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- Norwegian Mutual Fund Tournament -

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Abstract

We analyze if Norwegian equity funds have a tendency to alter their risk based on their performance relative to competing equity funds, called mutual fund tournament. The incentive for this behavior is that fund managers are competing for investor capital, as an increase in a fund's asset value often yields higher compensation, and investors often chose funds based on their previous performance. Our sample period reaches from 1998 to 2012 and includes monthly returns from 77 Norwegian equity funds. We apply a contingency table approach, as well as a regression approach to examine if funds participate in annual tournaments. Our results show mixed evidence of tournament behavior in the Norwegian equity fund industry. We find signs of tournament behavior from 2006 to 2012, but when testing for robustness in this period, the tests show indistinct results. Overall our analysis shows evidence and tendencies for tournament behavior in the Norwegian equity fund market in some periods, however with the contradictory results we cannot give a definite conclusion about the presence of a Norwegian mutual fund tournament.

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1. Introduction

We analyze if Norwegian equity funds have a tendency to alter their risk based on their performance relative to competing equity funds, called mutual fund tournament[1]. This issue stems from previous studies examining if fund managers actively seek to alter their risk in order to take advantage of the asymmetric mutual fund flow-performance relationship. This asymmetry means high-performing funds tends to receive higher inflow than the outflow under-performers are penalized with. Our research question is:

Do Norwegian equity fund managers make risk adjustments to their investment portfolio according to mid-year performance?

In 1996, Brown, Harlow and Starks (BHS) proved a significant competitive relationship amongst mutual fund managers in the US market, called a "mutual fund tournament". Their findings suggested that funds alter their risk profile during the year depending on their performance relative to competing funds, and implied that under-performers tend to increase fund volatility to a greater extent than well performing funds. After BHS pioneered the research regarding tournament behavior, the phenomenon has been researched frequently both in the US[2] and other markets[3]. Studies on mutual fund tournaments have never been done on the Norwegian market, and this motivates us to explore if there can be found similar tendencies in Norway. This market can be intriguing to focus on, since it is smaller and more volatile than the markets former research has primarily focused on. Because of this and differences such as other rules and regulations in the Norwegian market, countries with similar characteristics might find our results more interconnected than results produced by previous research done on markets such as the US and UK.

[1] We call it a mutual fund tournament, even though our data only contains equity funds. This is in line with previous studies.
[2] Busse, Jeffrey A. 2001. "Another Look at Mutual Fund Tournaments". *Journal of Financial & Quantitative Analysis*, 36 (1): 53-73.
Koski, Jennifer Lynch. Jeffrey Pontiff. 1999. "How are Derivatives Used? Evidence from the Mutual Fund Industry". *The Journal of Finance*. LIV (2): 791-816.
Schwarz, Christopher G. 2012. "Mutual Fund Tournaments: The Sorting Bias and New Evidence". *Review of Financial Studies.* 23 (3): 913-936.
[3] Robjans, Rogèr Otten. 2008. "Tournaments in the UK Mutual Fund Industry". *Managerial Finance,* 34 (11): 786-798.

The basis of a mutual fund tournament is that fund managers compete with each other in order to get new assets. An increase in funds' asset value yields higher compensation to fund managers, as they are often rewarded by a percentage of their fund's asset value (Golec 2003). This creates an incentive for the managers to attract new capital, and might create a principal-agent conflict between managers and investors. Guercio and Tkac (2008) studied this incentive by comparing Morningstar ratings with fund flow. Their findings suggest that mutual fund investors use ratings as a primary input in their decision process. This in turn provides under-performing fund managers with incentives to increase risk in order to improve the probability of ending the year with a higher rating, and hence attract more capital. This relationship between flow and performance is consistent with the tournament described by BHS and has later been proved by several studies such as Chevallier and Ellison (1997), and Kempf and Ruenzi (2008). A study by Sirri and Tufano (1998) also found that investors disproportionately flock to invest in high performing funds, while not to a similar extent flee low performing funds. If managers are compensated based on the fund's inflow, their payment has similarities to a call-option, in the sense that raising risk gives a higher expected return. Additional incentives for managers to risk shift is that good performance equal good personal reputation and employee safety (Hu et al. 2011).

Other studies regarding mutual fund tournaments have found differing results, such as Busse (2001). He found that tournament behavior did not exist in the US mutual fund market when testing with daily returns instead of monthly, as BHS used. He argues the contradicting results come from daily return autocorrelation biasing the monthly volatility estimates. Due to the conflicting results in the US market and the different methodologies used, we find mutual fund tournaments an interesting topic.

To study the tournament effect in the Norwegian market, we use a similar approach as the one used by BHS, as well as parts of the methodology from Busse (2001). We use monthly returns from the Norwegian equity funds gathered from Oslo Exchange. Our sample period reaches from 1998 to 2012 and includes data from 77 Norwegian equity funds. To make our analysis more robust, we separate our sample into 10 subsamples. We divide each year into two periods and compare each fund to see if we can observe any changes in risk characteristics from one period to the next. We initially use volatility of monthly returns as our proxy for risk. To test for tournament behavior we perform a chi-square test. Further we check for robustness by also applying volatility of residuals from a Flexible Least Squares regression, and average coefficients from the same regression. We include these two additional proxies for risk to test if tournament behavior is caused by idiosyncratic risk and/or systematic risk change.

We find evidence of tournament behavior from 2006 to 2012, e.g. when splitting the periods into 5 months and 7 months, we get a p-value of 0,008 when performing a chi-square test with similar methodology as BHS used. But when testing for robustness in this period, the tests show indistinct results. Overall our analysis shows evidence and tendencies for tournament behavior in the Norwegian equity fund market in some periods. However, with the contradicting results from our tests, we cannot give a definite conclusion about the presence of a Norwegian mutual fund tournament.

Our thesis is divided into six sections. Section 2 and 3 includes relevant background material, while section 4-7 contains data, methodology, empirical evidence and conclusion.

2. Institutional Background

The Norwegian mutual fund industry is closely monitored by the Financial Supervisory Authority of Norway (FSA). They inflict the industry with a number of rules and regulations, e.g. in order be classified as an equity fund in Norway, a fund needs to have at least 80 % of its assets invested on the Oslo Stock Exchange (OSE). Norwegian equity funds are also required to have stocks in at least 16 different companies, and no more than 10 % of a fund's assets can be allocated in one stock (Finanstilsynet 2012). This shows that a fund, by law, has an obligation to be somewhat diversified. Unlike the previously studied US market, Norwegian equity funds are not allowed to short sell stocks, which limit their investment opportunities. They are however permitted to use derivatives in their portfolio composition. . The mutual fund industry has been expanding rapidly in the past few years. It has more than tripled in value since 2004, and at the end of Q4 2012 the total value was NOK 557,6 billion, where 49.9 % of this stems from equity funds. 73,4% of the equity funds' assets are owned by Norwegian investors, 51,2 % and 48,8 % by institutional investors and private investors respectively. 26,6 % of the total equity funds value are owned by foreign investors (Verdipapirfondenes Forening 2012).

Mutual funds normally operate with 3 different types of investor fees: Front-end load, back-end load and operating expense. Front-end load is the fee you pay when you buy a stock in a fund, back-end load is the fee you pay when you sell a stock in a fund, and operating expense fee is the management fee and is normally paid as an annual percentage of the assets invested in the fund. As mentioned earlier, management fee is one of the main incentives for managers to maximize the inflow to the fund.

In 2011, Huang, Sialm and Zhang suggested that fund managers have three ways to alter the risk profile of their portfolios. The first option is to change the allocation of assets and cash; the second option is to buy less risky assets/sell risky assets in order to alter systematic risk. Changing the idiosyncratic risk of the portfolio is the last option.

3. Literature review

Brown, Harlow and Starks (1996) (BHS) investigate if the competiveness in mutual fund industry can affect fund managers decisions. They introduce an annual "tournament" between mutual funds, were the managers compete for fresh capital based on their performance relative to each other. This is because most mutual fund managers are evaluated by end-year results, and that mutual fund ranking systems are usually given annually. In recent years this has changed as technology has improved, information and fund ranking are given on a day-to-day basis. However, we believe that the annual tournament could still be present because newspapers and magazines often present whole-year results and rankings. BHS found that funds labeled as mid-year losers tend to increase the risk of their portfolio in the latter part of an annual assessment period to a greater extent than mid-year winners. This implies that the competitive mutual fund environment is effectively changing how fund managers act, and subsequently might change their objectives from a long-term to a short-term perspective. They also found that as investor awareness increased towards fund ranking systems, tournament behavior occurred more frequently. This article works as the foundation of our research.

