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Do Foreign Investors Have an Edge?

- *A study of Norwegian Equity Mutual Funds*

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Abstract

This paper examines the performance and investor behavior of Norwegian equity mutual funds in the time periods 1990-2012 and 2006-2012, respectively. The behavioral part try to reveal differences between local (Norwegian) and foreign (non-Norwegian) investors in light of home bias. We find that 94 per cent of the mutual funds are *not* expected to generate a significant positive alpha, excluding transaction costs. After deducting returns from capital assets, illustrations find that foreigners have more volatile cash flows than locals. We test if these differences are due to irrational biases, different risk profiles or information advantages. We provide significant evidence that three month average historic returns can predict larger changes in *foreign* capital assets than in local, which indicates that foreigners chase performance more than locals. Furthermore, we find that changes in foreign capital assets predict three- and six month average return *better* than locals, hence we can exclude the irrational bias story. Finally, after controlling for risk, we find significant positive alpha for foreigners and no significant results for locals, which exclude the different risk profile story. Overall, this suggests that foreign investors generate positive return because they have an information advantage.

Keywords: Norwegian Equity Mutual Funds, Carharts Alpha, Local vs. Foreigners, Capital Asset Flow, Investor Behavior, Home bias, Irrational bias, Different Risk Profiles, Information Advantage.

Preface

This paper is written as a finishing part of our Master of Science and Business Administration, and concludes our major in financial economics at Norwegian School of Economics (NHH).

Our interest for the Norwegian equity mutual fund market, and the widely discussed and well-known topic about home bias was the primary motivation for our choice. The final hypotheses are a result of challenging and an on-going process. After in-depth analysis and interesting findings in the beginning of the semester, regarding differences between the two investor types; foreigners and locals, we shifted the focus from performance measurement to a more behavioral approach. We hope that this paper will get in line with today's literature on this subject, and represent a worthy contribution of the Norwegian market. We are responsible for all errors.

We would like to give a special thanks to our advisor, Francisco Santos (NHH), for highly valued, detailed and professional guidance during the writing process. In addition we want to thank our key providers of essential data; Nils Diderik Algaard at Børsprosjektet NHH, Caroline Sesvold Tørring at VFF and Bernt Arne Ødegaard's for his work on Norwegian Fama-French and Carharts risk factors.

In the end we also want to thank friends and family for supporting two brothers co-operate together.

Bergen, June 20th 2013

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1. Introduction

The goal of this paper is two-fold. On one hand, we want to investigate how Norwegian equity mutual funds perform, namely if they generate a positive return. On the other hand, we want to address the topic of home bias in Norwegian mutual funds by exploring capital inflows and outflows by locals (Norwegians) versus foreigners (non-Norwegians).

Using Carharts four-factor model (1997), we find that only 6 per cent of the Norwegian mutual funds in our sample in the time period 1990 – 2012 generate a statistically significant positive alpha, with a monthly mean and median of 0.0043. We also find that an equally-weighted portfolio of the Norwegian mutual funds generates a significantly monthly alpha of -0.00415 during the same period.

Exploring differences between locals and foreigners, we find strong evidence that: historical 3-month returns predict larger 1-month change in foreign capital assets than in local capital assets, with coefficients of 1.997 and 1.564; changes in *foreign* capital assets predicts 3- and 6-month returns better than changes in local capital assets, with foreign coefficients of 0.040 and 0.034 and local coefficients of 0.014 and 0.008; controlling for risk, foreigners still outperform locals. Constructing a value-weighted portfolio where we buy (sell) the five mutual funds that have the highest inflow (outflow) for both foreigners and locals, we find that foreigners generate a monthly positive significant alpha of 0.00398, while locals do not.

The first part of this paper addresses the performance of Norwegian mutual funds. There has been extensive research on how to measure fund performance, and various methods of analysis are available (Markowitz 1952; Sharpe 1964; Lintner 1965; Mossin 1966; Fama-French 1993; Carhart 1997 among others). Over the last decades, there has been a boom in number of mutual funds, and the competition in attracting investors has increased. The main goal of an investor is to increase his wealth, and mutual funds give investors the possibility to invest in markets they might not have any knowledge or time to participate in.

Most papers find that mutual funds do not outperform their suitable reference index, and that the funds with the worst performance, greatly reduce investors' wealth (Carhart 1997; Nitzsche, Cuthbertson and O'Sullivan 2006; Fama-French 2008; Elton, Gruber and Blake 2008 among others). Hendricks, Jayendu and Zeckhauser (1997) examines US equity mutual funds from 1974-1988, and find that portfolios of recent poor performance do significantly worse than the benchmark, and those of recent top performers do better, though not significantly so. Brown and Goetzman (1995) among others, find the same evidence in short

term performance. Daniel et al. (1997) find evidence that particularly aggressive-growth funds exhibit some stock-picking ability, but that funds exhibit no characteristic timing ability compared to a benchmark of 125 passive funds. Carhart (1992) shows that persistence in expense ratios, drives much of the long-term persistence in mutual fund performance. For further discussion about mutual fund performance, see Carhart (1997).

In the second part of the paper, we investigate home bias by investigating capital assets changes in Norwegian equity mutual funds. To be more specific, we want to see if there are systematic differences in capital allocation between locals (Norwegians) and foreigners (non-Norwegians), and if so, what are the reasons behind and do they lead to superior performance. We find several previous papers on this topic. Some find that foreigners outperform the locals, while others find that locals outperform the foreigners. The common argument in these papers is that the investor group that outperform, seems to have better information and thus is able to generate abnormal returns.

(Grinblatt and Keloharju 2000; Seasholes 2000 and among others) uncover evidence from both stock picking and mutual funds, that foreigners beat the locals because they have better resources, know-how and timing. Foreigners buy winning stocks and sell losing stocks, while locals tend to be contrariwise. Froot and Ramadorai (2001) look at US closed-end country equity funds and find that foreign change in capital assets predict higher returns compared to the locals. While this paper focus on the information and price pressure stories in closed-end funds, our paper focus on irrational bias, different risk profiles and information advanteges in open-end mutual funds. Froot, O'Connel and Seasholes (2000) focus on international traders and find that capital assets are strongly influenced by past return, and foreign inflows predict return. The difference from this paper compared to ours is that they do not emphasize on the local investors.

The argument of locals having an edge over foreigners comes from the composition of local demographic information and international expertise. Brennan et al. (2005) find that foreigners show higher exposure to markets *after* positive returns. In other words, foreigners are less informed, since they react on lagged information. Several papers (Hau 2001; Choe, Kho and Stulz 2005; Dvořák 2005) use spectral decomposition in trading data and find that foreigners do not outperform the locals. Hau (2001) finds significant underperformance by foreigners in all intra-periods. Choe, Kho and Stulz (2005) and Dvořák (2005) find that foreigners trade at a worse price than locals. Kang and Stultz (1997) study non-Japanese ownership in the Japanese market, and find that foreigners do not hold portfolios in large

firms, but are more tilted toward small firms with higher risk and leverage. Shukla and Inwegen (1995) find similar results in the American market that foreigners (UK) perform worse than locals (US) and conclude that the US manager advantage is simply due to an information advantage.

To our knowledge, behavioral differences between local and foreigner investors has not been investigated for Norwegian equity mutual funds. Using changes in capital assets, historical returns and various other control variables, we evaluate if foreigners behavior differ from locals. To incorporate risk, we do a risk analysis to see if possible differences in behavior are due to asymmetric information or simply excessive risk taking.

In the first part of our analysis, we investigate fund performance to see if they generate a positive return. We use Carharts four-factor model (1997), an extension of Fama-French (1993), and find that most funds in the time period 1990 – 2012 *do not* have a positive statistically significant alpha. In fact, only 6 per cent of the funds were able to outperform the benchmark with a monthly mean and median of 0.0043. We also find that investing in an equally-weighted portfolio of mutual funds in the time periods 1990-2012 and 1990-2002 obtains statistically significant alphas of -0.00415 and -0.00637. Our findings suggest that Norwegian equity mutual funds do not generate positive significant return once we control for standard factors of risk. We exclude transaction costs since accurate data is not available.

Constructing an equally-weighted portfolio of 32 Norwegian mutual funds, we find the 12-month backward rolling betas with Carharts four-factor model (1997). In the time period before 2002 we find more volatile betas than after, and it seems that the average fund manager changed his strategy after the IT-crisis. The average funds beta is closer to one after 2002, suggesting there are more uncertainty and less willingness to take risk in the last decade.

In our second part, we use our data from Verdipapirfondenes Forening (VFF 2013) to illustrate how capital assets fluctuate in Norwegian mutual funds in the time period 2006 – 2012. Looking at capital assets under management changes (adjusting for fund returns), we see that an average investor increased investments before the market dropped in June 2008. After separating the foreigners from the locals, we see that over the 18 months leading up to December 2009, the foreigners increase their position by 100 per cent whilst locals increased their position by 30 per cent. Even though our illustrations show a bigger increase for foreigners than locals in per cent, the locals contributes with more than 90 per cent of the money invested over the time period. Further on, we observe that foreign investors have more volatile cash flows than locals.

