpha is a return measure, not a value measure of managerial skill.

"*To measure the skill of a mutual fund manager, we must measure the value the fund extracts from markets."* They point out "*the total amount of money collected in fees by the fund can only come from one of two places-investors pockets or financial markets. The total value the manager extracts from markets is therefore equal to the amount of money the fund charges in fees, minus any money it takes from investors: the percentage fee multiplied by AUM plus the product of the return to investors in excess of the benchmark and AUM*." I express this by, $V_{it} = q_{i,t-1} * f_{i,t-1} + q_{i,t-1} * (R_{it}^{n} - R_{B,t}^{n})$, at chapter Methodologies equation (2). This quantity is the fund's gross excess return over its benchmark multiplied by asset under management, what the definition of the value added of the fund.

The authors found that the average mutual fund generate about $2 million per year. He found also strong positive correlation between current performance and future performance. They conclude that mutual fund mangers do have skill on average and this skill is persistent for as long as 10 years.

3. Methodologies and Hypothesis

As Berk and Binsbergen (2012) pointed out that the net alpha is a measure of the abnormal return earned by investors, not the skill of the manager. What the net alpha measures is the rationality and competitiveness of capital markets.
In further, the gross alpha cannot be used to measure the value of a fund. It measures the return the fund earns, not the value it adds.

3.1 Added value

Let R_{it}^{g} denote the *gross* excess return (that is the return in excess of the risk free rate) earned by i'th fund at time t. To measure the value in Norwegian kroner of what the fund adds over the benchmark, I use the product of the fund's abnormal return (the gross return minus the benchmark return), $R_{it}^{g} - R_{it}^{B}$, and the real size of the fund (assets under management adjusted by inflation) at the end of the previous period, $q_{i,t-1}$. The realized value added between times t and times t-1 will be:

$$V_{it} = q_{i,t-1}(R_{it}^{g} - R_{it}^{B}) \quad (1)$$

We got the realized value added of each fund i at period t. This function can also express by:

$$V_{it} = q_{i,t-1} * f_{i,t-1} + q_{i,t-1} * (R_{it}^{n} - R_{B,t}^{n}) \quad (2)$$

Where,

$q_{i,t-1}$= Asset under management adjusted by inflation (AUM) at period t-1

$f_{i,t-1}$ = Expenses ratio at period t-1

R_{it}^{n} = Fund i's net return at period t

$R_{B,t}^{n}$ = Benchmark's net return at period t

My measure of skill is the (time series) expectation of (3):

$$S_i = \mathrm{E}[V_{it}] \quad (3)$$

For each fund that exists for T_i, the estimated value added is given by:

$$\hat{S}_i = \sum_{t=1}^{T_i} \frac{V_{it}}{T_i} \quad (4)$$

There are two ways to estimate the average value added of funds: mean and time-weighted mean: ex-ante distribution and ex-post distribution. The estimate average value added of ex-ante distribution is given by:

$$\bar{S} = \frac{1}{N} \sum_{i=1}^{N} \hat{S}_i \quad (5)$$

Where N is the number of funds in my sample. The time weighted mean which term termed ex-post distribution is estimated by weighting each fund by the number of periods that is appears in the sample:

$$\bar{S}_w = \frac{\sum_{i=1}^{N} T_i \hat{S}_i}{\sum_{i=1}^{N} T_i} \quad (6)$$

3.2 Persistence in performance

I still follow Berk and Binsbergen (2013) to test mutual funds persistence in performance. As they argued that managers skill should be predictable if they have skill. That means the past positive added value should be persistent, i.e., funds that have added value in the past keep adding value in the future. To test this persistence I sort funds into 10 decile based on a *skill ratio* during a *sorting period* and then examine the performance over a specified future time horizon, which are termed *measurement horizon.*

3.2.1 Sorting Period

I require funds must have at least 3 years historical data to be in sort.
And then I rank funds into 10 Decile based on *Skill ratio:*

$$SKR_i^\tau = \frac{\hat{S}_i^\tau}{\sigma(\hat{S}_i^\tau)} \tag{7}$$

Where $\hat{S}_i^\tau = \sum_{t=1}^{\tau} \frac{V_{it}}{\tau}$ and $\left(\hat{S}_i^\tau\right) = \frac{\sqrt{\sum_{t=1}^{\tau}(V_{it} - \hat{S}_i^\tau)^2}}{\tau}$. I organized Skill ratio by:

$$SKR_i^\tau = \frac{V_{it}}{\sqrt{\sum_{t=1}^{\tau}(V_{it} - \hat{S}_i^\tau)^2}} \tag{8}$$

I have assumed that funds start at time 1. As Berk and Binsbergen (2013) pointed out that the start date in skill ratio is adjusted to reflect this. Supplementary, I have most confidence that the actual value added of funds in the 10th Decile is positive in the sorting period and the actual value added of funds in the 1st decile is negative.

3.2.2 Measurement horizon

After I sort funds into 10 decile, I examine them by monthly value added of each fund in the measurement horizon. In each decile I compute a monthly average value added over funds, and then I got a time series of average monthly value added for each decile. The persistence is examined through the trends of the average monthly value added in each decile range during different *measurement horizons* after 3 years sorting period. I examined further mean of these time series, standard deviation and applied a t-statistic and a non-parametric test.

3.3 Hypothesis

In this section I present two hypothesis for performance and persistence in performance observed in these 53 Norwegian mutual funds. I take both strong form and weak form under performance hypothesis based on two assumptions. If the funds get a significant positive performance, I will further examine its persistence by my persistence hypotheses.

3.3.1 Performance

Here I base my hypothesis from two assumptions. 1) Managers have no skill and investors are not rational. 2) Mangers may have skill and investors are rational. And then I form my hypothesis on both strong- and weak form.

Because fund managers earn economic rents, so they should possesses a skill in short supply. However, Fama and French (2010) re-examine mutual funds and conclude that no manager has skill. Based on his result and the first assumption, my *strong form* of no skill Null hypothesis is:

$H_{0:}$ the added value of each fund is negative (9)

We can illustrate it mathematically way:

$$H_0: S_i \leq 0, for\ each\ i \quad (10)$$

This equation means no individual fund manager has skill. No individual manager has skill lead to that the average manager does not have skill either. So the *weak form* of Null Hypothesis is:

$$H_0: the\ added\ value\ is\ negative\ on\ average \quad (10)$$

Similarly, I express it by:

$$H_0: \bar{S} = \frac{1}{N}\sum_{i=1}^{N} \hat{S}_i \leq 0 \quad (11)$$

However, even though managers have no skill on average, some managers may have skill. So let me introduce my alternative hypothesis on strong- and weak form under the second assumption: managers may have skill and investors are rational.