Kempf and Ruenzi (2008) look at risk-changing behavior inside a mutual fund family rather than between different funds, as BHS did. The intuition behind their research is that fund managers within a family are incentivized by the top management to perform better by direct compensation, and indirect compensation such as advertising and marketing funds. Decisions regarding these three activities are usually done at the end of the year, such that an intra-firm competition arises amongst the fund managers in order to attract the most compensation. Their findings suggest that a mutual fund tournament exists within the family; fund managers do alter their funds risk profile dependent on their mid-year rank. Further, they find evidence that the degree of risk taking is more excessive for larger families than for smaller ones. The smaller families actually behave in an opposite manner, the mid-year winners take on more risk than losers, suggesting cooperation between funds is more present in smaller families. They conclude that such tournament behavior inside a mutual fund family is not optimal from an investor point of view, since the risk adjustments is not done by the means of optimizing portfolio, which causes extra rebalancing costs. The lack of cooperation within the family could also lead to unnecessary agency costs. However, the family effect can be favorable in case of a fire sale; According to Goncalves-Pinto and Schmidt (2013), funds within families coordinate trade in order to avoid the cost of fire sale, which results in a positive net effect for the distressed illiquid fund. The principal-agent conflict mentioned in Kempf and Ruenzi (2008) is studied more in-depth by Chevalier and Ellison in 1997.

Chevalier and Ellison (1997) studied the risk-adjusting behavior of fund managers in the light of principal-agent conflict between them and investors. A mutual fund manager is motivated by maximizing value by increasing cash inflows, while investors are interested in maximizing their risk-adjusted return. Chevalier and Ellison put the flow-performance relationship as an implicit incentive for funds to alter the risk profile of their portfolios. In the first part of their research, they prove that mutual funds' willingness to hold unsystematic risk is dependent on its position relative to the market index at the end of September. Their results suggest that fund managers change the riskiness of their portfolios between September and December, which is consistent with the incentive to alter risk based on the flow-performance relationship. This is further studied by Spiegel and Zhang (2012).

Spiegel and Zhang (2012) studied the relationship between mutual fund flows and past returns. They show that the convex flow-return relation indicated by prior research, i.e. Chevalier and Ellison (1997) and Sirri and Tufano (1998), is erroneous. They state that the empirical models commonly used when researching this topic can yield false convexity estimates, because heterogeneity often occurs. Spiegel and Zhang (2012) instead use a market share alternative specification for their research. With this alternative specification, they conclude that the flow-return relationship seems to be linear, and even has tendencies for an opposite relationship than previous research has indicated. Guercio and Tkac (2008) examine the flow-rating relationship, as an extension of flow-performance relationship.

Guercio and Tkac (2008) investigate the effect of the Morningstar star rating on mutual funds. Morningstar rates funds from 1-5 stars based on their past performance and future estimated results. In their study, they find that an upgrade or downgrade of the rating on a mutual fund has a substantial effect on flow of capital from retail investors. This suggests that the Morningstar's star rating system is the primary input of many mutual fund investors' decisions and has economically significant effect on the funds. Discrepancy between this study and prior studies is that Guercio and Tkac found that investors punish funds that lose its position amongst the top third ranked funds (goes down to 3-star rating). The effect from a rating change can be seen as soon as one month after. This effect shows that funds with 4-star rating might have different incentives according to risk depending on if they are closer to a downgrade or an upgrade.

Huang, Sialm and Zhang (2008) investigate if risk shifting of the fund's portfolio has an impact on the fund's performance. They compare funds that have a stable level of risk with funds who risk shifts. Results reveal a strong relationship between risk shifting and fund performance. Mutual funds that shift risk tend not beat the market, while funds with the most consistent risk levels tend to outperform the market. The study implies that even though risk shifting usually does not enhance performance, it is often implemented for a number of different reasons. One of these reasons is the managers' incentives to take excessive risk in order to possibly increase future fund inflows, which works as the basis for mutual fund tournament.

Busse (2001) reviews the methodology used in BHS, and in addition apply his own methods to test for tournament behavior in the US market. His results were consistent with BHS when using monthly returns. However, Busse also examines the same relationship by using daily returns, and shows that the tournament effect disappears when using daily data. In his analysis he argues that the effect disappears because daily return autocorrelation biases the monthly volatility estimates. The daily data further reveal that the intra-year change in a funds risk is mostly due to changes in the common stock market risk factors. Since daily data provided a more precise estimate of volatility, he questions the reliability of earlier research. While both BHS and Busse base their research using a contingency table approach, Busse also applies a regression methodology as a supplement to his research. He explains that it is not clear when mutual fund managers risk shift according to performance, since ratings and fund flows occur on a daily basis. This creates more complexity when researching tournament behavior. We follow Busse's methodology when testing our hypothesis.

In 2005, Goriaev, Nijman and Werker revisited the findings on mutual fund tournament initially done by Busse (2001). They used both daily and monthly returns, and opposed to Busse (2001), they found that monthly returns are more robust to autocorrelation effects than tests based on daily data. This underpins our data as we use monthly returns in our study. However, they found little empirical evidence of tournament behavior for U.S. equity funds, similar to Busse (2001).

Elton et al. (2010) studied tournament behaviour by using monthly holdings data rather than returns as previously used by BHS and Busse (2001). The holdings data consisted of US equity funds from 1994 to 2005. They examined two different ways to alter the risk profile of a fund's portfolio; change in the percentage of assets invested in cash, and altering the riskiness of their existing assets. They divided the year into two parts, the first 7 months and the last 5. By comparing the percentage invested in cash in both periods, they found that low return funds decreased cash holdings, while high return funds increased cash holdings. However, the change was so small that it had no perceptible impact on risk. In the second test they followed BHS, but used security weighted beta and standard deviation as their risk measures. Their results showed anti-tournament behaviour, completely opposite of BHS; high return funds increased risk while low return funds decreased risk.

There have been several studies on mutual fund tournaments and similar topics in recent years. E.g. Koski and Pontiff (1999) found similar results as BHS (1996), although their study showed that mutual funds that used derivatives for hedging changed their risk profile to a lesser degree. Schwarz (2012) found that the reason for mixed result regarding these tournaments strains from a sorting bias. The article by Hu et al. (2011) and Kempf, Ruenzi and Thiele (2009) shows that employment risk also act as an incentive to engage in tournament behavior.

4. Data

The data used in our thesis is extracted from Oslo Exchange and consists of monthly returns from 77 Norwegian equity funds. Our sample extends from January 1998 to December 2012, a total of 15 years. These funds need to have at least 80 % of their assets invested on the Oslo Stock Exchange to be classified as a Norwegian equity fund. Since our research is based on annual tournaments, we arrange our data year by year. We have chosen to eliminate a fund from a specific annual tournament if it either was initiated or removed during that year. This is done in order to achieve annual tournaments such that funds are ranked within an equal time period (12 months).

Table 1:

Descriptive Statistics

	Number of funds	Median (funds)		Oslo Benchmark Index	
		Return	Std.dev	Return	Std.dev
1998	36	-26,64 %	8,58 %	-25,67 %	8,93 %
1999	42	47,03 %	5,57 %	46,94 %	5,21 %
2000	45	3,38 %	5,20 %	4,67 %	3,78 %
2001	51	-15,17 %	6,75 %	-14,61 %	7,21 %
2002	55	-34,01 %	8,09 %	-30,43 %	7,14 %
2003	59	48,62 %	7,02 %	47,15 %	6,29 %
2004	60	36,70 %	5,54 %	38,30 %	4,86 %
2005	58	43,15 %	5,44 %	40,40 %	5,95 %
2006	58	31,81 %	4,32 %	32,51 %	4,54 %
2007	58	13,13 %	3,70 %	11,46 %	4,81 %
2008	57	-53,46 %	11,96 %	-55,06 %	13,06 %
2009	58	72,35 %	6,18 %	70,10 %	5,66 %
2010	58	21,15 %	6,83 %	17,50 %	7,04 %
2011	64	-18,25 %	5,40 %	-13,07 %	6,00 %
2012	66	16,01 %	4,56 %	15,87 %	3,51 %

Table 1 includes the median return and standard deviation from all active funds in each year over the whole sample 1998 to 2012. The return and standard deviation of Oslo Benchmark index is presented yearly.