Next, we examine if historic returns can predict changes in capital assets. For the average investor, we find that historical 1-month positive return predict a decrease in 1-month capital assets with a statistically significant coefficient of -0.654, which is a surprising result. Historical 3-month positive returns predict an increase in capital assets with a coefficient of 1.654. After splitting up the investors in foreigners and locals, we find that historical 1-, 3- and 6-month returns predict changes in foreign capital assets, with coefficients of -0.828, 1.997 and -0.556. For the local investors we find that historical 1- and 3-month returns predict changes in local capital assets with coefficients of -0.683 and 1.564. We expand the analysis to see if the difference between foreign and local coefficients is significantly different from zero. We find that only the 3-month historic return coefficients are different from each other. This tells us there is strong evidence that historical 3-month returns predicts larger 1-month changes in *foreign* capital assets than in local capital assets, which means foreigners chase performance more than locals.

Our analysis shows that foreigners and locals do not position themselves in the same way. If differences in capital inflows and outflows between foreigners and locals are due to informational advantages or different risk profiles then we should observe differences in performance. We look at 1-month changes in *foreign* capital assets and local capital assets to see if it predicts mutual funds returns. We find that a positive change in *foreign* capital assets predict positive 1-, 3- and 6-month returns with coefficients of 0.015, 0.040 and 0.034. For locals, we find that a positive change in capital assets predict positive 3- and 6-month returns with coefficients 0.014 and 0.008. We test if the difference between the estimated coefficients for locals and foreigners are significantly different from zero. Our tests show that the 3- and 6-month are different from each other within a 99 per cent confidence interval. This tell us that there is strong evidence that change in *foreign* capital assets predict 3- and 6-month returns better than the change in local capital assets, and we can reject the irrational bias story.

We find that foreigners predict performance better than the locals, but that could be a consequence of superior information or a more risk oriented profile. It could simply be because foreigners invest in more growth firms than locals, or that foreigners follow a momentum strategy and locals do not. To evaluate this, we do a risk strategy analysis to see if foreigners still outperform the locals after controlling for risk. We construct a value-weighted portfolio where we buy (sell) the five funds that have the highest inflow (outflow) of money each month, for both foreigners and locals. Then, using Carharts four-factor model (1997), we find that foreigners generate a significant monthly alpha of 0.00398, while locals do not. This

tells us that foreigners generate a positive return, on top of risk, and suggests that foreigners have an information advantage.

This paper is structured as follows: Chapter 2 provides a literature review on the relevant topics for this paper. Chapter 3 develops our hypotheses. Chapter 4 describes the methodology, dataset, assumption and approaches used in the empirical analysis, while chapter 5 presents the empirical findings. Chapter 6 provides a discussion of our results and limitations, and chapter 7 concludes.

2. Literature Review

2.1 Performance Measurement

In 1952, Harry Markowitz started developing a theory to identify the optimal mean-variance portfolio, which later on would be known as the Markowitz-frontier. This analytic approach, which addresses the impact of risk in stock prices, planted the seed of many researches in the topic of portfolio optimization. Sharpe (1964), Lintner (1965) and Mossin (1966), all building on Markowitz's (1952) earlier work, developed the Capital Asset Pricing Model (CAPM). To find the expected price of a security or portfolio, the model use expected return of the market, the risk free rate and reward-to-volatility. Later on Fama-French (1993) identifies five common risk factors in the return on stock and bond, and expanded the CAPM with two extra explanatory variables; SMB, small minus big firm, and HML, value minus growth firms. They find that by including SMB and HML, r-squared increases from 0.7 in CAPM to 0.9 in Fama-French three-factor model. Carhart (1997) introduced one extra factor, known as momentum (MOM). Carhart (1997) find that much of what appears to be the alpha of many mutual funds could in fact be explained as due to their loading or sensitivity to market momentum (Bodie, Kane and Marcus 2011).

There has been a lot of research on mutual fund performance. Most papers finds that few funds outperform the reference index (Carhart 1997; Nitzsche, Cuthbertson and O'Sullivan 2006; Fama-French 2008; Elton, Gruber and Blake 2008 among others), and the funds that perform the worst lose a lot compared to the benchmark. Brown and Goetzmann (1995) indicate that relative risk-adjusted performance of US mutual funds persists; however, persistence is mostly due to funds that lag the S&P 500. They also find that funds that perform poorly have an increase in the probability of disappearance. Daniel et al. (1997) find evidence that mutual funds, particularly aggressive-growth funds, exhibit some stock-picking ability, but that these funds exhibit no characteristic timing ability. Hendricks, Jayendu and Zeckhauser (1993) examines US mutual funds, and find that portfolios of recent poor performance do significantly worse than the reference index, and those who do better, do not yield any significant results. Carhart (1997) demonstrate that persistence in mutual fund performance does not reflect superior stock-picking skills. Common factors in stock returns and persistent differences in mutual fund expenses and transaction costs explain almost all of the predictability in mutual fund returns. Only the strong, persistent underperformance by the worst-return mutual funds remains anomalous.

2.2 Home Bias and Differences between Local and Foreign Investors

The home bias puzzle describes the fact that investors hold only modest amounts in foreign markets. That individuals and institutions overweight their national market was first documented by French and Poterba (1991), Cooper and Kaplanis (1994) and Tesar and Werner (1995). The bias occurs, despite the purported benefits from international diversification shown by Solnik (1974), DeSantis and Gerard (1997) among others, and is now a widely accepted phenomenon by international investors.

There are several possible explanations proposed to solve this puzzle: Black and Fischer (1974) and Stulz (1981) focused on barriers to international investments, restrictions set by the government, different tax regulation and high transaction costs. In recent time, these obstacles have fallen dramatically but the bias remains strong; Van Nieuwerburgh and Veldkamp (2005) find that local investors have a superior information advantage, and this explanation seems to replace the assumption of capital immobility.

In general, researchers separate between using trading and investment data. The methods used often depend on data availability. An interesting question is "Who is best informed, or who performs better?", and the evidence to this is mixed. Reasons for such can be that investors' allocation preferences have changed, or that there are simply too many methodology choices.

A great number of papers compare foreign and local investors in different regions from all over the world, for both stocks and funds. The well-known hypothesis is that local investors have an advantage, in terms of knowledge, demographic and cultural challenges. There is simply not just *one* solution to the argument.

Grinblatt and Keloharju (2000) and Seasholes (2000) are two papers that state that foreigners outperform the locals, where they argue that foreigners generally have better resources and know-how. Grinblatt and Keloharju (2000) use a 120 days trading window, and find that foreigners are momentum investors who buy (sell) winning (losing) stocks, while locals tend to be more contrariwise. Even after Grinblatt and Keloharju (2000) control for differences in behavior, the local portfolios seem to be in disfavor foreign portfolios, in terms of performance. Seasholes (2000) look at earnings announcement in Taiwan. Results indicates that foreigners buy ahead of good surprises and sell ahead of bad, which pinpoint that foreign

investors in Taiwan outperform the locals. Seasholes (2000) also find evidence that foreigners are able to capture abnormal return, based on a daily basis.

Froot and Ramadorai (2001) examine foreigners' ability to predict good returns using flow of capital assets with an aggregate data approach. They examine closed-end country funds of 25 different countries and look at the impacts of US institutional equity flows on prices. Their results indicate that in US; cross-border flows *can* predict performance in these countries and prices associated with these funds. Thus, foreign investors seem to be informed. The latter paper, Froot, O'Connel and Seasholes (2000) have similar conclusion. They find that flow of capital assets is strongly influenced by past returns, and foreign inflows predict return, and indicate that the sensitivity of local stock prices to foreign inflows is positive and large (Froot, O'Connel and Seasholes 2000). All these four papers are consistent with the statement that foreigners outperform the locals, and that foreigners are investors with greater sophistication that are able to choose more profitable investment strategies.

On the other side, we have the argument that foreigners are *less* informed than locals. Brennan et al. (2005) extend the paper by Brennan and Cao (1997) to be able to analyze how investors' react to cycles in foreign capital markets. They find that international investors show higher exposure to foreign markets *after* positive returns. Due to this lagged response, Brennan et al. (2005) indicates that foreigners are less informed than locals.

Hau (2001) use spectral decomposition and investigate trading data, and examine who has got the best information in the German market; the non-Germans (foreigners) or the Germans (locals)? He finds that the foreigners, located in Frankfurt do *not* outperform the locals. These non-German traders also show a significant underperformance in all intra-periods. Choe, Kho and Stulz (2005) and Dvořák (2005) have also done similar studies in Korea and Indonesia, respectively. They find that foreigners trade at worse prices in both countries. In Korea, foreign managers pay more (receive less) than locals when they buy (sell). Choe, Kho and Stulz (2005) indicates that domestic investors have an edge, compared to foreigners on average daily trades they have an advantage on 0.21 (0.16) per cent for purchases (sales). Dvořák (2005) also use spectral decompositions and look at clients of global and local brokerages, and find that local clients have an advantage when it comes to medium and short term profits. Even though clients with global brokerages are slightly better to predict long-term winners, the combination of local information and international expertise clearly results in higher profits. Hence, the locals experience *higher* profits than foreigners in Indonesia.