As definition of added value, the amount of money comes from two places. One is the overall money over- and under-performance relative to the benchmark. That means $q_{i,t-1}$ *$(R_{it}^n - R_{Bt}^n)$. The other is the fund charges in fee. That means $q_{i,t-1}$*f_{t-1}. Under assumption if managers have skill and investors are rational, net return that investors expect to earn is equal to the benchmark net return. Since fees are always positive, the expected value added will also be positive. So my alternative hypothesis on strong form is:

$$H_1: the\ added\ value\ of\ each\ fund\ is\ positive \quad (12)$$

It is given by:

$$H_1: S_i > 0, for\ each\ i \quad (13)$$

So the average manager must generate positive value, which express by:

$$H_1: the\ average\ added\ value\ is\ positive \quad (14)$$

We can illustrate it by:

$$H_1: \bar{S} = \frac{1}{N}\sum_{i=1}^{N} \hat{S}_i > 0 \quad (15)$$

In summary, null and alternative hypothesis will be following:

The strong form of my hypothesis is:

$$H_0: S_i \leq 0, for\ each\ i \quad (10)$$

$$H_1: S_i > 0, for\ each\ i \quad (13)$$

The weak form of my hypothesis is:

$$H_0: \bar{S} = \frac{1}{N}\sum_{i=1}^{N} \hat{S}_i \leq 0 \quad (11)$$

$$H_1: \bar{S} = \frac{1}{N}\sum_{i=1}^{N} \hat{S}_i > 0 \quad (15)$$

3.3.2 Persistence in performance

If the added value is significant positive and manager has skill, the added value will keep adding positive value in the future. If the past added value is not persistent in the future, we can conclude that the past positive added value is due to luck or timing. So, I construct the following strong form of hypothesis:

Ho: Relative positive performance does not persist in the future (16)

H_1: Relative positive performance persist in the future (17)

4. Data and variable Definitions

4.1 Actively Managed Equity Funds

The database of my sample comes mainly from Bloomberg database. It contains net monthly returns of 53 Norwegian actively managed open-end equity funds over 10 years. (From February 2004 to January 2014). All dividends are assumed to be reinvested again. Because of incomplete data of Asset under Management (AUM) and expenses ratio from Bloomberg, I had to obtain them from other sources. My used AUM is from Verdipapirfondenes forening (vff). Consume Price Index (CPI) to adjust AUM by inflation with a base year 2010 is from Statistic Norway (ssb). Expenses ratios are partly from Morningstar, Finansportalen and funds companies for merged- and not survived funds.

To obtain as many as actively managed Norwegian equity funds for observed period, I searched with following criteria at Bloomberg database:
1) Fund Geographical Focus[1]: Norway 2) Country of Domicile[2]: Norway 3) Manager location: Norway 4) Fund type: Open-End Mutual fund
5) Fund objective: Equity[3] 6) Fund Asset Class Focus: Equity.
I got a list of 74 Norwegian funds at first attempt. (See table 1 in Appendix)

4.1.1 Funds examination

To focus better on the performance of actively managed funds, I dropped all funds with names having the word "index". Focusing further on Norwegian and equities funds, I excluded funds with a foreign reference index. I further drop funds that

[1] Geographic focus (holding based) Geographic state, country or region in which majority of the fund's holdings fall(70% or more). If there is no majority, then this value is N/A. This is a holdings assessment, not based on prospectus.

[2] Country of Domicile: Returns the ISO(International Organization for Standardization) code of the country where the company's senior management is located.

[3] Fund Objective: This is the Bloomberg fund Classification system that identifies the funds objective as started by management in the prospectus. The classification system was implemented on March 17, 2000

invest more than 20% of their assets internationally and has less than 98% investment in equities.

Furthermore, I dropped any fund observations before the funds inflation adjusted AUM (Asset Under Management) reached $5 million (equivalent to kr. 30 mill) in order to lessen the effects of "incubation bias". Fama and French (2010) point out that the $5 million inflation adjusted AUM bound for admission to the observations alleviates this bias since AUM is probably to be low during the pre-release period. I require all of funds have a least one year data to be examined.

4.1.2 Data Screening

In order to get my results as accurate as possible and my conclusion as reliable as possible, I have to screen my data. Even through data from Bloomberg and Vff have been used extensively, some issues are found when I was examining them. I further dropped 6 funds because 3 of them were found without any returns and 3 of them were found without any size in my database. For some individual missing values in AUM and monthly returns I filled these missing values by most recent observations in the past.

Finally, my sample ended up with 53 Norwegian actively managed equity funds over the period from February 2004 to February 2014, with a total of 5492 monthly observations. (Table 2 in Appendix)

	Number of funds			AUM(in bill Y2010)	Abnormal Return(%)	Added Value(in mill Y2010)
Year	End of year	Born	Liquidated			
2004	46	0	0	22,4	-0,6435	10,18
2005	45	0	1	29,9	9,0932	61,56
2006	43	2	4	37,1	-1,7116	-4,78
2007	44	1	0	43,9	1,1234	-8,03
2008	44	0	0	24,4	-1,5757	-33,59
2009	45	1	0	43,6	4,2261	1,31
2010	45	0	0	52,5	6,0303	68,88
2011	47	2	0	41,3	-7,9023	-95,51
2012	47	0	0	46,0	2,2135	15,45
2013	43	1	5	54,2	2,8149	14,40

Table 1: **Mutual Fund Database Summary Statistics**

This table reports the number, total asset under management (AUM), abnormal returns and added value of Norwegian open-end equity funds in the period 2004-2013[4]. The first column of the table shows the number of funds in my sample in each year. The second (third) column reports the number of funds that started (liquidated) during each year. The fourth column reports the total asset under management (in billion NOK with a base year 2010) in the 53 mutual funds at the end of each year. The fifth column reports the abnormal return calculated as actively managed fund's gross returns (before fees) excess of an index fund's net return in percent per year. Last column reports average added value each fund generated over period 2004-2013.

4.1.3 Variable Definition

Net returns are those received by investors. Gross returns (R_{it}^{g}) are those returns earned by mutual funds. Abnormal returns (R_{it}^{Abn}) are those returns earned by mutual funds in excess of it benchmark. Therefore, to compute mutual funds' abnormal returns I used gross returns of mutual funds minus net return of an index fund. Let me express it on mathematic way:

$$R_{it}^{g} = R_{it}^{n} + \frac{Exp\ ratio_{i}^{Y}}{12} \tag{16}$$

Where R_{it}^{n} = monthly net returns those received by investors. $Exp\ ratio_{i}^{Y}$ is each fiscal year's expense ratio of fund i. These monthly net returns I got from Bloomberg are calculated through net asset value (NAV). The net asset values and dividends are combined to form a monthly return series for each fund as follows:

$$R_{it}^{n} = \frac{NAV_{it} + D_{it}}{NAV_{i,t-1}} - 1 \tag{18}$$

[4] I have just two monthes data in 2014. Therefore 2014 is not included in the table.

Where NAV_{it} is the net asset value which is net of all management expenses and 12b-fees, and D_{it} is ex-dividends of fund i on month t. So abnormal returns is given by:

$$R_{it}^{Abn} = R_{it}^{g} - R_{Bt}^{n} \quad (17)$$

Where R_{Bt}^{n} = monthly net returns those received by investors from a tradable index fund. In the end, I adjusted all AUM numbers by inflation by expressing all numbers in January 1, 2010 kroner.

4.2 Benchmarks Selection

Berk and Binsbergen (2012) augured that in order to measure the value that funds gives or takes from investors, the performance must be compared to the performance of the next best investment opportunities, which is termed benchmark in this thesis. And the next best investment opportunity should be available for investors.