Table 1 shows descriptive statistics of our sample and Oslo Benchmark Index (OSEBX). The number of funds has increased during our sample period, and we observe that the sample extends over bull and bear markets. To get a large enough sample each year we have chosen to include all of the available Norwegian equity funds. Some of the funds have a strategy that involves investing a small portion of their assets in foreign or unlisted stocks.

The funds in our sample are classified by size and type based on Morningstar Style Box (Morningstar 2013) showed in table 2:

Value	51	Large	18
Growth	2	Medium	42
Mix	13	Small	6
Sum	66	Sum	66

Table 2 shows how Morningstar classify the 77 funds of our sample. They are classified on whether they are Value, Growth or Mix funds, as well as their size. 11 funds are not included in the table above because Morningstar provides no information about them.

In Appendix 1 we have graphed the cumulative average fund return and Oslo Børs Benchmark from 1998 to 2012. In the graph we see that the fund returns are highly correlated with OSEBX.

For our single-factor and Carhart 4-factor model used in our methodology section, we have used Oslo Stock Exchange Benchmark Index as a proxy for the Norwegian stock market (Datastream). The rest of the factors, including the risk free rate (1 month NIBOR), were downloaded from Bernt Arne Ødegaard's webpage.

5. Methodology

The methodology consists of three different approaches testing our research question. Our main goal is to assess whether funds, relative to competing funds, alter risk in the latter part of the annual assessment period.

5.1 Annual splits

Throughout our research we divide the annual tournament into different annual splits. We have chosen to separate in the following way (M=4-8): 4/8, 5/7, 6/6, 7/5 and 8/4. E.g. 4/8 split meaning the first period contains the first 4 months (January-April), and the second is the last 8 months (May-December). Financial information and ratings regarding funds are available on a daily basis, so we might find that managers risk shift early or late in the annual tournament. By adding multiple separations of the year, we will be able to detect which month managers tend to change their risk according to their relative performance.

5.2 The BHS approach

First, we will allocate equity funds based on performance. This is done by calculating the cumulative return of each fund after M-months for each of the 15 annual samples.

We calculate the first period cumulative return (RTN) as follows:

(1) $$\mathrm{RTN_{jy}} = \left[\left(1 + \mathrm{r_{j1y}}\right) \times \left(1 + \mathrm{r_{j2y}}\right) \times \ldots.. \times \left(1 + \mathrm{r_{jMy}}\right)\right] - 1$$

Where r_j is the j'th fund return, y is the tournament year and 1-12 are the months of the year, January(1) to December(12). We will then annually rank the RTN of each fund from highest to lowest, and separate them into two groups, first period winners and losers. Winners are classified as the funds that are above the first period median RTN value, and losers are classified as funds that are below. If a fund is the median in a specific annual tournament, we delete it from that tournament, since they cannot be classified as a winner or a loser. In total we deleted 5 median funds. We also examine if being an “extreme” winner or loser yields different results, where we classify winners and losers if they are over third quartile RTN value or under first quartile RTN value respectively. After classifying winners and losers, we will calculate the risk adjusted ratio (RAR). This is a measure of the ratio between the volatility of returns before and after the cutoff mark (M). RAR is calculated by taking the standard deviation of the second period's monthly returns (M+1 to 12) and divide it by the standard deviation of the first period's monthly returns (1 to M).

(2) $$\mathrm{RAR}_{\mathrm{jy}} = \sqrt{\left(\frac{\sum_{\mathrm{m=M+1}}^{12}(\mathrm{r}_{\mathrm{jmy}}-\bar{\mathrm{r}}_{\mathrm{j2py}})^2}{(12-\mathrm{M})-1}\right)} \div \sqrt{\left(\frac{\sum_{\mathrm{m=1}}^{\mathrm{M}}(\mathrm{r}_{\mathrm{jMy}}-\bar{\mathrm{r}}_{\mathrm{j1py}})^2}{\mathrm{M}-1}\right)}$$

Where 1p and 2p is first and second period respectively. RAR shows if the returns of a fund is more volatile after the M-month cutoff (>1) or less volatile (<1), and is an indication of whether the manager of the fund makes risk adjustments to his portfolio from the first to the second period of the year. We will separate the RAR values into two groups, "high risk shift" and "low risk shift", they are allocated based on if the fund is above or below the median RAR value respectively. Now we have winners/losers and high/low risk shift for each fund over the course of 15 years. To test our research question we create a (RTN, RAR) pair for every fund, each year and split these pairs into four cells: (winner/high risk shift), (loser/high risk shift), (winner/low risk shift) and (loser/low risk shift).

Our null hypothesis:

(3) $$\frac{\sigma_{2pL}}{\sigma_{1pL}} = \frac{\sigma_{2pW}}{\sigma_{1pW}} \rightarrow \mathrm{RAR}_{\mathrm{Losers}} = \mathrm{RAR}_{\mathrm{Winners}}$$

Our alternative hypothesis:

(4) $$\frac{\sigma_{2pL}}{\sigma_{1pL}} > \frac{\sigma_{2pW}}{\sigma_{1pW}} \rightarrow \mathrm{RAR}_{\mathrm{Losers}} > \mathrm{RAR}_{\mathrm{Winners}}$$

Where L is loser and W is winner. As in BHS we form a 2x2 contingency table that contain all the funds for a specific year. To test our null hypothesis, we perform a chi-square test comparing the predicted table with the actual cell frequency table and see if they are significantly different. The predicted allocation of funds in our contingency table is 25 % in each cell. It is important to note that although we find a significant difference with the chi-square test, tournament behavior is only present if the cells (loser/higher risk shift) and (winner/lower risk shift) has significantly higher cell frequencies than the other two cells. If the cell frequencies would come out significant in the opposite direction than our alternative hypothesis we define it as anti-tournament. This is a type of tournament as well, just in a different manner than we expect.

5.3 Testing for systematic and idiosyncratic risk change

In the BHS approach we used RAR as a proxy for risk; in this section we will explain how we perform a similar test with two different proxies for risk. We have one proxy for systematic risk, and one for idiosyncratic risk. Testing using idiosyncratic risk will be interesting to look at because we eliminate any risk shifting that is caused by general market factors. This will act as an approximation of the risk the mutual fund managers can control. If tournament behavior is present, testing using systematic risk could show if market factors is the cause for such behavior.

For idiosyncratic risk we will use standard deviation of residuals from a 4-factor regression, and for systematic risk we will use coefficients from the same regression. To extract residuals and coefficients we have chosen to use a method called Flexible Least Squares[4] (FLS). Unlike the standard OLS method, FLS assumes time varying coefficients and provide us with different coefficients each month. Berzins, Liu and Trzcinka (2013 Journal of Financial Economics (JFE), forthcoming) states that there are several studies showing how mutual fund coefficients vary over time. We apply FLS on a Carhart 4-factor model shown in equation 5. In the regressions we use monthly fund return, Oslo Børs Benchmark Index (OSEBX), 1m NIBOR as risk free rate, SMB, HML and PR1YR (momentum). The market return factor is OSEBX risk premium. The model includes a lagged variable of each factor to control for non-synchronous trading problems, which is autocorrelation caused by infrequently traded stocks. These stocks have downward biased estimates. (Dimson, 1979). Both Busse (2001) and Dimson (1979) included this lagged variable in their regression with monthly data.

[4] FLS is a regression approach developed by Kalaba and Tesfatsion (1989) and further developed by Lutkepohl and Herwartz in 1996.

Carhart 4-factor model:

(5) $$R_{jt} - R_{ft} = \propto_j + \sum_{q=1}^{4}(\beta_{jt}R_{qt} + L\beta_{jt-1}R_{qt-1}) + \varepsilon_{jt}$$

Where R_f is the risk free rate, q depicts the four different factors and t is the month.

When performing FLS regression we obtain one coefficient per observation. In this way we are able to average coefficient and calculate the standard deviation of residuals over our different annual splits; M=4-8.

The risk shifts are calculated in line with Busse (2001):

(6) $$Idiosyncratic\ risk = \frac{\sigma(\epsilon_{p2})}{\sigma(\epsilon_{p1})}$$

Idiosyncratic risk is measured as the standard deviation of residuals from period 2 divided by the standard deviation of residuals from period 1.