Kang and Stulz (1997) study non-Japanese ownership in the Japanese market, they find that foreigners do *not* hold portfolios in large firms with high expected returns in the national market, but are more tilted towards small firms with higher risk and leverage. Shukla and Inwegen (1995) look at mutual funds and examine UK fund managers' performance in the American market. They find that foreigners (UK) performs worse than locals (US). Hence both authors have consistent results. Shukla and Inwegen (1995) conclude that the reason for the results simply is information, and to local (US) managers advantage.

3. Hypothesis Development

In this paper, we aim to measure the performance of Norwegian registered equity mutual funds and to investigate possible differences between local and foreign investors. Our goal is to determine if funds generate a significant positive return, if local and foreign investors position themselves differently and if one group of investor achieves a better performance.

Do historical returns predict changes in capital assets? Do changes in capital assets predict returns, and if there are any differences, is this due to behavioral bias, excessive risk taking or asymmetric information?

The stock market is often viewed as semi-strong efficient, meaning that stock prices reflect all public information, except insider information (Fama 1970). Active portfolio managers believe that the market sometimes is mispriced, either that a stock is priced too high or too low, and strive to earn this abnormal return. They measure their performance against a suitable reference index and try to outperform this by timing and stock-picking. A conventional used method of measuring performance is the Carhart four-factor model (1997), an extension of the Fama-French three-factor model (1993). The model adjusts returns for commonly accepted factors of risk: market, size, growth and momentum; the alpha is then what is left from the raw return after adjusting for these risk factors. The alphas can be used to compare how well each portfolio manager performs in the same time period and investment universe. Most studies on this subject find that few funds outperform the reference index after accounting for transaction costs. In other words, most funds do not generate a positive significant alpha (Carhart 1997). Based on this, we predict that Norwegian mutual funds will not generate positive alpha, and develop our first null hypothesis:

H_1: Norwegian equity mutual funds do *not* generate significant positive alphas, excluding transaction costs.

Some of the reasons to invest in mutual funds are due to investors not having the time or the knowledge to invest themselves. By outsourcing this to a fund manager, investors get exposure to the market they are interested in. Our first hypothesis evaluates if the funds outperform the reference index, after controlling for the risk factors.

Our second hypothesis, evaluate if historic return can predict changes in capital assets. Do locals and foreigners respond to the available information the same way? This is an important

question, because it tells us how the investors position themselves based on the available information. Any deviation between the local and foreign investors, tells us that they value the information and opportunities different. We want to investigate if locals and foreigners chase performance in the same way. If not, this could be because of behavioral biases, information advantages or different risk profiles. It is a known fact that there is a home bias, so there could easily be differences in Norwegian mutual funds when we look at local versus foreigners. Under the assumption that all investors *should* have the same public information, we develop our second null hypothesis:

H_2: Historic returns do not predict larger changes in *foreign* capital assets than locals

Next, we want to see if positions taken today generate positive return. Do changes in capital asset flows predict returns, and if so, is there any difference between foreigners and locals? In other words, we want to investigate if the investors are able to place money in the funds that performs well in the future. This is a way of testing the behavioral biases versus information advantages and different risk profiles. If the differences are based on irrational biases, this will lead to bad performance. If we see good performance this eliminates the irrational bias story, which leads us to our third null hypothesis:

H_3: Changes in *foreign* capital assets do not predict return better than locals

Finally, we want to do a risk strategy analysis, to investigate if good performance comes from excessive risk taking or information advantages. We construct a value-weighted portfolio where we buy (sell) the five funds that have the highest inflow (outflow) of money for both foreigners and locals. Then, using Carharts four factor model (1997), we can see if foreigners/locals generate a positive alpha. If the analysis generates a significant positive alpha, it tells us that excessive risk is not the reason for good performance. From this we develop our final null hypothesis:

H_4: Foreign investors do *not* outperform local investors, controlling for risk

4. Methodology and Data Description

4.1 Regression Models

In this chapter, we present our methodology used in the empirical analysis chapter. We describe the models, dataset, assumptions and approaches used in the paper.

4.1.1 Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) was first introduced by Sharpe (1964), Lintner (1965) and Mossin (1966), all building on earlier work from Markowitz (1952). Bodie, Kane and Marcus (2011) explain that the CAPM is a set of prediction concerning equilibrium expected returns on risky assets. The assumptions of the model can be summarized as follows; investors are price-takers, only trades in financial assets, no taxes, are rational mean-variance optimizing and have homogeneous expectations. The CAPM model:

$$E(R_i) - r_f = \alpha_i + \beta_i\left[E(r_m) - r_f\right] + \varepsilon_i \qquad (1)$$

Where, $E(R_i)$ = expected return of fund i, r_f = risk-free rate, α_i = deviation from SML, β_i = portfolios reward-to-volatility, $\left[E(r_m) - r_f\right]$ = market risk premium, ε_i = residual.

4.1.2 Fama-French three-factor model

Fama-French (1993) identifies five common risk factors in the return on stocks and bonds. We focus on the three stock-market factors; the overall market factor, the small minus big firms, SMB, and the value minus growth firms, HML. Bodie, Kane and Marcus (2011) illustrates that these additional factors are empirically motivated by the observations, that average historic returns on stocks of small firms and on stocks with high ratios of book-to-market equity are higher than predicted by the SML from CAPM. The Fama-French three-factor model:

$$E(R_i) - r_f = \alpha_i + b_i\left[E(r_m) - r_f\right] + s_i E[SMB] + h_i E[HML] + \varepsilon_i \qquad (2)$$

Where coefficients b_i, s_i and h_i are the beta of the fund on each of the three factors. According to the arbitrage pricing model, if these are the relevant factors, excess return

should be fully explained by risk premium due to these factor loadings. In other words, the intercept of the equation should be zero.

How the factors are constructed is shown in French (2013). We use the work of Professor Bernt Arne Ødegaard. He finds the SMB and HML factors calculated by Fama and French, using Norwegian data (Ødegaard 2013).

4.1.3 Carharts momentum factor

Carhart (1997) suggests extending the Fama-French three-factor model with a fourth factor called PR1YR, from now on referred to as MOM. He finds that much of what appears to be the alpha of many mutual funds could in fact be explained as due to their loadings or sensitivity to market momentum (Bodie, Kane and Marcus 2011). Carharts four-factor model:

$$E(R_i) - r_f = \alpha_i + b_i\left[E(r_m) - r_f\right] + s_i E[SMB] + h_i E[HML] + p_i E[MOM] + \varepsilon_i \qquad (3)$$

Where the coefficient, p_i, is the estimated beta of the funds MOM factor. We use the MOM factor from Ødegaard (2013) of Norwegian data. We apply the different regression models in our empirical analysis, but our main focus is the results from Carharts four-factor model.

4.1.4 Backward rolling beta estimates in the average fund

By finding the backward rolling betas we can investigate how exposed the average fund is to the market in the time period 1990 – 2012. It also tells us if there have been any changes in investment strategies. We use the EW portfolio from the 32 mutual funds as our average fund return, and OSEFX/MSCI[1] as our reference index. From Carharts four-factor model (1997) we find the 12-month backward rolling betas and compare it with the OSEFX/MSCI market price.

4.2 Pearson Chi-squared Testing of Coefficient Estimates

We also want to compare coefficients in regressions where you use data on locals and data on foreigners and test if these coefficients are different. This we can do with the Pearson Chi-squared test, and compare the difference between two coefficients and see if they are significant different from zero. The Pearson Chi-squared test of independence:

[1] OSEFX/MSCI represents 80 per cent in OSEFX (and TOTX before January 1996), and 20 per cent in MSCI ACWI large/mid-capitalization. See section *4.3.3 Indices* for explanation.

$$X^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{i,j} - E_{i,j})^2}{E_{i,j}} \qquad (4)$$

Where the independence reduces the number of freedom by p = r + c – 1.[2]

4.3 Data Description and Sample Selection

4.3.1 Dataset

Our dataset consists of historical monthly returns for different reference indices and funds from all over the world over the time period January 1990 until August 2012, retrieved from Børsprosjektet at NHH. Out of the 3475 funds and indices, 74 are Norwegian equity mutual funds. The period constitutes 272 months, and a total of 11,660 month-fund observations. Ideally we would like to base the analysis on all the 74 funds, but since we have incomplete dataset for investor information, we restrict number of funds to 32 to get matching datasets. See section 4.4.1 for explanation.

After the two datasets are determined, we choose five time periods to be used for further analysis:

1. 1990m1 - 2012m8
2. 1990m1 - 2002m10
3. 2002m10 - 2008m12
4. 2006m1 - 2012m8
5. 2008m12 - 2012m8

The first one represents the whole dataset, the fourth time period match the investor information, while second, third and fifth represents periods before and after recessions. 2002m10 and 2008m12 are months where the economy reaches lowest values measured in OSEFX/MSCI market price.

[2] In section *5.3 Historic return predictability of changes in capital assets* and *5.4 Change in capital assets predictability of return* we do the regressions without robust in STATA, since Pearson Chi-squared test generates robust standard deviation by itself.