In previous studies it is commonly used to construct this alternative investment opportunity by using risk factor model to adjust for risk. As Berk and Binsbergen (2012) mentioned the extent to which factor models accurately correct for risk has arouse attention in recent years. They concluded some reasons that investors cannot invest in the factor portfolio. For example, these portfolio do not take transaction cost into account such as the momentum strategy requires high transaction costs and time to implement.

For those reasons I choose to use a tradable index fund as my benchmark.
It contains 8 index funds in my database. After I plot all of these index funds' returns, I find out 3 of them have almost same movement. And one of these 3 index funds has data over all my sample period. Therefore I choose to use Aksjefond Pluss Indeks Fund as the next best investment opportunity termed also benchmark in this paper.

5. Results and analysis

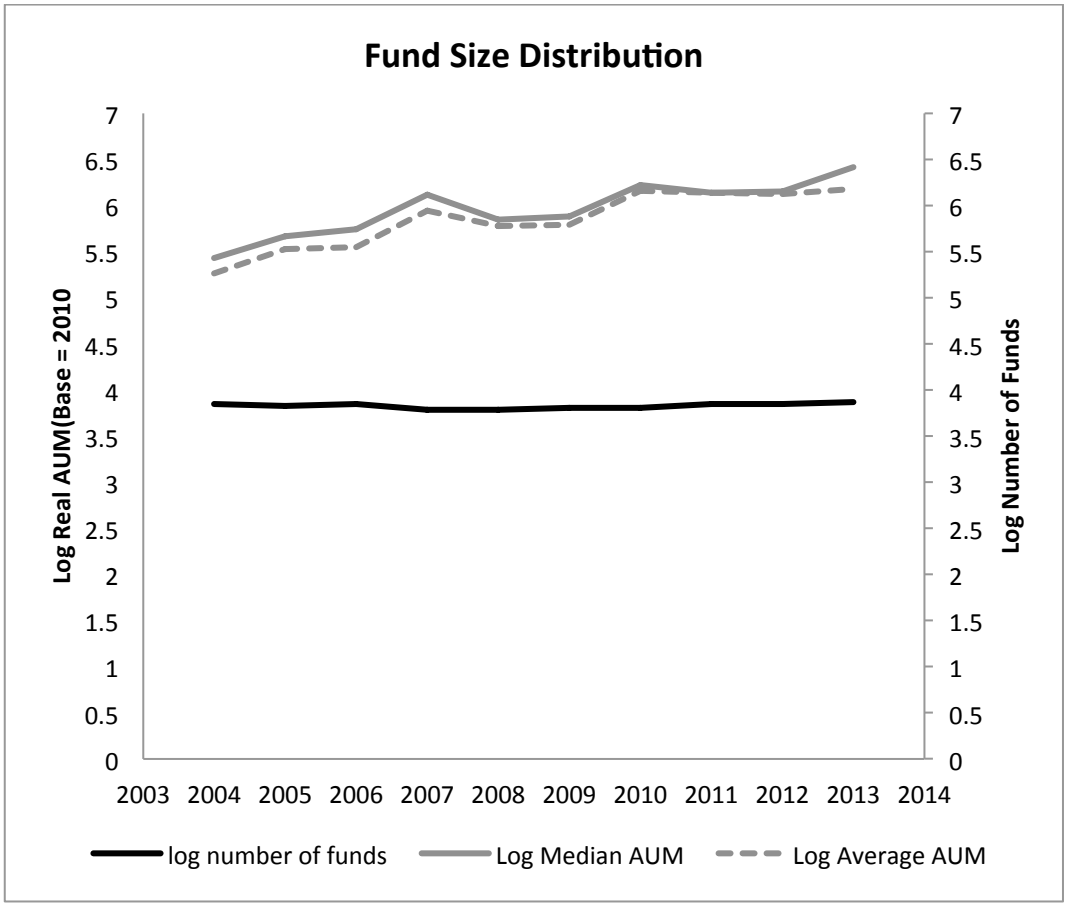

Figure 1: **Fund Size Distribution**

The graph plots the evolution of the distribution of the logarithm of real asset under management (AUM) in kroner millions with a base year 2010. The black smooth line is the logarithm of the total number of actively managed funds. The grey smooth line is median of log monthly AUM of all sample funds. The grey dashed line displays logarithm of average monthly AUM in all observed period.

Here I will start to measure performance and analysis the skill by observing the performance I measure is persistent. Before moving on analysis of the average value added of the funds, one thing is important to check, that is, stationarity. If time series is not stationary, previous values of the error term will have a non-declining effect on the current value as time progresses. (Brooks, 2012). Because the average added value ($\hat{S}_i$) is the product of gross abnormal return and funds size, I plot the distribution of fund size of the series and then check the stationarity of itself. Figure 1displays both average funds size and the median inflation adjusted size. From the grey smooth line we can see any joint distribution of the

AUMs is identical to the others. That means the stationarity exists. The flat black smooth line and two grey increasing lines indicate that the expansion of Norwegian mutual fund industry from 2004 to 2014 is caused by increasing of fund size rather than the amount of funds.

5.1 Performance

	Ex-ante	Ex-post
Cross-Sectional Mean	0,32	0,35
Standard Error of the Mean	1,53	0,03
t-Statistic	1,51	76,90
1st Percentile	-3,54	-0,15
5th Percentile	-1,90	-0,04
10th Percentile	-0,94	-0,02
50th Percentile	0,22	0,00
90th Percentile	2,04	0,04
95th Percentile	2,20	0,05
99th Percentile	3,86	0,08
Percent with greater than zero	71,70 %	71,7 %
No. of Funds	53,00	

Table 2: **Value Added** ($\hat{S}_i$): The ex-ante distribution displays the estimated monthly value added, $\hat{S}_i$, for each qualified actively managed fund in my database during 2004 to 2014 and defined by (5). Ex-post distribution are computed by weighting by the number of periods the fund exists, that is, they are statistical properties of $\bar{S}_w$ The cross sectional mean, standard error, t-statistic and percentiles are the statistical properties of this distribution and based on both ex-ante and ex-post distribution. Percent with greater than zero is the fraction of the distribution that has value added estimates greater than zero. The numbers are reported in base year 2010 kroner millions per month.

Table 2 shows the cross sectional distribution of S_i in my sample. The average fund adds kr. 320,000 per month (in Y2010 kroner) with an insignificant t-value

of 1,53. There is large variation of added value among funds. The funds at the 99th percentile cutoff generated kr. 3,86 million per month. Funds at 90th percentile cutoff generated kr. 2,04 million per month on average. The median funds generated also a positive added value kr. 0,22 million a month, and 71,7% of funds had positive estimated added value a month on average.

The Ex-post (time weighted) distribution of S_i reports that the average fund adds an economically significant kr.350,000 per month (in Y2010 kroner). And ex-post distribution of S_i reports kr 30,000 greater than ex-ante distribution on a month. Because an estimate of the ex-post distribution of talent is the average skill of the set of funds actually managing money. The standard error of this average is kr. 30 000 with a t-statistic of 76,9. Hence, my weak form null hypothesis of fund managers on average having no skill get rejected at 95% level. The time weighted fund at 99th percentile cutoff adds kr 80 000 per month, which is kr 40 000 greater compared with 90th percentile cutoff. The time weighted fund at 1st percentile cutoff generated a negative value kr 150 000 per month.