(7) $$Systematic\ risk = \frac{(\bar{\beta}_{pj2} + L\bar{\beta}_{pj2})}{(\bar{\beta}_{pj1} + L\bar{\beta}_{pj1})}$$

$(\bar{\beta}_{pj2} + L\bar{\beta}_{pj2})$ is the sum of the average coefficient and the average lagged coefficient of a given factor from period 2. The denominator is the equivalent from period 1.

Equation 6 and 7 are then used in the BHS approach as the variable RAR from equation 2 to assign if winners and losers are high or low risk-shifters. The new classifications are put in the contingency tables to test our null hypotheses stated in equation 3.

5.4 Regression

In order to widen the scope of our tests, and as a method to check for robustness, we also test for tournament behavior by a regression methodology as performed by Busse (2001). To test the relationship between fund performance and subsequent risk shift we initially run the following FLS regression to extract coefficients and residuals:

(8) $$R_{jt} - R_{ft} = \alpha_{jt} + \beta_{jt}(R_{mt} - R_{ft}) + \epsilon_{jt}$$

Where R_{mt} is the market return from OSEBX.

We create three proxies for risk in period 1 and 2:

(9) $\sigma(R_{jpy})$ – *Standard deviation of monthly return*

(10) $\sigma(\epsilon_{jpy})$ – *Standard deviation of residuals*

(11) $\overline{\beta_{Jpy}}$ − *Average coefficient*

p depicts period 1 and 2, y is year and j is fund.

With the aim to check if fund performance in period 1 affects risk change, these measures are then used in the following cross-sectional OLS regression.

(12) $$Risk_{jy2} - Risk_{jy1} = \alpha + \gamma Perf_{jy1} + \quad Risk_{jy1} + \epsilon_{jy}$$

The dependent variable is calculated by taking period 2 risk minus period 1 risk, using the measures above. The variable perf is the return in period 1, calculated by taking the fund return minus the month's average return across all funds. In total we perform 9 regressions, 3 proxies for risk for 3 annual splits, each year.

By doing the regression we want to find if the variable perf (γ) has a significant negative effect on risk shift, which would be a sign of tournament behavior.

6. Empirical evidence

In this chapter we will present the findings of our research in four different sections. We define our result as significant if it is under the 5 % significance level.

6.1 The BHS approach

In this section we follow the BHS approach as outlined in the methodology. We classify funds as winners/losers based on monthly returns, and high/low risk-shifters on RAR. We then put them into 2x2 contingency tables to test our hypothesis.

Table 3 shows the contingency tables of each of the chosen annual splits (M=4 to M=8) over the whole sample. This contains the sum of each cell from each of the 15 annual tournaments. The P-value shows the statistical significance of how the cell frequencies differ from the predicted cell frequencies in a chi-square test. It should be kept in mind that even if we get a significant p-value, it can still be that the result significantly shows anti-tournament behaviour i.e. losers with low risk shift is more frequent than losers with high risk shift. The table shows the results for both median and quartile separation.

Table 3:

	Observations	Loser		Winner		
		Low RAR	High RAR	Low RAR	High RAR	P-value
MEDIAN						
(4,8)	820	184	226	226	184	0,003***
(5,7)	820	195	215	215	195	0,162
(6,6)	820	205	205	205	205	1,000
(7,5)	820	214	196	196	214	0,209
(8,4)	820	202	208	208	202	0,675
QUARTILES						
(4,8)	420	88	122	122	88	0,001***
(5,7)	420	94	116	116	94	0,032**
(6,6)	420	97	113	113	97	0,118
(7,5)	420	111	99	99	111	0,242
(8,4)	420	106	104	104	106	0,845

Table 3: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. The table shows the frequency of funds in each cell of the contingency table in all the

annual splits (in parentheses). An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. The sample period is from 1998 to 2012 and includes 77 funds. Under “Median”, winners and losers are classified table as being above or below the median fund return respectively. Under “Quartiles”, winners and losers are classified in this table as being above the third quartile fund return or below the first quartile fund return respectively. RAR is the risk-adjusted ratio, where the standard deviation of returns in period 2 is divided by the standard deviation in period 1. Low RAR and High RAR are classified as being below or above median risk shift.

Our results reveal that the annual split 4/8 yields the most diverging observations, both in median and quartiles winners/losers. These results indicate that tournament behaviour is present when setting the cut-off point at April. Further, we observe that the annual split 5/7 gives significant results when separating by quartiles. Interestingly, we find some signs of anti-tournament behaviour, although none of them provides significant p-values. The table generally does not show a strong indication of tournament behaviour. In order to examine if the behaviour is only present in some time periods and as a means for robustness testing, we have chosen to divide our full sample of 15 annual tournaments into several temporal sample partitions. We divide the full sample into the 10 subsamples as shown in table 4.

When dividing into subsamples we sum the cell frequencies of the annual tournaments in that subsample. Table 4 is a continuation of table 3 and shows the p-values from the chi-square test of the 10 subsamples from the annual split of 8/4, 7/5 and 6/6, where winners and losers are classified by median. The r and w explains whether the results from the cell frequencies are consistent with the tournament behaviour (r) or the cell frequencies show anti-tournament behaviour (w). We have chosen not to go further with the annual split of 7/5 and 8/4 since the results in table 3, as well as further research, show no interesting results. They will however still be included in the Appendices. The same goes for the results when separating by quartiles. We included this separation to see if being an “extreme” winner or loser would affect the result. Throughout the tests we found slightly different results, although none of significant importance. Thus, the quartile results are from now on presented in Appendix 3, 5 and 7.

Table 4:

	(4,8)	(5,7)	(6,6)
		Whole sample	
98-12	0,003 r***	0,162 r	1
		7 and 8 year periods	
98-05	0,195 r	0,485 w	0,195 w
06-12	0,005 r***	0,008 r***	0,203 r
		5 year periods	
98-02	0,084 r	0,894 r	0,506 w
03-07	1,000	0,160 w	0,010 w**
08-12	0,001 r***	0,000 r***	0,008 r***
		3 year periods	
98-00	0,205 r	0,365 w	0,046 w**
01-03	0,157 r	0,084 r*	0,008 r***
04-06	0,546 r	0,132 w	0,003 w***
07-09	0,127 r	0,127 r	0,127 w
10-12	0,080 r*	0,041 r**	0,000 r***

Table 4: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. The table shows the p-values from the chi-square tests from the contingency tables used in the BHS approach. Three annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. Winners and losers are classified in this table as being above or below the median fund return respectively. The complete table can be found in Appendix 2.

Table 4 shows that the annual split 4/8 has an economic tendency for tournament behaviour, even though only two of the periods have a significant result under the 5 % level. The second half of the sample (06-12) has significant results in the annual splits 4/8 and 5/7. The annual splits 5/7 and 6/6 shows mixed results, where some of the periods have results leaning towards anti-tournament behaviour. The most interesting results we get from this table is that the subsamples 01-03, 06-12, 08-12 and 10-12 has significant results or at least a tendency for tournament behaviour in all the three annual splits. There is an indication that the month managers risk shift is closer to April. This is seen as there are no anti-tournament results in the annual split of 4/8, while the annual splits 5/7 and 6/6 have some subsamples that produce anti-tournament results. To see if tournament behaviour is only present in some market situations, we compare our results with market returns presented in table 1. Our comparison showed no clear relationship of tournament behaviour only being present in bull or bear markets.

The results from table 4 show signs of tournament behaviour, however in some periods we see no significant results and even anti-tournament behaviour. We will further test with using standard deviation of residuals instead of monthly returns in order to capture idiosyncratic risk shifting.

6.2 Idiosyncratic risk

By using idiosyncratic risk, we eliminate any risk shifting caused by general market factors. This will act as an approximation of the risk the fund managers can control.

Table 5 has the same setup as table 4, except that the classification of high risk shift and low risk shift is defined by the standard deviation of the residuals instead of monthly returns. These residuals are extracted from a Carhart 4-factor FLS regression as outlined in equation 5.

Table 5:

	(4,8)	(5,7)	(6,6)
		Whole sample	
98-12	0,402 r	0,018 r**	0,005 r***
		7 and 8 year periods	
98-05	0,765 w	0,485 r	0,369 r
06-12	0,142 r	0,008 r***	0,002 r***
		5 year periods	
98-02	0,894 w	0,352 r	0,352 r
03-07	0,815 r	0,349 r	0,349 r
08-12	0,206 r	0,029 r**	0,004 r***
		3 year periods	
98-00	0,856 r	0,103 r	0,103 r
01-03	0,432 r	0,432 r	0,637 r
04-06	0,132 w	0,366 w	0,763 r
07-09	0,015 r**	0,015 r**	0,360 r
10-12	1,000	0,145 r	0,004 r***

Table 5: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour

respectively. The table shows the p-values from the chi-square tests from the contingency tables used in the BHS approach. . Three annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. Winners and losers are classified in this table as being above or below the median fund return respectively. The complete table can be found in Appendix 4.