4.3.2 Portfolio returns

All returns are arithmetic and collected from net asset value (NAV). The returns are adjusted for dividend payments, where dividends are reinvested to the last inclusive dividend price with the subject dividend subtracted. Total return is calculated according to the following formula (OsloBors 2013a):

$$R_{t_0,t} = \left(\frac{P_t}{P_{t_0}} * \left(\prod_{d=1}^{n} 1 + \frac{D_d}{P_{d-1} - D_d} \right) \right) - 1 \qquad ,where$$

$$R_{t_0,t} = total\ return\ for\ period\ t_0 - t$$

$$P_t = adjusted\ price\ at\ time\ t$$

$$D_d = adjusted\ dividend\ at\ ex-date\ d. All\ dividends\ with$$
$$ex-dates\ within\ the\ time\ frame < [t_0, t]\ \textit{are included}$$

$$P_{d-1} = adjusted\ price\ last\ inclusice\ dividend\ date$$

All returns and dividends are calculated in NOK, and the fund price exclude redemption fee and sales charge. Denote:

$$T = Return\ this\ month$$

$$T1 = Return\ previous\ month$$

$$T3 = Average\ return\ of\ the\ last\ 3\ months$$

$$T6 = Average\ return\ of\ the\ last\ 6\ months$$

$$T12 = Average\ return\ of\ the\ last\ 12\ months$$

We also compute forward returns, the structure is similar to historical but instead of t-1 we now use t+1. We skip 12-month and use; 1-, 3- and 6-month forward returns, because it is very difficult to predict 12-month. Here is an overview:

$$T + 1 = Return\ 1\ month\ forward$$

$$T + 3 = Average\ return\ 3\ months\ forward$$

$$T + 6 = Average\ return\ 6\ months\ forward$$

4.3.3 Indices

Most of the Norwegian equity mutual funds restrict themselves that at least 80 per cent of the capital needs to be invested on Oslo Bors. Some of the funds use OSEAX (all shares listed on OSE) and OSEBX (most traded shares listed on OSE) as a reference index. The majority use OSEFX (mutual fund index) which is a capped version of OSEBX, and we therefore choose to use this one. Since we only have data from 1996m1-2012m8 for OSEFX, we use returns from TOTX[3] in the missing period 1990m1-1995m12 (OsloBors 2013b).

Close price and arithmetic returns are used for indices. The funds have the possibility to invest up to 20 per cent internationally. In our original dataset we have the most commonly used international index from January 1999 – August 2012, the MSCI ACWI. To be able to fit this index for the whole period we downloaded MSCI ACWI large/mid-cap in the time period January 1990 – August 2012 from MSCI (2013), and the monthly currency USD/NOK from Datastream and converted the index into NOK. Since the difference was minor ($\Delta < 0.05$ per cent) between the two indices, we decide to use the MSCI ACWI large/mid-cap index (MSCI 2013).

From this we can construct a new index that represents the investor universe for the Norwegian funds, with 80 per cent in OSEFX/TOTX and 20 per cent in MSCI ACWI large/mid-cap. We name it OSEFX/MSCI, and this index will be our reference index throughout the paper.

4.3.4 Risk-free rate

We downloaded our risk-free rates from the Norwegian central bank (Norges Bank 2013). Since our observations in the dataset are based on monthly returns, we choose to use the 1-month nominal rate of interest (NIBOR). Most of the funds are a branch within a bank, and therefore it would be reasonable to use the NIBOR rate as the risk-free rate, because this is the rate banks are willing to loan money to each other. The differences from using longer horizon are nevertheless trivial; hence the final choice does not affect our results substantially.

[3] TOTX (Total Index) was the former index used on Oslo Bors. They abandon this officially in September 2001.

4.3.5 Equally-weighted and value-weighted portfolio

We constructed an equally-weighted portfolio of the 32 funds (EW32). In the calculation we add the monthly returns R_i of all the funds, and then divide the total return by the number of funds n. For each period t, the equally-weighted portfolio R_p^{EW} return is calculated:

$$R_p^{EW} = \frac{1}{n}\sum_{i=1}^{n} R_i$$

The value-weighted (VW) portfolios are based on the funds' market capitalization (MC), retrieved from VFF (2013). Where n is the number of funds and MC_i is the market capitalization of fund i in the portfolio p. The VW portfolio return R_p^{VW} is then specified with the formula:

$$R_p^{VW} = \sum_{i=1}^{n}(w_i * R_i)\ , \qquad w_i = \frac{MC_i}{\sum_{i=1}^{n} MC_i}$$

4.3.6 Survival bias

Our dataset are to some extent free from survival bias, since through an on-going evaluation, we always included non-surviving funds. When funds have been excluded it has been because of incomplete investor data or too few total investors.

4.3.7 Variable construction

One of the most important variables in the dataset is capital asset; for total, foreigners and locals. Since we look at *percentage change* from month to month, extreme values occur. In natural cases, where e.g. fund is established or goes bankrupt, the change in capital assets can be as much as 1000 per cent, or higher. Regressions are vulnerable for extreme values, even though it not represents any technical errors, it will have huge effects on the final result. Without any adjustment all regression yield zero r-squared. To cope with this problem we decide to winsorize data at a 1 per cent level.

Denote total, foreign and local capital assets as TOT, FOR and LOC. The control variable SIZE is the same as TOT.

Denote total, foreign and local percentage change in capital assets as TOTP, FORP and LOCP. The calculation for TOTP is capital asset from period t, $TOT_{t,}$ subtracted and divided with last month capital asset, TOT_{t-1}. The same approach applies for FORP and LOCP:

$$TOTP = \frac{TOT_t - TOT_{t-1}}{TOT_{t-1}}$$

We also use changes in capital assets the month before as one of our control variables. When you make a decision in period *t,* you cannot use TOTP to compare capital assets flow. By using t-1, we can now use historical information in the regressions to see if it has any effect. We write these variables as TOTPt1, FORPt1 and LOCPt1, and it is calculated as follows:

$$TOTPt1 = \frac{TOT_{t-1} - TOT_{t-2}}{TOT_{t-2}}$$

To compute one of the control variables used in the regression, called artificial inflow, we multiply previous month return (T1) with total capital assets (TOT_t). E.g. let's say we have a couple of funds with the same return in January, with this variable we are able to control if the big firm attracts more capital in February than a small firm with equal return the month before.

$$Artificial\ Inflow = T1 * TOT$$

We will also control our regression for time and fund effects. For example, by controlling for time effect in our dataset, we make sure that if there are months with extraordinary incidents this variable will identify and separate the effect. E.g. if Russia, because of monetary policies has excess cash in May 2007 and randomly invest everything in Norwegian mutual funds, the effect will be excluded. Likewise, we give each fund unique numbers from 1-32, the flagfund variable deal with extraordinary monthly returns.

4.3.8 Organizing the data

After we calculate all variables, we organized each month: 2006m1 = F1-F32, and 2006m2 = F1-F32 … 2012m8 = F1-F32, where *F* stands for fund. With a total of 80 months from January 2006 to August 2012, we end up with 2560 observations for part two in the paper. See section 4.4.1 for explanation of why we start in January 2006. This dataset now consist of 20 variables; *eight* of them represent our historic and forward returns; total, foreign and local capital assets have all *three* variables each: size, change in capital asset for period t and t-1; the *three* last variables are time effect, flagfund and artificial inflow.

4.4 Investor Behavior

4.4.1 Capital assets and investor information

The part with investor information is only 80 months of data 2006m1-2012m8 for the 32 Norwegian equity mutual funds (VFF 2013). The reason why this dataset has a shorter time period than the one used in the performance analysis, is because that the investor information is not available before 2001, and in the time period 2001 – 2006 there is only quarterly data. An option to extend the dataset was to change the years after 2006 from monthly to quarterly, but this would have led to an undesirable shrinkage of the final number of observations. We therefore decide to use monthly observations, and reduce number of months from 272 to 80.

Further on, we set restriction that each fund must have at least 12 months of information in both dataset, and we exclude funds with less than 50 total investors. Eight of the funds were excluded because they were index funds, eleven of the funds had no investor information at all, and thirteen funds had no foreign investors. Five of the funds had less than 50 total investors, and we exclude Warren Wicklund Alpha because this fund became a combination fund in 2008. These adjustments was necessary to end up with a matching dataset, number of funds were therefore reduced from 74 to 32. We are now able to compare the two investor types under equal conditions, see section 4.3.1.

The dataset contains an overview of capital asset for; total, foreign and local investors, and represent both private and institutional investors. The locals are Norwegians and foreigners are non-Norwegians. We will not distinguish between private and institutional, and throughout the paper only focus on the foreigners and locals as the two investor types.

The change in capital assets can be divided into two parts, returns and investors cash flows. To be able to separate these two, and see how much each contributes, we eliminate the gains and losses from the capital assets. We do so by using January 2006 as the starting point and add net money cash flow for February 2006 to the normalized total capital asset. We then end up with an adjusted approximation of capital assets that only reflects investors' cash flow.

$$\text{Cap. Asset Adjusted}_1 = Total\ Cap.Asset_0 + Netto\ Money\ Cash\ Flow_1$$

$$\text{Cap. Asset Adjusted}_2 = Cap.Asset\ Adjusted_1 + Netto\ Money\ Cash\ Flow_2$$

…

$$\text{Cap. Asset Adjusted}_t = Cap.Asset\ Adjusted_{t-1} + Netto\ Money\ Cash\ Flow_t$$

4.5 Regression Methodology

All regressions are performed in STATA, and to control for heteroscedasticity we run all regressions with the robust function.