5.2 Persistence in performance

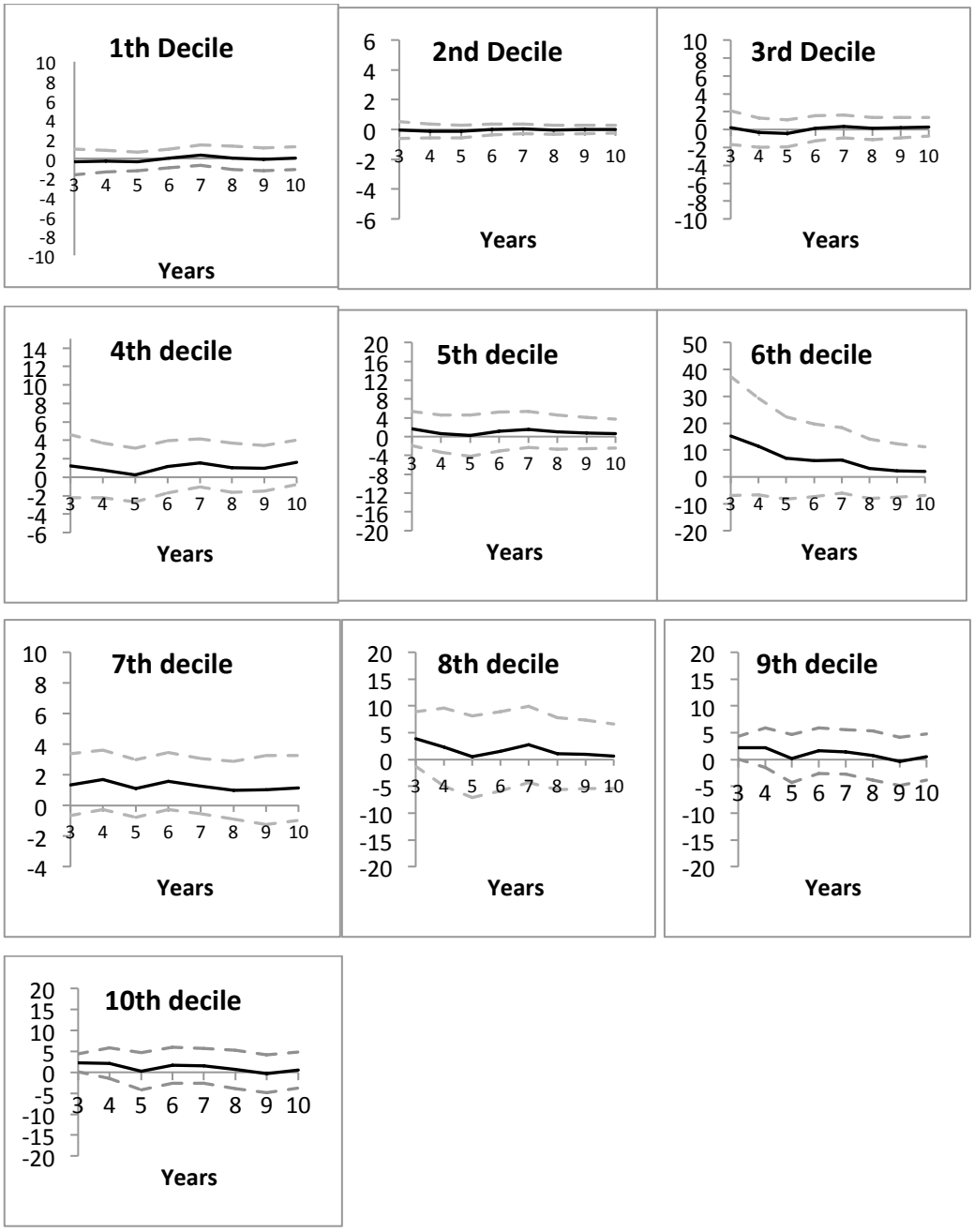

Figure 2: **Persistence in Performance Trends of Each Decile:** Each graph plots the average monthly value added of each decile range adjusted by inflation with base year in 2010 under 7 different measurement horizon, i.e. 4 to 10 years (Feb.2007- Jan.2014) after sorting period. Each decile (Table 4 in Appendix) is sorted by skill ratio in the sorting period (3 years). The black solid line indicates the trend of average monthly value added of each decile. The two dashed lines denote the two bounds with 95% confidence interval.

Decile	3	4	5	6	7	8	9	10

		Years	Years	Years	Years	Years	Years	Years	Years
1th	added value	-0.35	-0.26	-0.32	0.03	0.34	0.06	-0.11	0.06
	p-value	0.700	0.678	0.746	0.472	0.263	0.463	0.571	0.460
2rd	added value	-0.04	-0.10	-0.13	0.01	0.04	-0.02	-0.01	0.01
	p-value	0.555	0.660	0.737	0.485	0.400	0.556	0.514	0.456
3rd	added value	0.21	-0.35	-0.44	0.14	0.33	0.12	0.20	0.29
	p-value	0.411	0.665	0.716	0.423	0.302	0.422	0.363	0.289
4th	added value	1.19	0.75	0.22	1.14	1.55	1.03	0.95	1.61
	p-value	0.243	0.304	0.440	0.211	0.118	0.218	0.221	0.093
5th	added value	1.71	0.63	0.23	1.11	1.51	0.99	0.77	0.65
	p-value	0.175	0.374	0.460	0.297	0.216	0.293	0.323	0.339
6th	added value	15.26	11.30	6.97	6.09	6.22	3.09	2.33	2.04
	p-value	0.086	0.104	0.182	0.185	0.155	0.289	0.321	0.328
7th	added value	1.36	1.68	1.10	1.60	1.28	0.99	1.02	1.15
	p-value	0.091	0.044	0.122	0.046	0.080	0.148	0.184	0.142
8th	added value	3.86	2.31	0.55	1.52	2.81	1.08	1.01	0.62
	p-value	0.066	0.262	0.443	0.341	0.215	0.375	0.375	0.419
9th	added value	2.20	2.18	0.20	1.64	1.49	0.72	-0.35	0.52
	p-value	0.023	0.120	0.464	0.223	0.237	0.377	0.562	0.405
10th	added value	2.31	1.60	1.66	1.54	1.48	1.22	0.73	1.14
	p-value	0.012	0.050	0.053	0.076	0.062	0.104	0.221	0.115

Table 3: **Performance of each decile in the Measurement Horizon:**
This table shows monthly added value on average of each decile at each horizon and p values. Each decile is ranked by skill ratio in a 3 years sorting period. Average monthly value added ($\hat{S}_i$) is calculated in the measurement horizons. All p values are one tailed based on strong form null hypothesis: no individual manager has skill. P-value shows the probability t statistic is greater than critical value under null hypothesis.