The most notable result in table 5 is that both the 5/7 and the 6/6 annual split for the whole sample shows significant results for tournament behaviour. There is also no significant result showing anti-tournament behaviour in any of the subsamples.

One peculiar result when using residual approach rather than BHS approach, is that the annual split 4/8 now has some tendencies for anti-tournament behaviour, even though not significant. Contradictory to this, every subsample of the annual split 5/7 and 6/6 indicate tournament behaviour, except one subsample in 5/7. Thus, this table indicates that managers risk shift based on performance closer to the month of July, instead of closer to April as indicated in tables 3 and 4

There are some contradicting results in table 4 and 5, and this might be because systematic risk affects the results in table 4. We will therefore check for robustness by testing if systematic risk causes the tournament behaviour results.

6.3 Systematic risk

We test with systematic risk by using the average beta over the first and second period each year as a proxy for risk as explained in the methodology. We extract the betas from the regression in equation 5. The statistical explanatory power of the factors SMB, HML and momentum is low, and we will therefore not go further with them. The OSEBX risk premium coefficient has some statistical explanatory power. However, it only has significant results from the chi-square test in one subsample in one annual split, 6/6 and 07-09, seen in Appendix 6. This means that within this subsample and annual split, any proven tournament behaviour could be explained by this market factor. However, when testing the same subsample and annual split in the BHS approach, we saw no significant tournament behaviour, such that the result from this robustness test is inconsequential.

So far our tests have produced mixed results, and to supplement our findings with an additional robustness test, we have chosen to do a single factor regression.

6.4 Regression

We perform the regression from equation 12, to see how much the first period risk and performance affect risk shift. As in our tests above, we have used three different proxies for risk, standard deviation of monthly returns, standards deviation of residuals, and average beta. Risk from period 1 is included to ensure that the model is not biased by omitting a relevant variable. When interpreting the regression results we focus on the performance coefficient, since this coefficient provides the economic explanation for tournament behaviour.

Table 6:

	CONSTANT	**PERF1**	**RISK1**
		Residual	
(4,8)	0,013***	-0,017**	-0,733***
	(8,267)	*(-2,195)*	*(-12,708)*
(5,7)	0,012***	-0,022**	-0,616***
	(6,316)	*(-2,426)*	*(-8,003)*
(6,6)	0,012***	-0,019**	-0,555***
	(4,984)	*(-2,017)*	*(-6,022)*
		Beta	
(4,8)	0,017**	-0,011	-0,021***
	(2,243)	*(-0,874)*	*(-3,08)*
(5,7)	0,016**	-0,009	-0,021***
	(2,198)	*(-0,667)*	*(-3,04)*
(6,6)	0,016**	-0,011	-0,02***
	(2,141)	(-0,879)	(-2,97)
		Standard deviation of returns	
(4,8)	0,05***	-0,019	-0,79***
	(8,871)	*(-1,441)*	*(-11,111)*
(5,7)	0,036***	-0,016	-0,574***
	(6,344)	*(-0,931)*	*(-6,108)*
(6,6)	0,036***	-0,013	-0,543***
	(5,133)	*(-0,497)*	*(-5,505)*

Table 6: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. The table represents the output from the regression in equation 12 where we perform a single factor regression. It contains three annual splits (in parentheses) for each of the three proxies for risk. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012. T-statistics are presented in the parenthesis under the coefficients. Perf1 is the first period fund performance, and Risk1 is the first period fund risk.

Table 6 shows the regression output. The variable risk1 shows significant coefficients for all risk measures, all negative. This is expected, because with higher risk in period 1, there is less possibility for a high risk shift. We observe that performance from period 1 does not have any significant effect on risk shift when using average beta or standard deviation of returns as proxies for risk. However, when applying standard deviation of residuals as the proxy for risk, we get reasonable results. Perf1 is significantly negative in all three periods, which implies that higher performance gives lower risk shift from period 1 to period 2. The results are in line with tournament behaviour and are consistent with the full sample results in table 5, where we use the contingency table and residual risk. It should be noted that the Perf1 variable show little effect on risk shift, as the coefficients are low.

6.5 Discussion

In the BHS approach we saw significant results in the whole sample with the annual split 4/8, and no significant results in the other samples. BHS and Busse found most significant results when using the 7/5 annual split. While they argue that managers alter their risk following the release of the second quarter report, our results from the BHS approach indicates that risk shifting occurs the month after the first quartile numbers are released (May).

When splitting the whole sample into two subsamples in the BHS approach, the results reveal that the period 06-12 shows the most indication of tournament behaviour in the annual splits 4/8 and 5/7. The result in subsample 08-12 is probably the main reason for this, where every annual split show significant chi-square statistics, 0,001, 0,000 and 0,008 for 4/8, 5/7 and 6/6 respectively. The story retells itself in the residual testing; the only difference is that annual split 4/8 is not significant. The test indicates that idiosyncratic risk shifting is the cause for the tournament behaviour results. This is augmented by testing using systematic risk, where we find no significant results. One interesting results is that in the first half of the sample, 98-05, there are no significant results in the BHS approach or residual approach. The results in the second half of the sample suggest that the market has changed into a more competitive environment. A possible explanation to the strong result in 08-12 might be the impact of the recent financial crisis and its aftermath. Investors were possibly more risk averse, and chose their investments more carefully during this period. This could have caused more intense tournament behaviour between the funds. Such behaviour represents a principal-agent conflict between fund managers and investors. Combining this notion with our results from 08-12 could be an indication of fund managers acting more on their own behalf when the competitive environment intensifies. In addition, technology has improved substantially during our sample period, making it much easier for private investors to gain knowledge about equity funds, performance and ratings. This could also be a reason for increased tournament behaviour. However, we have not studied these topics in depth, but we suggest it for further research.

In our regression approach, standard deviation of residuals is the only risk measurement that shows significant results for the performance coefficient. This reinforces our findings from the previous tests. The performance coefficient is significant in every annual split, but they are quite small, so the amount of impact they have to risk shifting can be discussed.

7. Conclusion

We analyze if Norwegian equity funds have a tendency to alter their risk based on their performance relative to competing equity funds, called mutual fund tournament. This issue stems from the previous studies that fund managers actively seek to increase risk in order to achieve higher returns, such that they take advantage of the asymmetric mutual fund flow-performance relationship. Mutual fund tournaments produce a principal-agent conflict, in the way that mutual fund managers try to maximize raw returns, while their customers desires to maximize risk-adjusted returns. Our sample period reaches from 1998 to 2012 and includes data from 77 Norwegian equity funds.

When performing our tests, we divide the year into two periods and compare them to see if we could observe any changes in risk characteristics from one period to the next. We classify each fund, each year by their performance in the first period and risk shifting behaviour relative to other funds in the same market. Further, we place them by their characteristics and test, by using a chi-square test, whether poor performing funds tend to increase their risk more than well performing funds.

Our results show mixed findings considering tournament behavior in the Norwegian equity fund industry. Results from the first half of the sample period (98-05) show no significant results in either of the tests, while the second half (06-12), shows some significant results. E.g. when splitting the periods into 5 months and 7 months, we get a p-value of 0,008 when performing a chi-square test on the BHS approach. By testing with idiosyncratic risk, eliminating any risk shifting caused by general market factors, the results also show indication of tournament behavior in the 06-12 subsample. Although we find significant results in this subsample, we are careful to give a definite conclusion about tournament behavior in the Norwegian equity fund market. When checking for robustness in the 06-12 sample by separating it into smaller subsamples, we observe contradicting results. E.g. 07-09 show no significant tournament behavior in the BHS approach, and 10-12 shows only weak signs of tournament behavior when using idiosyncratic risk.

To give a more definite conclusion about tournament behavior in the Norwegian equity fund market, more research is needed. One possibility is to increase sample size by adding funds that invest abroad and/or include other types of funds. This may give a clearer answer regarding tournament behavior in the equity fund market.