4.5.1 Historic return predictability of changes in capital assets

In this section our dependent variables are TOTP, FORP and LOCP. Our independent variables are historic returns for 1-, 3-, 6- and 12-month. We are also controlling for size, time effect, previous month return multiplied with size (artificial inflow), flagfund and change in capital assets last month (TOTPt1, FORPt1 and LOCPt1). The structure is based on adding variables; firstly we run all historical returns separately before we merge them and get the final regression for TOTP, FORP and LOCP:

$$\boldsymbol{TOTP} = SIZE + TIME\ EFFECT + ARTIFICIAL\ FLOW + TOTPt1 + FORPt1 + LOCPt1 + \boldsymbol{T1} + \boldsymbol{T3} + \boldsymbol{T6} + \boldsymbol{T12} + FLAGFUND$$

4.5.2 Changes in capital assets predictability of return

Our dependent variables are the 1-, 3- and 6-month forward returns. The independent variables are TOTP, FORP and LOCP. In addition we also control for size, time effect, historic returns (T1, T3 and T6) and flagfund. All variables are explained in section 4.3.

$$\boldsymbol{FORWARD\ RETURN} = SIZE + TIME\ EFFECT + T1 + T3 + T6 + \boldsymbol{TOTP} + \boldsymbol{FORP} + \boldsymbol{LOCP} + FLAGFUND$$

4.5.3 Risk strategy analysis

After looking on how foreign and local cash flows can predict performance, we now shift our view to risk. The previous section only evaluates if foreigners can predict returns better than the locals, which simply can come from foreigners having a different risk profile. If for example foreigners follow a momentum strategy, and the locals do not, then this can cause the foreigners to predict performance better than the locals. To cope with this, we construct a portfolio for the two investor types, and compare them with the market to see if they create a positive significant alpha or not.

First of all we need to organize our data. In each month, the 32 funds have different in- and outflow of money. Some of them have no change in capital asset. We want to construct a portfolio where we buy the 5 funds with highest inflow and short the 5 funds with highest

outflow of money, from now on called 5 HIGH and 5 LOW. In some months, the 32 funds have all positive or negative FORP. If all are positive (negative), we buy the 5 funds that are most positive (closest to zero) FORP and sell the 5 that are less positive (farthest from zero) FORP.

We first exclude the funds with FORP equal to zero, since we want to look on the funds where foreigners invest or sell. In each month we have total capital assets held by foreigners, and from this we can find the value-weights (VW). By multiplying the VW with their respectively HIGH and the LOW 1-month forward returns (T1), we now have the 5 HIGH and 5 LOW portfolios. The difference between 5 HIGH and 5 LOW is the same as buying the 5 highest inflow of money and shorting the 5 highest outflow of money each month. We do the same procedure for LOCP.

This gives us a total of 156 observation; 78 for foreigners and 78 for locals. We then subtract the 1-month NIBOR from the foreign portfolios, local portfolios and the OSEFX/MSCI reference index, to find the excess return. We can now employ the Carhart four-factor model to analyze our data and see if the alpha is significant or not, see section 5.5 for results.

In the approach above we assume that we can short sell a fund. In practice this is not possible, since we do not know the funds composition of stocks each month, and even if we did, the transaction cost would go through the roof. As an alternative we can buy the 5 HIGH and buy the 5 LOW portfolios, and use the four-factor model to see what side the alpha comes from.

5. Empirical Analysis

In this chapter we present our empirical findings from the performance analysis, rolling betas, adjusted capital asset, historical regressions, forward regressions and risk strategy.

5.1 Performance Measurement – Alpha

Here we present our results from the performance analysis of the mutual funds. We analyze the data with CAPM, Fama-French three-factor and Carharts four-factor model. Our main results are the alphas from the four-factor model, and the two other models act as robustness tests. We use the alphas to test the hypothesis H_1 and analyze if the funds generates a significant return after adjusting for the risk factors. The null hypothesis predicts that Norwegian mutual funds do not generate significant positive alpha, excluding transaction costs. In appendix A1-A4 we show the estimated coefficients of the beta, HML, SMB and MOM as shown with alpha in table 1 and 2.

5.1.1 Time periods

In each time period we discuss the most significant alphas from the four-factor model. We also construct an equally-weighted (EW) portfolio of the 32 funds to see how an average investor performs. The last two time periods also include the value-weighted (VW) portfolio.[4]

January 1990 – August 2012

WW Norge Verdi and Pareto Aksje Norge are the only two funds that have a positive monthly alpha of 0.00428 and 0.00425, significant within a 95 per cent confidence interval. We see that these funds did not exist before 2003 and 2001, which can explain some of the positive results. As we will see, the time period before 2003 generates mostly negative alphas.

The EW portfolio gives us a monthly alpha of -0.00415, significant within a 99 per cent confidence interval. This tells us that on average, the mutual funds did not produce a sufficient excess return in this period.

January 1990 – October 2002

In this time period we find the most discouraging results. There are three funds that have a negative alpha, significant within a 95 per cent confidence interval; AFB Norge, DNB Avanse

[4] VW is calculated only in periods after 2006, because of incomplete investor dataset. See section *4.4.1 Capital assets and investor information.*

1 and DNB Avanse 2 with monthly alphas of -0.00334, -0.00283 and -0.00367. All three funds have been active in the time period, so few observations are not an explanation of the poor performance.

The EW portfolio gives us a monthly alpha of -0.00637, significant within a 99 per cent confidence interval. This was the time period with the worst EW alpha.

October 2002 – December 2008

Some of the best performances measured in alpha are from this time period. There are four funds that have a positive significant alpha; DF Norge 2, Holberg Norge, Storebrand Aksje Innland and WW Norge Verdi with monthly alpha of 0.00378, 0.00789, 0.00338 and 0.00717. Some of this can be explained by the boom in the stock markets up to the financial crisis in late 2008.

The EW portfolio gives us a monthly alpha of -0.00152, but no significant results.

January 2006 – August 2012

This is the time period we focus on in chapter 5.2 - 5.5. There are three funds that distinguish themselves from the rest with positive significant alphas: DF Norge 1, DF Norge 2 and WW Norge Verdi with monthly alphas of 0.00363, 0.00432 and 0.00390.

The EW and VW portfolio gives us a monthly alpha of -0.00140 and 0.00066, respectively, but no significant results.

December 2008 – August 2012

This time period show how the funds performed after the financial crisis. There are two funds that distinguish themselves from the rest; Holberg Norge and Storebrand Vekst with monthly significant alphas of -0.00614 and 0.00836.

The EW and VW portfolio gives us a monthly alpha of -0.00158 and -0.00111, respectively, but no significant results

Table 1 – Performance Measurement – Alpha Overview

Ref. Index: OSEFX/MSCI			Jan 1990 - Aug 2012			Jan 1990 - Oct 2002		
Living time:	N	Fund name:	CAPM	3-factor	4-factor	CAPM	3-factor	4-factor
199601-201208	200	**AFB Aktiv**	0.00159	0.00035	-0.00046	0.00386	-0.00213	-0.00255
199710-201208	179	**AFB Kapital**	0.00097	0.00007	-0.00048	0.00114	-0.00448	-0.00433
199011-201208	262	**AFB Norge**	-0.00068	-0.00065	-0.00089	-0.00272*	-0.00330**	-0.00334**
199801-201208	176	**AFB Norge Pluss**	0.00197	0.00199	0.00164	0.00063	-0.00021	-0.00019
199508-201208	205	**Carnegie Aksje Norge**	0.00302**	0.00322**	0.00229	0.00518*	0.00432	0.00363
199407-201208	218	**Delphi Norge**	0.00347	0.00204	0.00164	0.00469	0.00084	0.00029
199711-201208	178	**Delphi Vekst**	0.00212	0.00124	0.00085	0.00820	0.00374	0.00319
199402-201208	223	**DF Norge 1**	0.00079	0.00100	0.00128	-0.00041	-0.00080	-0.00023
199402-201208	223	**DF Norge 2**	0.00130	0.00153	0.00182	-0.00003	-0.00035	0.00020
199402-201208	223	**DF Norge Vekst**	0.00409	0.00209	0.00103	0.00771	0.00086	-0.00016
199001-201208	272	**DNB 1**	-0.00075	-0.00026	-0.00045	-0.00233*	-0.00215	-0.00217
199603-201208	198	**DNB 3**	0.00083	0.00128	0.00108	-0.00067	-0.00074	-0.00046
199001-201208	272	**DNB Avanse 1**	-0.00116	-0.00094	-0.00094	-0.00232*	-0.00286**	-0.00283**
199101-201208	260	**DNB Avanse 2**	-0.00129	-0.00106	-0.00114	-0.00304**	-0.00368***	-0.00367***
199605-201208	196	**DNB Selektiv 1**	0.00149	0.00159	0.00186	0.00076	-0.00040	0.00073
199504-201208	209	**Handelsbanken Norge**	-0.00028	-0.00026	-0.00058	-0.00060	-0.00158	-0.00184
200101-201208	140	**Holberg Norge**	0.00294	0.00266	0.00279	0.00471	0.00456	0.00426
199609-201208	192	**NB-Aksjefond**	-0.00095	-0.00110	-0.00069	-0.00094	-0.00090	-0.00034
199001-201208	272	**Nordea Avkastning**	-0.00035	0.00007	0.00004	-0.00086	-0.00056	-0.00056
199504-201208	209	**Nordea Kapital**	0.00127	0.00133	0.00117	0.00174	0.00041	0.00036
199706-201208	183	**Nordea SMB**	-0.00006	-0.00139	-0.00142	-0.00223	-0.00637	-0.00602
199001-201208	272	**Nordea Vekst**	-0.00145	-0.00117	-0.00118	-0.00195	-0.00191	-0.00190
199207-201208	242	**ODIN Norge**	0.00422*	0.00201	0.00220	0.00700**	0.00310	0.00346
199001-201208	272	**Orkla Finans Fund**	0.00037	0.00008	-0.00007	0.00018	-0.00112	-0.00115
200110-201208	131	**Pareto Aksje Norge**	0.00535**	0.00499**	0.00425**	0.01894*	0.01447	0.01708
200601-201208	80	**Pareto Verdi**	0.00091	0.00124	0.00152			
199608-201208	193	**Storebrand Aksje Innland**	0.00087	0.00130	0.00092	-0.00121	-0.00145	-0.00130
199001-201208	272	**Storebrand Norge**	0.00031	0.00042	0.00032	-0.00043	-0.00086	-0.00087
199210-201208	239	**Storebrand Vekst**	0.00232	0.00158	0.00122	0.00265	0.00098	0.00030
199801-201208	176	**Storebrand Verdi**	0.00259	0.00313*	0.00244	0.00335	0.00438	0.00452
199805-201208	172	**Terra Norge**	0.00082	0.00076	0.00060	0.00239	0.00057	0.00059
200310-201208	107	**WW Norge Verdi**	0.00404**	0.00400**	0.00428**			
199001-201208	272	**Equally-Weighted portfolio**	-0.00366***	-0.00395***	-0.00415***	-0.00543***	-0.00630***	-0.00637***