If managers possess skill, the past positive added value will keep adding value in the future. So I sort my sample into 10 decile by Skill Ratio defined by (8) during sorting period and observe their tendency in the measurement horizon. I have

most confidence that the actual value added of funds in 1st decile (bottom) of my sample is negative over the sorting period. Similarly, I have most confidence that the actual value added of funds in 10th decile (top) is positive over the sorting period. Figure 2 displays the persistent in performance of each decile in 7 different measurement horizons. (These graphs were constructed based on Figure 1 in Appendix) It is not difficult to see that poor performance funds in sorting period still keep poor performance in the future such as 1th to 3th decile. From 4th decile to 10th decile the performance in persistence are unstable over measurement horizon. 4th to 8th decile have positive added value over all measurement horizon. But 6th decile has a decreasing tendency over almost all period. In additional, I tested the weak form no skill hypothesis of each decile by t-statistic in table 3. The results indicates the positive monthly value added on average of the 10th decile range are statistically significant at 90% confidence level during 3 to 7 years. Simultaneously, 10th decile has a significantly positive added value until 4 years at 95% confidence level. The results show also some significantly positive added value at 9th and 7th decile at 95% confidence level. 6th and 8th decile have significantly positive added value at 90% confidence level. Therefore, for the 10th decile range specifically, we may reject strong form null hypothesis, and then conclude that 10th decile managers possess skill in general. But caution is in order.

5.3 Non Parametric test

Thus far, I have ignored the fact that data of my sample is not normal distribution. QQ-plot, boxplot and Sharpiro-Wilk in appendix show that the value added is not normal distribution and features excess kurtosis. So a non parametric test is evaluated to be used here. As Berk and Binsbergen (2013) suggested that the most straightforward way to deal with the economic shortcoming of t-statistics is to use an alternative measure of statistical significance that does not have these issues. That is an order statistics. So we will not need to rely on and large sample or asymptotic properties of the distribution. As a result, neither the excess kurtosis in returns nor the correlation across funds affects our calculations.

Now I report my results based on the order statistic. I adopt a relative performance comparisons to construct a non parametric test of the strong form of the Null Hypotheses (relative positive performance does not persist in the future) by counting the number of times the top decile beats the bottom decile and the number of times it is one of the top 5 decile beats the bottom decile over measurement horizon. As is evident from Table 4, the Null Hypothesis can be rejected at the 95% confidence level at all horizons under top in top half. In addition, the null hypothesis can be rejected at the 90% confidence level at all horizon under top outperform bottom. So we can definitively reject the strong form of the Null Hypothesis: the relative positive performance does not persist in the future. As a result, I can conclude that skilled managers exist. In the end, the increasing share of capital controlled by 10^{th} decile managers implies that investors reward skilled managers by providing them with more capital.

Horizon	Value Added		Top Outperforms Bottom		Top in Top		Fraction of Total
Years	(kr)Mil	p-value(%)	Freq.(%)	p-value(%)	Freq.(%)	p-value(%)	AUM(%)
3	2,31	0,012	63,89	3,36	66,67	1,82	12,65
4	1,6	0,05	62,50	2,60	66,67	0,80	13,15
5	1,66	0,053	60,00	3,13	63,33	1,23	16,19
6	1,54	0,076	56,94	4,71	62,50	1,00	14,27
7	1,48	0,062	54,76	5,95	58,33	2,73	15,30
8	1,22	0,104	56,25	3,86	57,29	2,95	16,21
9	0,73	0,221	53,70	5,71	57,41	2,36	17,41
10	1,14	0,115	53,33	5,58	56,67	2,52	17,15

Table 4: Out of sample Performance of the Top Decile

The two columns labeled “Value Added” report the average value added of the top decile (10^{th} decile) at each horizon and associate p-value by t-statistics. The rest of columns report by a non parametric test. The column labeled “top outperforms bottom” report the fraction of time and p-value by counting the number of times the top managers decile beats the bottom managers. The column labeled “Top in top half” report the fraction of time and p-value by counting the one of top decile in top 5 beats the bottom decile. The final column reports the average fraction of total AUM in the top (10^{th}) decile. All p-values are one tailed, that is, they represent the probability, under the Null Hypothesis, of the observed test-statistic value or greater.

6 Robustness Test

	Feb.2004-Jan.2014	Feb.2004-Jan.2010	Feb.2008-Jan.2014
Mean (kr.mil/mon)	0.36	1.20	-0.17
Time Weighted Mean (kr.mil/mon)	0.346*	0.006	0.008
Total Number of Funds	53	53	53

Table 5: This table tests the robustness of my total sample data within different sub periods and compares them with the original whole sample period (Feb.2004-Jan.2014). Mean is computed by ex-ante distribution of monthly value added, which is the distribution of average mutual funds. The time-weighted mean is based on ex-post distribution of monthly value added, which is real stock picking skill in the past. All the mean values are calculated in millions of Norwegian kroner, and adjusted by inflation with base year 2010. Besides,* indicates the t-statistic is significant at 95% confidence level.

In order to test the continuity of value added in different sub periods I split my sample into two different subsample periods: February 2004-January 2010 and February 2008 to January 2014. Under two sub periods, the value added is almost positive expect average added value in period February 2008 to January 2014. But none of these positive added value is statistical significant. So we accept the weak form of Null Hypothesis. That means the evidence of the Norwegian equity funds having no added value on average is proved.

7. Conclusion and Limitation

I observed the performance and persistence of Norwegian mutual funds using a data set of monthly returns from February 2004 to January 2014. I used added value adjusted by inflation instead of alpha which means the performance is investigated by value, not percentage. The Null Hypothesis got rejected on both performance and persistent in performance hypotheses in my study. That implies that the skill exist among Norwegian mutual fund managers. I discover the evidence of positive value added on Norwegian mutual funds. Norwegian actively managed mutual funds add a roughly kr. 0, 35 million per month on average, and most of these fund capital was controlled by positive-value-added Norwegian fund managers. Moreover, there is significant positive added value at 10^{th} decile and the persistence in performance exist as far as 7 years. But the other decile ranges are not proved enough significant added value in persistence. Because the data of my sample is not normal distribution, I used further a non-parametric test to examine the persistence in performance for top and top in top half docile. The results showed that the relative positive performance do persist in the future. I further document that investors recognize this skill and reward it by investing more capital with better funds.

However, one of weakness of my study is the selection of sample period length considering that it is not long enough to reveal the real performance of the funds. In addition, access of AUM is from other sources than Bloomberg, some of funds use very similar names but not exactly same even though I tried to figure out by checking Morning Star and Finansportalen. To a certain extent, it would affect the accuracy of the results.