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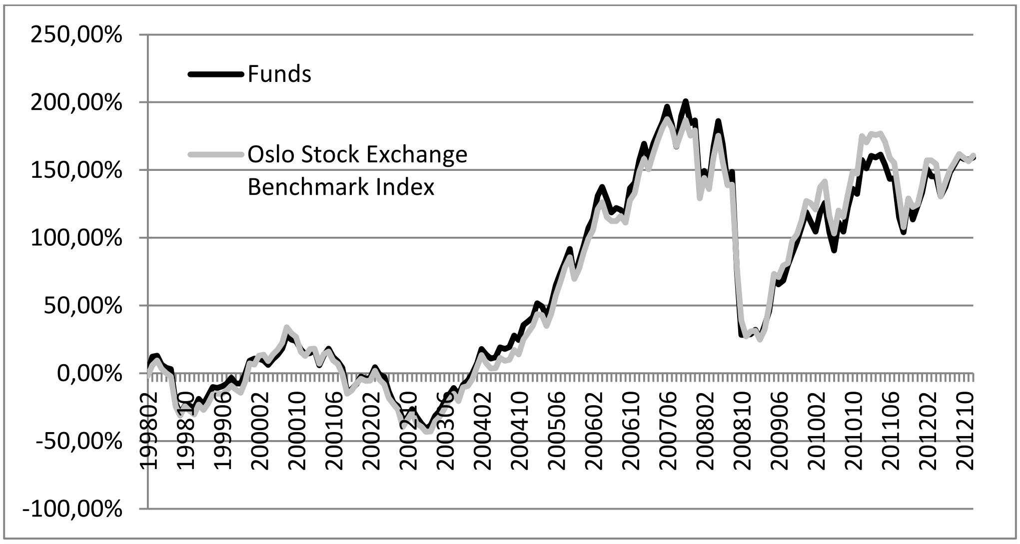
9. Appendices

Appendix 1



Appendix 1: The graph represents the median fund cumulative return from 77 funds, as well as the cumulative return of Oslo Stock Exchange Benchmark Index from 1998 to 2012.

Appendix 2

Median - P-values - BHS

	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Whole sample		
98-12	0,003 r***	0,162 r	1	0,209 w	0,675 r
			7 and 8 year periods		
98-05	0,195 r	0,485 w	0,195 w	0,058 w*	0,090 w*
06-12	0,005 r***	0,008 r***	0,203 r	0,922 r	0,024 r**
			5 year periods		
98-02	0,084 r	0,894 r	0,506 w	0,506 w	0,506 w
03-07	1,000	0,160 w	0,010 w**	0,002 w***	0,160 w
08-12	0,001 r***	0,000 r***	0,008 r***	0,135 r	0,008 r***
			3 year periods		
98-00	0,205 r	0,365 w	0,046 w**	0,046 w**	0,103 w
01-03	0,157 r	0,084 r*	0,008 r***	0,041 r**	0,157 r
04-06	0,546 r	0,132 w	0,003 w***	0,000 w***	0,007 w***
07-09	0,127 r	0,127 r	0,127 w	0,542 w	0,067 r*
10-12	0,080 r*	0,041 r**	0,000 r***	0,145 r	0,080 r*

Appendix 2: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. The table shows the p-values from the chi-square tests from the contingency tables used in the BHS approach. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012,

and is divided into 10 subsamples. Winners and losers are classified in this table as being above or below the median fund return respectively.

Appendix 3

Quartile - P-values - BHS

	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Whole sample		
98-12	0,001 r***	0,032 r**	0,118 r	0,242 w	0,845 w
			7 and 8 year periods		
98-05	0,889 r	0,210 r	0,210 w	0,486 w	0,070 w*
06-12	0,000 r***	0,000 r***	0,001 r***	0,339 w	0,133 r
			5 year periods		
98-02	0,710 r	1,000	0,458 w	0,710 r	0,458 w
03-07	0,870 r	0,253 w	0,253 w	0,002 w***	0,034 w**
08-12	0,000 r***	0,000 r***	0,000 r***	0,420 r	0,016 r**
			3 year periods		
98-00	0,446 r	0,799 r	0,204 w	0,799 w	0,446 w
01-03	1,000	1,000	0,029 r**	0,081 r*	0,383 r
04-06	0,527	0,292 w	0,020 w**	0,002 w***	0,000 w***
07-09	0,000 r***	0,001 r***	0,088 r	0,394 w	0,670 w
10-12	0,041 r**	0,041 r**	0,004 r***	1,000	0,001 r***

Appendix 3: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. The table shows the p-values from the chi-square tests from the contingency tables used in the BHS approach. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. Winners and losers are classified in this table as being above the third quartile fund return or below the first quartile fund return respectively.

Appendix 4

	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Median - P-values - Residuals		
			Whole sample		
98-12	0,402 r	0,018 r**	0,005 r***	0,003 r***	0,675 r
			7 and 8 year periods		
98-05	0,765 w	0,485 r	0,369 r	0,485 r	0,765 w
06-12	0,142 r	0,008 r***	0,002 r***	0,001 r***	0,379 r
			5 year periods		
98-02	0,894 w	0,352 r	0,352 r	0,506 r	0,690 w
03-07	0,815 r	0,349 r	0,349 r	0,061 r*	0,483 w
08-12	0,206 r	0,029 r**	0,004 r***	0,016 r**	0,084 r*
			3 year periods		
98-00	0,856 r	0,103 r	0,103 r	0,205 r	0,205 r
01-03	0,432 r	0,432 r	0,637 r	0,157 r	0,875 w
04-06	0,132 w	0,366 w	0,763 r	0,366 w	0,035 w**
07-09	0,015 r**	0,015 r**	0,360 r	0,067 r*	1,000
10-12	1,000	0,145 r	0,004 r***	0,004 r***	0,041 r**

Appendix 4: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. The table shows the p-values from the chi-square tests from the contingency tables when using residuals as a proxy for idiosyncratic risk. The residuals are produced in a regression from equation 5. Winners and losers are classified in this table as being above or below the median fund return respectively.

Appendix 5

Quartile - P-values - Residuals

	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Whole sample		
98-12	0,079 r*	0,006 r**	0,000 r***	0,032 r**	0,696 r
			7 and 8 year periods		
98-05	0,889 r	0,486 r	0,037 r	0,889 r	0,889 r
06-12	0,020 r**	0,002 r***	0,001 r***	0,004 r***	0,682 r
			5 year periods		
98-02	0,710 r	0,458 r	0,063 r	1,000	1,000
03-07	0,414 r	0,072 r*	0,014 r**	0,142 r	0,870 r
08-12	0,076 r*	0,036 r**	0,016 r**	0,036 r**	0,629 r
			3 year periods		
98-00	0,799 r	0,799 r	0,204 r	0,204 r	0,204 r
01-03	0,029 r**	0,029 r**	0,009 r***	0,383 r	0,663 r
04-06	0,140 w	0,527 w	0,527 r	0,140 w	0,058 w*
07-09	0,001 r***	0,001 r***	0,011 r**	0,088 r*	0,670 r
10-12	1,000	0,414 r	0,102 r	0,014 r**	0,414 r

Appendix 5: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. The table shows the p-values from the chi-square tests from the contingency tables when using residuals as a proxy for idiosyncratic risk. The residuals are produced in a regression from equation 5. Winners and losers are classified in this table as being above the third quartile fund return or below the first quartile fund return respectively.

Appendix 6

	Median - P-values - OSEBX Coefficient				
	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Whole sample		
98-12	0,264 r	0,264 r	0,889 w	0,780 w	0,264 r
			7 and 8 year periods		
98-05	0,618 r	0,369 r	0,369 r	0,765 w	0,765 w
06-12	0,282 r	0,493 r	0,282 w	0,922 w	0,063 r*
			5 year periods		
98-02	0,506 r	0,231 r	0,143 r	0,894 w	0,894 r
03-07	0,640 r	0,815 r	0,640 w	0,483 w	0,815 r
08-12	0,420 r	0,565 r	0,300 w	0,730 r	0,135 r
			3 year periods		
98-00	0,856 w	0,587 r	0,365 r	0,587 r	0,856 w
01-03	0,875 w	0,875 w	0,637 w	0,271 w	0,432 w
04-06	0,132 r	0,070 r*	0,366 r	0,763 r	0,228 r
07-09	0,127 r	0,360 r	0,015 w**	0,360 w	0,127 r
10-12	0,770 w	0,560 w	0,381 r	0,560 r	0,560 r

Appendix 6: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. The table shows the p-values from the chi-square tests from the contingency tables when using betas as a proxy for systematic risk. The betas are produced in a regression from equation 5. Winners and losers are classified in this table as being above or below the median fund return respectively.