In this table we present our alphas in alphabetic order for all the 32 funds, for the CAPM, 3- and 4-factor model. The two time periods are: Jan 1990-Aug 2012 and Jan 1990-Oct 2002. Column 1 and 2 shows the living time and number of monthly observations. Missing values mean that the fund didn't exist. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively.

Table 2 – Performance Measurement Continued – Alpha Overview

Ref. Index: OSEFX/MSCI Fund name:	Oct 2002 - Dec 2008			Jan 2006 - Aug 2012			Dec 2008 - Aug 2012		
	CAPM	3-factor	4-factor	CAPM	3-factor	4-factor	CAPM	3-factor	4-factor
AFB Aktiv	0.00132	0.00152	0.00042	0.00105	0.00098	0.00032	-0.00089	-0.00089	-0.00098
AFB Kapital	0.00191	0.00194	0.00102	0.00069	0.00067	0.00005	-0.00106	-0.00100	-0.00108
AFB Norge	0.00250	0.00300*	0.00220	0.00231	0.00239	0.00193	0.00149	0.00168	0.00161
AFB Norge Pluss	0.00299	0.00350**	0.00276	0.00268*	0.00275*	0.00229	0.00168	0.00185	0.00178
Carnegie Aksje Norge	0.00229	0.00275	0.00174	0.00195	0.00187	0.00129	-0.00061	-0.00054	-0.00065
Delphi Norge	0.00504	0.00482	0.00551	0.00190	0.00213	0.00185	0.00087	0.00087	0.00076
Delphi Vekst	0.00255	0.00237	0.00313	-0.00021	0.00012	0.00006	-0.00237	-0.00223	-0.00232
DF Norge 1	0.00246	0.00292	0.00302	0.00356*	0.00375*	0.00363*	0.00245	0.00257	0.00252
DF Norge 2	0.00319	0.00365*	0.00378*	0.00424**	0.00443**	0.00432**	0.00314	0.00325	0.00321
DF Norge Vekst	0.00037	0.00000	-0.00116	0.00014	0.00019	0.00019	0.00249	0.00255	0.00254
DNB 1	0.00194	0.00256	0.00184	0.00228	0.00226	0.00154	0.00054	0.00059	0.00048
DNB 3	0.00260	0.00323*	0.00251	0.00300*	0.00297*	0.00225	0.00120	0.00124	0.00114
DNB Avanse 1	0.00115	0.00160	0.00143	0.00073	0.00087	0.00074	-0.00112	-0.00092	-0.00092
DNB Avanse 2	0.00137	0.00177	0.00136	0.00124	0.00137	0.00125	-0.00061	-0.00040	-0.00040
DNB Selektiv 1	0.00357	0.00398*	0.00380	0.00259	0.00256	0.00191	0.00090	0.00088	0.00077
Handelsbanken Norge	0.00134	0.00189	0.00115	0.00116	0.00100	0.00112	-0.00317	-0.00329	-0.00311
Holberg Norge	0.00848***	0.00833***	0.00789**	-0.00191	-0.00134	-0.00103	-0.00670**	-0.00630**	-0.00614**
NB-Aksjefond	-0.00098	-0.00094	-0.00065	-0.00044	0.00035	0.00069	-0.00177	-0.00118	-0.00104
Nordea Avkastning	0.00004	0.00042	0.00055	0.00118	0.00133	0.00114	0.00057	0.00075	0.00072
Nordea Kapital	0.00097	0.00138	0.00146	0.00207	0.00220	0.00204	0.00154	0.00171	0.00169
Nordea SMB	0.00558	0.00480	0.00386	-0.00334	-0.00245	-0.00188	-0.00639	-0.00599	-0.00572
Nordea Vekst	-0.00133	-0.00096	-0.00078	-0.00047	-0.00025	-0.00042	0.00064	0.00097	0.00093
ODIN Norge	0.00615*	0.00527*	0.00444	-0.00340	-0.00288	-0.00235	-0.00641	-0.00593	-0.00578
Orkla Finans Fund	0.00123	0.00152	0.00120	0.00107	0.00130	0.00131	-0.00021	0.00011	0.00010
Pareto Aksje Norge	0.00511*	0.00483	0.00304	0.00211	0.00243	0.00271	0.00041	0.00071	0.00077
Pareto Verdi	0.00110	0.00126	0.00251	0.00091	0.00124	0.00152	-0.00073	-0.00043	-0.00037
Storebrand Aksje Innland	0.00349*	0.00411**	0.00338*	0.00275	0.00261	0.00195	0.00111	0.00116	0.00104
Storebrand Norge	0.00201	0.00242	0.00225	0.00219	0.00230	0.00205	0.00056	0.00074	0.00066
Storebrand Vekst	-0.00130	-0.00116	-0.00022	0.00432	0.00435	0.00506	0.00823*	0.00812*	0.00836*
Storebrand Verdi	0.00452	0.00526*	0.00290	0.00136	0.00130	0.00038	-0.00254	-0.00232	-0.00243
Terra Norge	0.00063	0.00126	0.00062	0.00092	0.00148	0.00135	-0.00117	-0.00064	-0.00048
WW Norge Verdi	0.00739***	0.00736***	0.00717***	0.00269	0.00341*	0.00390*	-0.00124	-0.00069	-0.00053
Equally-Weighted portfolio	-0.00140	-0.00125	-0.00152	-0.00146	-0.00127	-0.00140	-0.00160	-0.00155	-0.00158
Value-Weighted portfolio				0.00051	0.00073	0.00066	-0.00135	-0.00113	-0.00111

In this table we present the rest of our alphas in alphabetic order for all the 32 funds, for the CAPM, 3- and 4-factor model. For time periods: Oct 2002-Dec 2008, Jan 2006-Aug 2012 and Dec 2008-Aug 2012. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively.

5.1.2 Transaction costs

To find the exact transaction costs in each fund accurately proved to be very difficult. At the funds homepages, they do not list the historical transaction costs. From Morningstar (2013) we are able to find an overview of total costs in recent times, see appendix A5.