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Appendix

Table 1: **A list of funds at my database**

Nr	Ticker	Name	ReferenceIndex
1	ABOBXFD NO	ABN AMRO INDEKS	OBX
2	FOPLOBX NO	AKSJEFOND PLUSS INDEKS FUND	OBX
3	FOPLIDX NO	AKSJEFOND PLUSS MARKEDSVERDI	OBX
4	AIAKTIV NO	ALFRED BERG AKTIV	OSEFX
5	GAMBAKF NO	ALFRED BERG GAMBAK	OSEFX
6	ALFBHUM NO	ALFRED BERG HUMANFOND	OSEFX
7	ALFINKS NO	ALFRED BERG INDEKS	OSEFX
8	AINORG NO	ALFRED BERG NORGE	OSEFX
9	AINORGS NO	ALFRED BERG NORGE +	OSEFX
10	ABNORET NO	ALFRED BERG NORGE ETISK	OSEFX
11	CAAKSJE NO	CARNEGIE AKSJE NORGE	OBX
12	CAOBX NO	CARNEGIE NORGE INDEKS	OBX
13	DANINII NO	DANSKE INVEST NOR AKS IN II	OSEFX
14	FFNORGE NO	DANSKE INVEST-NORGE I	OSEFX
15	FFNORG2 NO	DANSKE INVEST-NORGE II	OBX
16	FFSMBFD NO	DANSKE INVEST-NORGE VEKST	OSESX
17	DFNORGE NO	DELPHI NORGE FUND	OSEFX
18	DFVEKST NO	DELPHI VEKST	OSEFX
19	DIBARNE NO	DNB BARNEFOND	OSEFX
20	AFNORDE NO	DNB NORDEN IV	MXND
21	PVAKSJE NO	DNB NORGE	OSEFX
22	AFAVANS NO	DNB NORGE AVANSE I	OBX
23	AFMARKE NO	DNB NORGE AVANSE II	OBX
24	DINORGE NO	DNB NORGE III	OSEBX
25	DNBNORI NO	DNB NORGE INDEKS	OSEFX
26	DINOIII NO	DNB NORGE IV	OSEBX
27	DI20FND NO	DNB NORGE SELEKTIV I	OSEBX
28	AFGNNOA NO	DNB NORGE SELEKTIV II	OSEBX
29	AFNOAK2 NO	DNB NORGE SELEKTIV III	OSEBX
30	DISMB NO	DNB SMB	OSESX
31	EKNORD NO	EIKA NORDEN	NDCXT
32	NFPLUSS NO	EIKA SMB	OSEFX
33	EKNORGE NO	EIKANORGE	OBX
34	FIRGENE NO	FIRST GENERATOR	OSEFX
35	FONSPAR NO	FONDSFINANS SPAR	OSEFX
36	FORNORG NO	FORTE FORGE	OSEFX
37	SUAKTIV NO	GLOBUS AKTIV	OSEFX
38	SUNORGE NO	GLOBUS NORGE II	OSEFX
39	GLTVFND NO	GLOBUS TVFOND	OSEFX
40	HANORGE NO	HANDELSBANKEN NORGEFOND	OSEFX

41	HONORGE NO	HOLBERG NORGE	OBX
42	KFSMBFD NO	K-SMB FUND	N.A.
43	KFVEKST NO	K-VEKST FUND	N.A.
44	NRNORGE NO	KAUPTHING NORGE	MXEU
45	KLPAKNO NO	KLP AKSJENORGE	OBX
46	KLPANOI NO	KLP AKSJENORGE INDEKS	OSEBX
47	KLPANII NO	KLP AKSJENORGE INDEKS II	OSEBX
48	LAKNORG NO	LANDKREDITT NORGE	N.A.
49	LDUTBNO NO	LANDKREDITT UTBYTTE	OSEFX
50	NFAKSJE NO	NB-AKSJEFOND	OSEFX
51	NORAVKA NO	NORDEA AVKASTNING	OBX
52	NORKAP1 NO	NORDEA KAPITAL	OBX
53	NORKAP2 NO	NORDEA KAPITAL II	OSEFX
54	NORKAP3 NO	NORDEA KAPITAL III	OSEFX
55	NORNRPL NO	NORDEA NORGE PLUSS	OSEFX
56	NONORVE NO	NORDEA NORGE VERDI	OSEFX
57	NORSMB2 NO	NORDEA SMB II	NOCXS
58	NORVEKS NO	NORDEA VEKST	OBX
59	ODNORGE NO	ODIN NORGE	OSEFX
60	ORFINF NO	OMEGA INVESTMENT FUND	OBX
61	ORFIN30 NO	ORKLA FINANS 30	OSEFX
62	POAKTIV NO	PARETO AKSJE NORGE	OSEFX
63	POAKTNY NO	PARETO AKTIV	OSEFX
64	PRVERDI NO	PARETO VERDI	OSEFX
65	FOPLAKS NO	PLUSS AKSJE FUND	OSEAX
66	VESTAMS NO	SKANDIA AMS FUND	MXEU
67	SPAKSIN NO	STOREBRAND AKSJE INNLAND	OSEBX
68	SPNORGE NO	STOREBRAND NORGE FUND	OSEFX
69	SPPENSJ NO	STOREBRAND PENSJONSPAR FUND	MSCI
70	SPSMBFD NO	STOREBRAND VEKST	OSEBX
71	SPVERDI NO	STOREBRAND VERDI FUND	OSEBX
72	TFNORGE NO	TERRA NORGE	OSEBX
73	SUINDEK NO	WARRENWICKLUND INDEKS+	OSEFX
74	WWKNORD NO	WARRENWICKLUND NORDEN	MSCI

Table 2: My sample of 53 Norwegian actively managed mutual funds after deleting unqualified funds

Nr	Ticker	Name	ReferenceIndex
1	FOPLIDX NO	AKSJEFOND PLUSS MARKEDSVERDI	OBX
2	AIAKTIV NO	ALFRED BERG AKTIV	OSEFX
3	GAMBAKF NO	ALFRED BERG GAMBAK	OSEFX
4	ALFBHUM NO	ALFRED BERG HUMANFOND	OSEFX
5	AINORG NO	ALFRED BERG NORGE	OSEFX
6	AINORGS NO	ALFRED BERG NORGE +	OSEFX
7	ABNORET NO	ALFRED BERG NORGE ETISK	OSEFX
8	CAAKSJE NO	CARNEGIE AKSJE NORGE	OBX
9	DANINII NO	DANSKE INVEST NOR AKS IN II	OSEFX
10	FFNORGE NO	DANSKE INVEST-NORGE I	OSEFX
11	FFNORG2 NO	DANSKE INVEST-NORGE II	OBX
12	FFSMBFD NO	DANSKE INVEST-NORGE VEKST	OSESX
13	DFNORGE NO	DELPHI NORGE FUND	OSEFX
14	DFVEKST NO	DELPHI VEKST	OSEFX
15	PVAKSJE NO	DNB NORGE	OSEFX
16	AFAVANS NO	DNB NORGE AVANSE I	OBX
17	AFMARKE NO	DNB NORGE AVANSE II	OBX
18	DINORGE NO	DNB NORGE III	OSEBX
19	DINOIII NO	DNB NORGE IV	OSEBX
20	DI20FND NO	DNB NORGE SELEKTIV I	OSEBX
21	AFGNNOA NO	DNB NORGE SELEKTIV II	OSEBX
22	AFNOAK2 NO	DNB NORGE SELEKTIV III	OSEBX
23	DISMB NO	DNB SMB	OSESX
24	NFPLUSS NO	EIKA SMB	OSEFX
25	FONSPAR NO	FONDSFINANS SPAR	OSEFX
26	FORNORG NO	FORTE FORGE	OSEFX
27	SUAKTIV NO	GLOBUS AKTIV	OSEFX
28	SUNORGE NO	GLOBUS NORGE II	OSEFX
29	HANORGE NO	HANDELSBANKEN NORGEFOND	OSEFX
30	HONORGE NO	HOLBERG NORGE	OBX
31	NRNORGE NO	KAUPTHING NORGE	OSEFX
32	KLPAKNO NO	KLP AKSJENORGE	OBX
33	LAKNORG NO	LANDKREDITT NORGE	OSEFX
34	LDUTBNO NO	LANDKREDITT UTBYTTE	OSEFX
35	NFAKSJE NO	NB-AKSJEFOND	OSEFX
36	NORAVKA NO	NORDEA AVKASTNING	OBX
37	NORKAP1 NO	NORDEA KAPITAL	OBX
38	NORKAP2 NO	NORDEA KAPITAL II	OSEFX
39	NORKAP3 NO	NORDEA KAPITAL III	OSEFX
40	NORNRPL NO	NORDEA NORGE PLUSS	OSEFX
41	NONORVE NO	NORDEA NORGE VERDI	OSEFX
42	NORVEKS NO	NORDEA VEKST	OBX
43	ODNORGE NO	ODIN NORGE	OSEFX
44	ORFIN30 NO	ORKLA FINANS 30	OSEFX
45	POAKTIV NO	PARETO AKSJE NORGE	OSEFX
46	POAKTNY NO	PARETO AKTIV	OSEFX