Appendix 7

Quartile - P-values - OSEBX Coefficient

	(4,8)	(5,7)	(6,6)	(7,5)	(8,4)
			Whole sample		
98-12	0,435 r	0,696 r	0,032 w**	0,696 r	0,435 r
			7 and 8 year periods		
98-05	0,889 w	0,889 w	0,329 w	0,676 r	0,889 w
06-12	0,219 r	0,494 r	0,040 w**	0,891 r	0,219 r
			5 year periods		
98-02	0,458 r	0,137 r	1,000	0,265 r	0,710 r
03-07	0,624 r	0,142 w	0,034 w**	0,253 w	0,624 w
08-12	0,259 r	0,420 r	0,147 w	0,420 r	0,147 r
			3 year periods		
98-00	0,446 r	0,204 r	0,204 r	0,204 r	0,446 r
01-03	0,383 w	0,383 w	0,081 w*	0,663 w	0,383 w
04-06	0,833 w	0,527 w	0,527 w	0,833 w	0,527 r
07-09	0,088 r*	0,394 r	0,394 w	1,000	0,670 r
10-12	0,683 r	0,683 r	0,014 w**	0,683 r	0,414 r

Appendix 7: *, **, *** represents significant chi-square p-value on the 10 %, 5 %, 1 % level respectively. R and w represents tournament behaviour and anti-tournament behaviour respectively. All annual splits (in parentheses) are included. An annual split is how we divide each year, where the first digit represents the number of months included in period 1, and the second digit the number of months in period 2. Our sample period is from 1998 to 2012, and is divided into 10 subsamples. The table shows the p-values from the chi-square tests from the contingency tables when using betas as a proxy for systematic risk. The betas are produced in a regression from equation 5. Winners and losers are classified in this table as being above the third quartile fund return or below the first quartile fund return respectively.

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Preliminary Thesis Report

- Norwegian Mutual Fund Tournament -

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1. Introduction

In 1996, Brown, Harlow and Starks (BHS) proved a significant competitive relationship amongst mutual fund managers in the US market, called a "mutual fund tournament". Their findings suggested that funds alter their risk halfway through the year depending on their mid-year performance, and implied that under-performers increased risk to improve their competitive position, while over-performers decreased risk to lock in their profits. After the article by BHS was published, a number of research papers have studied the same behavior in the US market, as well as other markets. However, studies on mutual fund tournaments has never been done on the Norwegian market, and this motivates us to explore if there can be found similar tendencies in this market. In our thesis we will analyze if Norwegian mutual fund managers have a tendency to alter their risk based on previous performance. This market can be intriguing to focus on, since it is smaller and more volatile than many of the other markets previously studied. This leads us to our research question:

Do Norwegian mutual fund managers make risk adjustments to their investment portfolio according to mid-year performance?

The basis of this type of tournament is that the different fund managers compete with each other in order to get new assets. An increase in funds asset value yields higher compensation to fund managers as they often are rewarded by a percentage of their funds asset value (Golec 2003). This creates an incentive for the managers to attract new capital, and might create a principal agent conflict between managers and investors. Guercio and Tkac (2008) studied this incentive by comparing Morningstar ratings with fund flow. Their findings suggested that mutual fund investors use ratings as a primary input in their decision process. This in turn provides under-performing fund managers with incentives to increase risk mid-year in order to increase the possibility of ending the year with a higher rating, and hence attract more capital. The relationship between flow and performance is consistent with the tournament described by BHS (1996) and has later been proved by several studies such as Chevallier and Ellison (1997) and Kemp and Ruenzi (2008). A study by Sirri and Tufano (1998) found that investors disproportionately flock to invest in high performing funds, while not to a similar extent flee low performing funds. If managers are compensated on the basis of the fund's inflow, managers' payment has similarities to a call-option, in the sense that raising risk gives a higher expected return. Additional incentives for managers to risk shift is that good performance equal good personal reputation and employee safety (Hu et al. 2011). Other studies regarding mutual fund tournaments have found differing results, such as Busse (2001). He found that tournament behavior did not exist in the U.S mutual fund market. Due to the conflicting results in the US market and the different methodologies used, we find mutual fund tournaments an interesting topic.

To study the tournament effect in the Norwegian market, we use a similar approach as the one used by BHS (1996). The returns and the volatility of the returns (risk) will be measured using monthly data provided by our supervisor. Sample period reaches from 2000-2010 and includes data from 70 Norwegian equity funds. We will divide the year into two 6-months periods and compare them to see if we can observe any changes in risk characteristics from one period to the next.

2. Key information

The Norwegian mutual fund industry is closely monitored by the Financial Supervisory Authority of Norway (FSA), and inflicts the market with a number of rules and regulations. E.g. in order be classified as an equity fund in Norway, a fund needs to have at least 80 % of the assets invested on the Oslo Stock Exchange (OSE). Norwegian equity funds also has to have stocks in at least 16 different companies, and no more than 10% of the fund's assets should be allocated in one stock (Finanstilsynet 2012). This shows that a fund, by law, has an obligation to be somewhat diversified. The Norwegian mutual fund industry's total value was NOK 581.2 billion in the end of Q32012 (Statistisk Sentralbyrå 2012), and the total value has more than tripled in value since 2004. This shows that the Norwegian mutual fund industry is expanding rapidly.

In mutual funds there are normally 3 different types of investor fees: Front-end load, back-end load and operating expense. Front-end load is the fee you pay when you buy a stock in a fund, back-end load is the fee you pay when you sell a stock in a fund, and operating expense fee is the management fee and this is normally paid as an annual percentage of the assets invested in the fund. The management fee is one of the main incentives for managers to maximize the inflow to the fund, as mentioned earlier.

Huang, Sialm and Zhang (2011) states that fund managers have three ways to alter the risk profile of their portfolios. The first option is to change the allocation of assets and cash; the second option is to buy less risky assets/sell risky assets in order to alter systematic risk. Changing the idiosyncratic risk of the portfolio is the last option; this will change the funds diversification and overall risk.

3. Literature review

Brown, Harlow and Starks (1996) (BHS) investigate if the competiveness in mutual fund industry can affect fund managers decisions. They introduce an annual "tournament" between mutual funds, were the managers compete for fresh capital based on their performance relative to each other. This is due to the fact that most mutual fund managers are evaluated by end-year results, and that mutual fund ranking systems are usually given annually. They found that funds labeled as mid-year losers tend to increase the risk of their portfolio in the latter part of an annual assessment period to a larger extent than mid-year winners. This implies that the competitive mutual fund environment is effectively changing how fund managers acts, and subsequently might change their objectives from a long-term to a short-term perspective. They also found that as investor awareness increased towards fund ranking systems, tournament behavior occurred more frequently.

Kempf and Ruenzi (2008) look at risk-changing behavior inside a mutual fund family rather than between different funds as BHS (1996) did. The intuition behind their research is that fund managers within a family are incentivized by the top management to perform better by direct and indirect compensation through advertising, marketing and compensation. Decisions regarding these three activities are usually done at the end of the year, such that an intra-firm competition arises amongst the fund managers in order to attract the most compensation. Their findings suggest that a mutual fund tournament exists within the family; fund managers do alter their funds risk profile dependent on their mid-year rank. Further on they find evidence that the degree of risk taking is more excessive for larger families than for smaller ones. The smaller families actually behave in an opposite manner, the mid-year winners take on more risk than losers, suggesting cooperation between funds is more present in smaller families. They conclude that such tournament behavior inside a mutual fund family is not optimal from an investor point of view, since the risk adjustments is not done by the means of optimizing portfolio, which causes extra rebalancing costs. The lack of cooperation within the fund could also lead to unnecessary agency costs. This principal agent conflict has earlier been studied by Chevalier and Ellison (1997)

Chevalier and Ellison (1997) studied the risk-adjusting behavior of fund managers in the light of principal agent conflict between them and investors. A mutual fund manager is motivated by maximizing value by increasing cash inflows, while investors are interested in maximizing their risk-adjusted return. Chevalier and Ellison put the flow-performance relationship as an implicit incentive for funds to alter the risk profile of their portfolios. In the first part of their research they prove that mutual funds willingness to hold unsystematic risk is dependent on its position relative to the market index at the end of September. Their results suggest that fund managers change the riskiness of their portfolios between September and December which is consistent with the incentive to take risk calculated from the flow-performance relationship. This is further studied by Guercio and Tkac (2008).