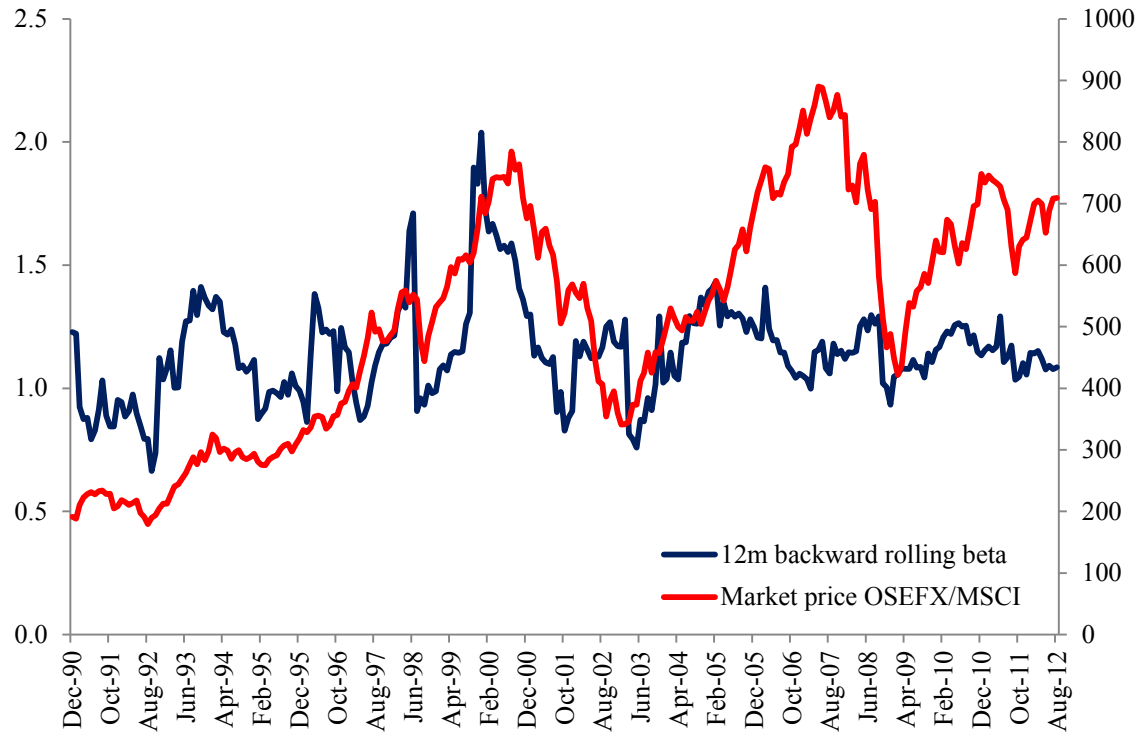
Typically, every fund has a management fee of 1 - 2 per cent annually. The funds we contacted by mail, said they used to have sign on/off fees, but the trend is now turning towards no fees when buying or selling the fund. One explanation to lower fees can be the enhanced competition. In 1990 there were 6 Norwegian funds in our dataset, and in August 2012 there were 74 Norwegian funds.

Our performance analysis finds that the fund that have a significant positive alpha vary between 4 – 8 per cent annually. Based on the information from Morningstar (2013), these funds are able to cover the transaction costs and generate excess return to the investors. Since we do not know the exact transaction costs for each fund, we choose not to investigate this any further.

5.1.3 Backward rolling betas

Figure 3 has two inputs. On the left-hand axis we have the backward rolling Beta-values, which are regressed from the EW32 with the four-factor model. They are displayed as 12-month backward rolling betas. So, if you are in August 2012, this shows the beta for August 2011 until August 2012. On the right-hand axis we have the market price of the OSEFX/MSCI in NOK.

Figure 1– Market Price OSEFX/MSCI and four-factor 12-month backward rolling beta



The illustration in figure 3 shows that 12-month backward rolling beta varies more before 2002 than after. This can be an indication of change in the average fund manager's strategy. A possible explanation can be that in aftermath of the IT-crisis in 2002, fund managers shifted their strategy to a less risky position. In the time period from January 2003 to May 2007 the OSEFX/MSCI increased steadily, while the betas remained more stable than prior to 2002.

5.1.4 The null hypothesis H_1

We us the monthly alphas from Carharts four-factor model to investigate if we can reject or not the null hypothesis, H_1: Norwegian equity mutual funds do not generate significant positive alphas, excluding transaction costs.

Table 3 shows that only 6 per cent of the funds, over the whole time period, generate a positive significant alpha, with monthly mean/median of 0.0043. When an investor pays a fund manager to invest in the stock market, the least he expects is to get his money's worth. The observation that only 6 per cent of the funds fall into this category, tells us that few managers are able to generate abnormal return in the market after controlling for the risk factors.

Table 3 – Monthly Alphas from Carharts Four-Factor model

		Jan 1990 - Aug 2012	Jan 1990 - Oct 2002	Oct 2002 - Dec 2008	Jan 2006 - Aug 2012	Dec 2008 - Aug 2012
FUND %	Significant positive	6 %	0 %	13 %	9 %	3 %
	Positive	59 %	40 %	75 %	78 %	50 %
	Negative	35 %	50 %	12 %	13 %	44 %
	Significant negative	0 %	10 %	0 %	0 %	3 %
MEAN	Significant positive	0.0043		0.0056	0.0040	0.0084
	Positive	0.0014	0.0032	0.0023	0.0015	0.0013
	Negative	-0.0008	-0.0016	-0.0007	-0.0014	-0.0018
	Significant negative		-0.0033			-0.0061
MEDIAN	Significant positive	0.0043		0.0055	0.0039	0.0084
	Positive	0.0013	0.0020	0.0022	0.0014	0.0010
	Negative	-0.0007	-0.0012	-0.0007	-0.0015	-0.0010
	Significant negative		-0.0033			-0.0061

This table is based on the alphas from Carharts four-factor model (1997) in our five time periods. We have divided the alphas based on their significance (90 per cent CI) and if they are positive or negative. Fund % shows how many funds there are in each group. We also find the corresponding mean and median alphas for each group.

The largest group is the one with positive alphas. Over the whole time period 59 per cent of the funds end up here, with a mean of 0.0014 and median of 0.0013. They are not significant, meaning they are achieving the right return for the level of risk.

The second largest group is the one with negative alphas, and in the whole time period 35 per cent of them end up here, with a mean of -0.0008 and median -0.0007. They are negative and non-significant, meaning they do not achieve the right return for the level of risk.

The last group is the significant negative alphas. We only found this group in the time periods 1990-2002 and 2008-2012, where 10 and 3 per cent of the funds ended up, respectively. Since they are significant negative, this means they do not deliver as much return as needed to cover the risk taken. The outlier here was Holberg Norge, with a monthly alpha of -0.00614 from December 2008 to August 2012.

Based on our findings, only 6 per cent of the funds are able to generate a significant positive alpha. This suggests that 94 per cent of the funds will not beat the reference index. Because of these results, we *do not reject* the null hypothesis, H_1, hence Norwegian mutual funds do not generate significant positive alphas, excluding transaction costs.

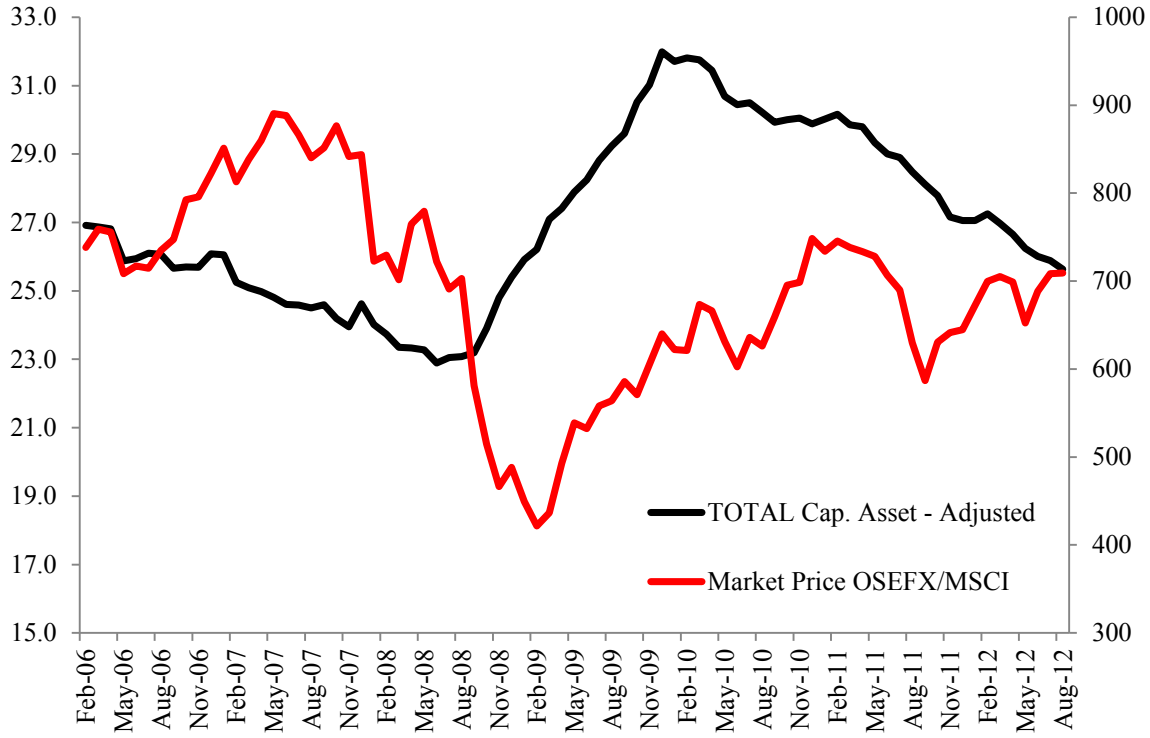
5.2 Foreign and Local Investor Behavior

After the first part, where we focused on performance and each funds separately, our datasets led us to a more behavioral approach. Investors may find their national stock market to be more familiar than foreign stock markets (French and Poterba 1991 among others). Explanations to why local overweight their home market are; advantages compared to foreigners when it comes to knowledge and available information, and capital immobility. Ken French says that, while home bias is still the norm, investors have significantly increased their allocation to foreign markets over the last 30 years (Dimensional 2013).

5.2.1 Adjusted capital asset

Figure 2 shows the constructed market price OSEFX/MSCI in NOK on the right axis. The left axis is capital asset in Bill NOK, illustrating the adjusted total capital assets from the investors, aggregated.