47	PRVERDI NO	PARETO VERDI	OSEFX
48	FOPLAKS NO	PLUSS AKSJE FUND	OSEAX
49	SPAKSIN NO	STOREBRAND AKSJE INNLAND	OSEBX
50	SPNORGE NO	STOREBRAND NORGE FUND	OSEFX
51	SPSMBFD NO	STOREBRAND VEKST	OSEBX
52	SPVERDI NO	STOREBRAND VERDI FUND	OSEBX
53	TFNORGE NO	TERRA NORGE	OSEBX

Table 3: Overview of the dropped funds

International funds	Index funds	No returns	No size	Changed name
DNB BARNEFOND	ABN AMRO INDEKS	K-SMB	FIRST GENERATOR	EIKA NORGE
DNB NORDEN IV	AKSJEFOND PLUSS INDEKS	K-VEKST	GLOBUS TVFOND	
EIKA NORDEN	ALFRED BERG INDEKS	NORDEA SMB II	OMEGA INVESTMENT	
SKANDIA AMS FUND	GARNEGIE NORGE INDEKS			
STOREBRAND PENSJONSPAR FUND	DNB NORGE INDEKS			
WARRENWICKLUND NORDEN	KLP AKSJENORGE INDEKS			
	KLP AKSJENORGE INDEKS II			
	WARRENWICKLUND INDEKS+			

Table 4: Funds are sorted into 10 decile by skill ratio in sorting period.

rank by Skill Ratio	Ticker	Decile	Name
45	FOPLAKS NO Equity	1(bottom)	PLUSS AKSJE FUND
44	SPSMBFD NO Equity	1	STOREBRAND VEKST
43	AIAKTIV NO Equity	1	ALFRED BERG AKTIV
42	DFVEKST NO Equity	1	DELPHI VEKST
41	PRVERDI NO Equity	1	PARETO VERDI
40	ALFBHUM NO Equity	2	ALFRED BERG HUMANFOND
39	NFAKSJE NO Equity	2	NB-AKSJEFOND
38	NFPLUSS NO Equity	2	EIKA SMB
37	FOPLIDX NO Equity	2	AKSJEFOND PLUSS MARKEDSVERDI
36	NORVEKS NO Equity	3	NORDEA VEKST
35	ABNORET NO Equity	3	ALFRED BERG NORGE ETISK
34	FFNORGE NO Equity	3	DANSKE INVEST-NORGE I
33	FFNORG2 NO Equity	3	DANSKE INVEST-NORGE II
32	TFNORGE NO Equity	3	TERRA NORGE
31	NONORVE NO Equity	4	NORDEA NORGE VERDI
30	AFAVANS NO Equity	4	DNB NORGE AVANSE I
29	NORKAP1 NO Equity	4	NORDEA KAPITAL
28	AFNOAK2 NO Equity	4	DNB NORGE SELEKTIV III
27	DFNORGE NO Equity	4	DELPHI NORGE FUND
26	FFSMBFD NO Equity	5	DANSKE INVEST-NORGE VEKST
25	NORAVKA NO Equity	5	NORDEA AVKASTNING
24	AFMARKE NO Equity	5	DNB NORGE AVANSE II
23	POAKTNY NO Equity	5	PARETO AKTIV
22	DI20FND NO Equity	5	DNB NORGE SELEKTIV I
21	LAKNORG NO Equity	6	LANDKREDITT NORGE
20	GAMBAKF NO Equity	6	ALFRED BERG GAMBAK
19	DANINII NO Equity	6	Danske Invest Norske Aksjer Institusjon II
18	ODNORGE NO Equity	6	ODIN NORGE
17	HANORGE NO Equity	7	HANDELSBANKEN NORGEFOND
16	AINORG NO Equity	7	ALFRED BERG NORGE
15	SPNORGE NO Equity	7	STOREBRAND NORGE FUND
14	AFGNNOA NO Equity	7	DNB NORGE SELEKTIV II
13	AINORGS NO Equity	8	ALFRED BERG NORGE +
12	POAKTIV NO Equity	8	PARETO AKSJE NORGE
11	CAAKSJE NO Equity	8	CARNEGIE AKSJE NORGE
10	NRNORGE NO Equity	8	KAUPTHING NORGE
9	HONORGE NO Equity	9	HOLBERG NORGE
8	KLPAKNO NO Equity	9	KLP AKSJENORGE
7	DISMB NO Equity	9	DNB SMB
6	DINORGE NO Equity	9	DNB NORGE III
5	FONSPAR NO Equity	10(top)	FONDSFINANS SPAR
4	PVAKSJE NO Equity	10	DNB NORGE
3	DINOIII NO Equity	10	DNB NORGE IV
2	SPVERDI NO Equity	10	STOREBRAND VERDI FUND
1	SPAKSIN NO Equity	10	STOREBRAND AKSJE INNLAND