Guercio and Tkac (2008) investigate the effect of the Morningstar star rating on mutual funds. Morningstar rates funds from 1-5 stars based on their past performance and future estimated results. In their study they find that an upgrade or downgrade of the rating on a mutual fund has a substantial affect on flow of capital from retail investors. This suggests that the Morningstar's star rating system is the primary input of many mutual fund investors' decisions and has economically significant affect on the funds. Discrepancy between this study and prior studies is that Guercio and Tkac found that investors punish funds that lose its position amongst the top third ranked funds (goes down to 3-star rating). The Morningstar-effect can be seen as soon as one month later. This effect shows that funds with 4-star rating might have different incentives according to risk depending on if they are closer to a downgrade or an upgrade.

Huang, Sialm and Zhang (2008) investigate if risk shifting of the fund portfolio has an impact on the fund's performance. They compare funds that have a stable level of risk with funds who risk shifts. Results reveal a strong relationship between risk shifting and fund performance. Mutual funds that shift risk tends not beat the market, while funds with the most consistent risk levels tend to outperform the market. The study implies that even though risk shifting usually does not enhance performance, it is often implemented for a number of different reasons. One of these reasons are the managers incentives to take excessive risk in order to possibly increase future fund inflows, which is one of the reasons mutual fund tournaments exists.

Busse (2001) uses the article of BHS (1996) as his basis. His results were consistent with BHS when using monthly returns. However, Busse (2001) also examines the same relationship by using daily returns. He proves that the tournament effect disappears when using daily data. In his analysis he argues that this is because daily return autocorrelation biases the monthly volatility estimates. The daily data further reveal that the intra-year change in a funds risk is mostly changes in the common stock market risk factors. He questions the reliability of earlier research, since daily data provide more precise estimates of volatility. Busse explains that it is not clear when mutual fund managers risk shifts according performance, since ratings and fund flows occur on a daily basis. This creates more complexity when researching tournament behavior.

There have been several studies on mutual fund tournaments and similar topics in recent years. E.g. Koski and Pontiff (1999) found similar results as BHS (1996), although their study showed that mutual funds that used derivatives for hedging changed their risk profile to a lesser degree. Schwarz (2012) found that the reason for mixed result regarding these tournaments strains from a sorting bias. The convex relationship between performance and fund flow found in studies, e.g. Chevallier and Ellison (1997) and Sirri and Tufano (1998), failed to hold in the study by Spiegel and Zhang (2012). A research by Elton et al. (2010) used holdings data rather than returns to find evidence of tournament behavior, and with this method they found results not congruent with earlier studies. The article by Hu et al. (2011) and Kempf, Ruenzi and Thiele (2009) shows that employment risk also act as an incentive to risk shift.

4. Data and Methodology

4.1. Data

Our study will be based on monthly returns from 70 Norwegian Equity funds, and our sample period is from 2000-2010. As previously mentioned, these funds need to have at least 80 % of their assets invested on the Oslo Stock Exchange (OSE) to be classified as Norwegian Equity funds. In addition to monthly returns from Norwegian funds, we will apply data on average managers' fee on these funds. This is to examine if Norwegian fund managers have similar incentives to US mutual fund managers, based on compensation. All our data will be provided by our supervisor.

To perform the analysis, we will arrange the data yearly, in order to research annual tournaments. Further we will only include funds, in the yearly tournament, if it has returns for every month of the year. Thus a mutual fund that started out during a tournament will not be included that year.

4.2. Methodology

In this part we will study if Norwegian mutual fund managers make risk adjustments to their investment portfolios according to mid-year performance. We have monthly returns from 70 Norwegian mutual funds over the course of 10 years. In our approach we follow the literature by BHS (1996) which has been used in a number of studies concerning mutual fund tournament research. We will start by summarizing the data sample, and extract relevant descriptive statistics, such as number of funds and total asset value. To be able to perform a comparison between first and second half of the year, we divide the year into two parts of six months. The first part is from January to July, and second part is July to January.

First, we will allocate mutual funds based on mid-year performance. This is done by calculating the cumulative return of each mutual fund after six months for each of the 10 annual samples. We calculate the first half cumulative return (RTN) as follows:

$$\mathbf{RTN_{jy}} = [(\mathbf{1} + \mathbf{r_{j1y}}) \times (\mathbf{1} + \mathbf{r_{j2y}}) \times \ldots\ldots \times (\mathbf{1} + \mathbf{r_{j6y}})] - \mathbf{1}$$

Where r_j is the j'th mutual fund return for each month, y is the tournament year and 1-12 are the months of the year, January(1) to December(12). We will then annually rank the RTN of each fund from highest to lowest, and separate them into two groups, mid-year winners and losers. Winners are classified as the funds that are above that year's median RTN value, and losers are classified as funds that are below. Secondly we will calculate the risk adjusted ratio (RAR). This is a measure of the ratio between the volatility before and after the mid-year mark. RAR is calculated by taking the standard deviation of a fund after the first six months and divide it by the standard deviation of the last six months.

$$\mathbf{RAR_{jy}} = \sqrt{\left(\frac{\sum_{m=7}^{12}(\mathbf{r_{jmy}} - \bar{\mathbf{r}}_{\mathbf{j2py}})^2}{\mathbf{6-1}}\right)} \div \sqrt{\left(\frac{\sum_{m=1}^{6}(\mathbf{r_{jmy}} - \bar{\mathbf{r}}_{\mathbf{j1py}})^2}{\mathbf{6-1}}\right)}$$

Where 1p and 2p is first and second period respectively. RAR shows if the returns of a mutual fund is more volatile after mid-year (>1) or less volatile (<1), and is a indication of whether the manager of the mutual fund makes risk adjustments to his portfolio from first to second half of the year. Now we have RTN and RAR for each fund over the course of 10 years. To test our research question we create a (RTN, RAR) pair for every fund each year and split these pairs into four cells: (winner/higher risk shift), (loser/higher risk shift), (winner/lower risk shift) and (loser/lower risk shift). “Higher risk shift" and "lower risk shift", are allocated based on if the mutual fund is above or below the median RAR value respectively. As in BHS (1996) we form a 2x2 contingency table that contain all the mutual funds for a specific year.

Further we will test if there is a significant difference in the allocation of the mutual funds in the cells, or if there is an equal amount of mutual funds in each cell.

Our null hypothesis:

$$\frac{\sigma_{2pL}}{\sigma_{1pL}} = \frac{\sigma_{2pW}}{\sigma_{1pW}} \rightarrow \mathrm{RAR_{Losers}} = \mathrm{RAR_{Winners}}$$

Our alternative hypothesis:

$$\frac{\sigma_{2pL}}{\sigma_{1pL}} \neq \frac{\sigma_{2pW}}{\sigma_{1pW}} \rightarrow \text{RAR}_{\text{Losers}} \neq \text{RAR}_{\text{Winners}}$$

To test the null hypothesis, we will use a chi-square test to find if the cells (loser/higher risk shift) and (winner/lower risk shift) has a measurably higher frequency than the other two cells. If we find a significant difference in the risk shifting of winners and loser, we can research further why mutual fund managers act this way.

4.3. Further/alternate research

Based on the results found in our research, we could add alternate methods to get a more explicable result. There are many alternate research methods used in attempt to improve the original research done by BHS (1996). Chen and Pennacchi (2009) suggest using tracking error volatility instead of return volatility. This is because of the diverse results in prior studies of United States mutual fund tournaments, and that volatility in returns could sometimes not give a valid view of mutual fund managers risk adjustments. Busse (2001) also used a different method than the original BHS (1996) research. He used daily returns of mutual fund rather than monthly returns. The reason behind this is that he believes the daily return autocorrelation bias the monthly volatility estimates.

5. Our expectations

Due to the Norwegian market being smaller than previous studied markets, we may find stronger results of mutual fund tournament. The Norwegian market is considered more volatile than the US market, where most of the prior studies were performed. Hence, fund managers can more easily risk shift with fewer alterations to their portfolio. Based on this we expect to find evidence of mutual fund tournament in the Norwegian market.

6. Progression plan

15th of January: Preliminary report hand-in.

16th-31th of January: Deeper studies of topic and collecting data.

February/March: Work on our analysis and prepare presentation.

March/April: Complete first draft for feedback.

1st of May: Hand-in of first draft for feedback.

May/June: Correct and improve thesis after feedback.

20th of June: Hand in final thesis.

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