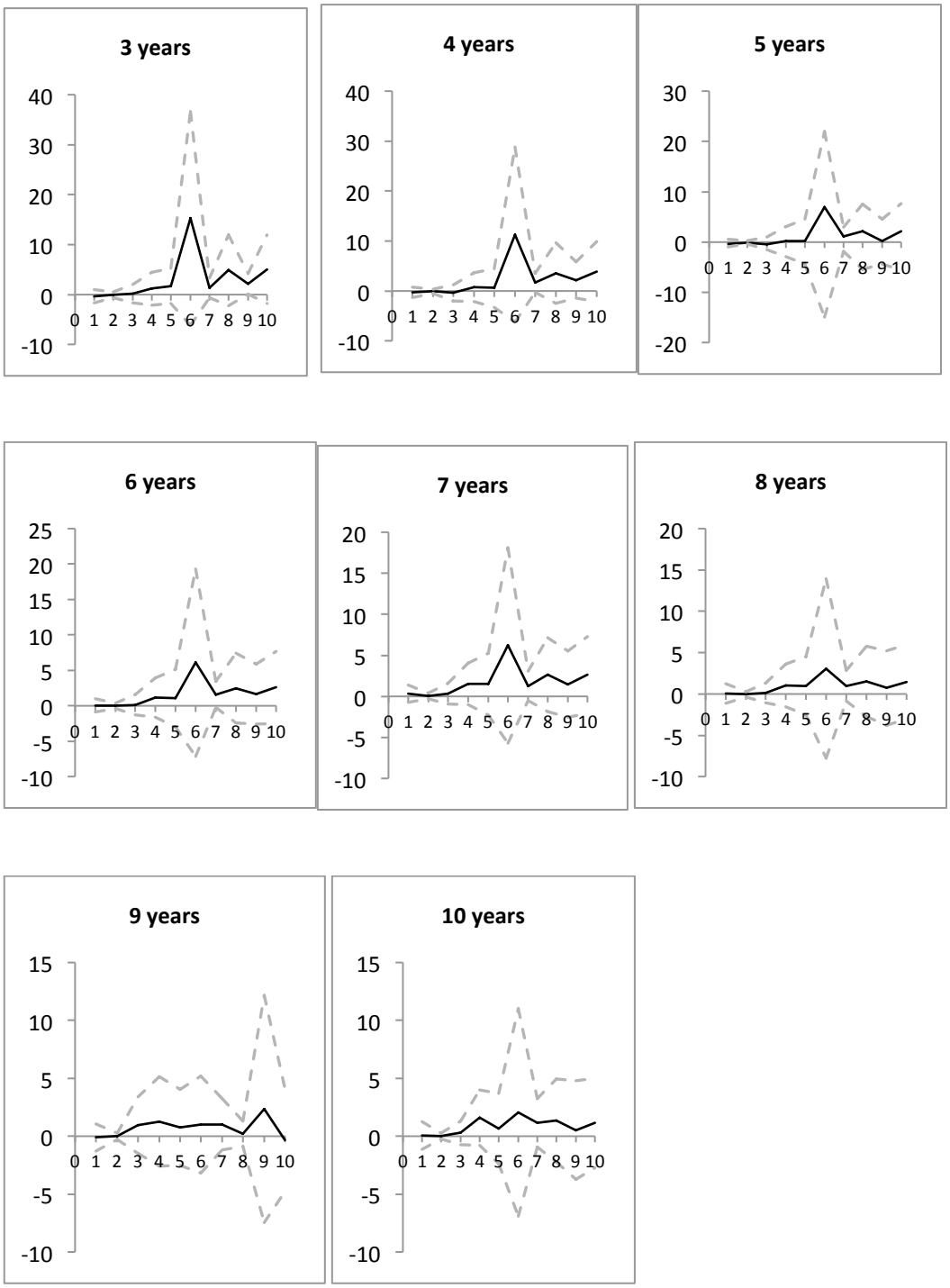


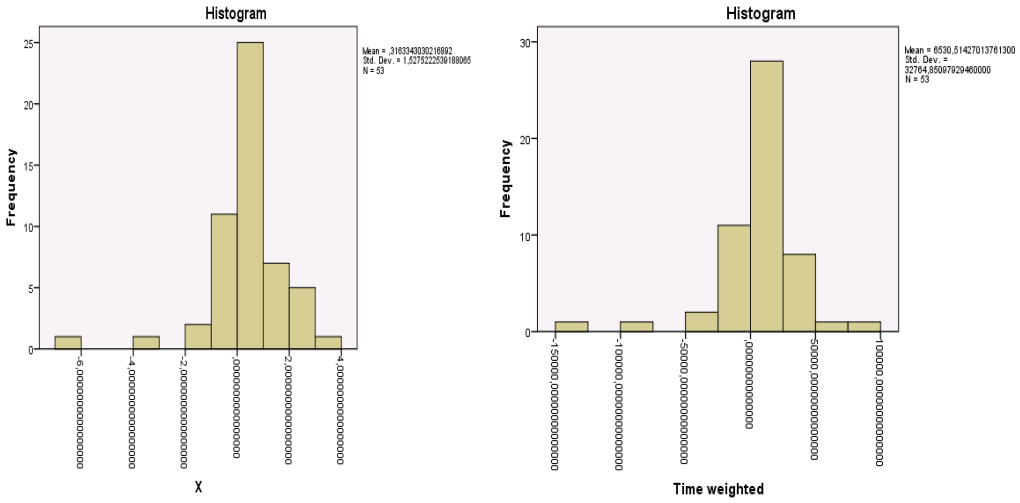
Figure 1: Out of sample Value Added

Each graph shows average out of sample added value, $\hat{S}_i$ (in Y2010 kr million/month), of funds sorted into deciles on the Skill Ratio, over the measurement horizon. The solid line indicates the performance of each decile and the dashed lines indicated the two standard error bounds.

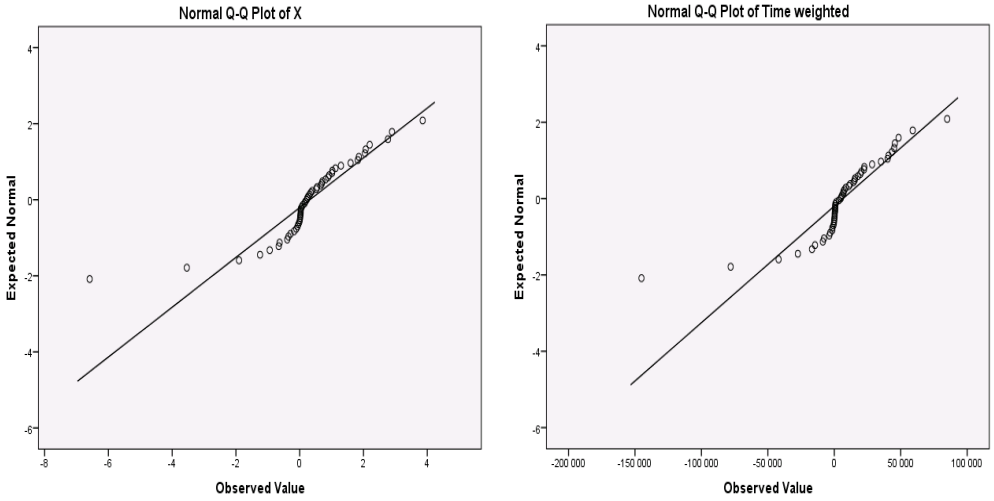
Table 1: Summary of distribution of the average added value ($\hat{S}_i$) and time weighted added value ($\bar{S}_w$).

	$\hat{S}_i$	$\bar{S}_w$
Skewness	-1,688	-1,867
Standard Erro	0,327	0,327
Kurtosis	7,9	8,926
Standard Erro	0,644	0,644
Sharpiro-Wilk	0,000	0,000

Figur 1 : Histogram of the average added value ($\hat{S}_i$) and time weighted added value ($\bar{S}_w$)



Figur 2: Q-Q plot of the average added value ($\hat{S}_i$) and time weighted added value ($\bar{S}_w$).



Figur 3: Boxplot of the average added value ($\hat{S}_i$) and time weighted added value ($\bar{S}_w$).

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