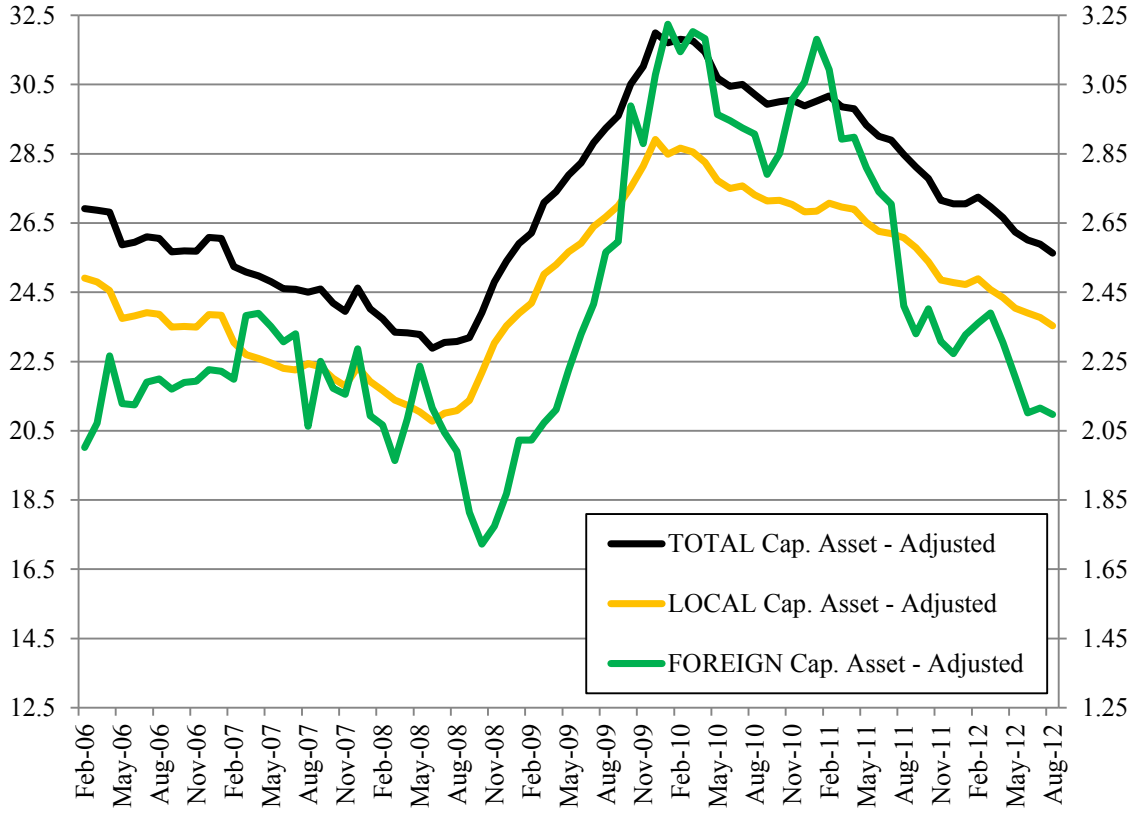
Figure 2 – Market price and Total Capital Asset Adjusted



By eliminating the returns from total capital assets, we are now able to see how the investors behave when the market is shifting. The total capital asset adjusted hit a bottom low in June 2008, with 23 Bill NOK invested in the 32 funds. In December 2009 it increased to 32 Bill NOK, representing nearly a 40 per cent increase over the 18 months.

After looking at the total capital asset adjusted, we want to see if the locals or foreigners are the ones contributing to this increase. Figure 3 shows both the foreign and the local capital asset, adjusted for only investor flow of capital.

Figure 3 – Total, Foreign and Local Capital Asset Adjusted



Total and local investors are representing the left axis, and the foreigners are presented on the right side, all numbers are in Bill NOK. Clearly, we can see that the locals are contributing most in terms of amount, because the local axis is ten times bigger than the foreigners. Already before the financial crisis reach bottom low in February 2009, we see that both groups are starting to invest. From September 2008 to December 2009 the foreigners are almost doubling their position approximately from 1.7 Bill NOK to 3.2 Bill NOK, and locals increase their capital with 30 per cent from 22 Bill NOK to 29 Bill NOK. Further on, we see that the locals do not fluctuate as much as the foreigners. They are decreasing and increasing more steadily.

5.2.2 Summary of findings

The adjusted capital assets for total, foreigners and locals, indicates that their behavior is different; the foreigners are more volatile compared to the locals. It seems that when the market is booming, foreigners are chasing performance, by increasing their position more compared to the locals. But in the end, it is still the locals who contribute the most, because this group is much larger.

5.3 Historic Return Predictability of Changes in Capital Assets

We are testing our hypothesis H_2 of relations between historic return and change in capital assets. The null hypothesis states that historic returns do not predict larger changes in *foreign* capital assets than locals. In the first part we will analyze total capital assets, before the focus shifts towards foreigners and locals where we try to answer the hypothesis and investigate if there is any difference.

In this section, our dependent variables are TOTP, FORP and LOCP. These variables are presented horizontally. Our independent variables are historic returns for 1-, 3-, 6- and 12-month. We are also controlling for size, time effect, previous month return (T1) multiplied with size (artificial inflow), flagfund and change in capital assets for last month (TOTPt1, FORPt1 and LOCPt1).

5.3.1 Total change in capital assets

The results from the regression are presented in table 4. In column 6, we see that 1- and 3-month historic returns have negative and positive coefficients, respectively. A 0.01 increase in historic returns predicts -0.0065 and 0.0165 in TOTP, significant within a 99 per cent confidence interval. Historic returns for 6- and 12-month are negative and non- significant. This implies that after 1-month of positive return, the TOTP decreases; hence an average investor will withdraw money from the funds, which is a surprising result. Further on, over a 3-month period with positive average return, TOTP increases, hence an average investor will invest more money in the funds. An explanation to this might be market timing; investors want to capture the upside by investing in mutual funds after three months with continuous increase.

Table 4 – Historic returns predictability of TOTP

	TOTP	**TOTP**	**TOTP**	**TOTP**	**TOTP**	**TOTP**
SIZE	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Artificial Inflow	-0.000	-0.000***	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TOTPt1	-0.095	0.003	-0.047	-0.087	-0.080	0.053
	(0.174)	(0.166)	(0.171)	(0.174)	(0.167)	(0.183)
FORPt1	0.005	-0.047	-0.011	0.004	-0.015	-0.045
	(0.043)	(0.043)	(0.042)	(0.042)	(0.041)	(0.041)
LOCPt1	0.275	-0.036	0.162	0.267*	0.327**	0.102
	(0.168)	(0.157)	(0.157)	(0.158)	(0.162)	(0.180)
Historic 1m Return	0.012				-0.778***	-0.654***
	(0.109)				(0.145)	(0.144)
Historic 3m Return		1.006***			1.650***	1.654***
		(0.127)			(0.211)	(0.208)
Historic 6m Return			0.606***		-0.248	-0.249
			(0.156)		(0.265)	(0.260)
Historic 12m Return				0.189	-0.342	-0.331
				(0.201)	(0.235)	(0.232)
Flagfund						0.005***
						(0.001)
Observations	2274	2274	2274	2274	2274	2274
R^2	0.010	0.037	0.017	0.010	0.050	0.077

In this table we present the coefficients from regression on our dependent variable, total capital asset change (TOTP). Our independent variables are historic returns for 1-, 3-, 6- and 12-month. In addition we also control for size, time effect, artificial inflow, flagfund and change in capital assets for last month (TOTPt1, FORPt1 and LOCPt1). All control variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.3.2 Foreign change in capital assets

Here the dependent variable is FORP. The first four columns in table 5 represent the simplest regressions, and we observe that these four coefficients are all positive and significant on a high confidence interval, except column 1. In column 5 we merge the four different returns. In column 6 we also include our last control variable; flagfund. This column represents our main results. Holding all other variables constant, a 0.01 increase in historic 1-, 3- and 6-month return predicts -0.00828, 0.01997 and -0.00556 coefficients in FORP. The results are all significant within a 99 per cent confidence interval. We find the most extreme case when we look at the historic 3-month return. After a 3-month period of positive (negative) return, FORP is predicted to increase (decrease) twice the amount of the average return last 3-month.

Table 5 – Historic returns predictability of FORP

	FORP	**FORP**	**FORP**	**FORP**	**FORP**	**FORP**
SIZE	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	-0.000*	-0.000*	-0.000	-0.000	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Artificial Inflow	-0.000	-0.000***	-0.000*	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TOTPt1	-0.618**	-0.512*	-0.574**	-0.611**	-0.603**	-0.582**
	(0.284)	(0.288)	(0.287)	(0.284)	(0.286)	(0.289)
FORPt1	0.110**	0.053	0.096**	0.110**	0.087*	0.082*
	(0.046)	(0.045)	(0.045)	(0.045)	(0.044)	(0.045)
LOCPt1	0.837***	0.510*	0.750***	0.854***	0.906***	0.870***
	(0.275)	(0.275)	(0.272)	(0.268)	(0.279)	(0.283)
Historic 1m Return	0.070				-0.848***	-0.828***
	(0.102)				(0.112)	(0.112)
Historic 3m Return		1.191***			1.997***	1.997***
		(0.088)			(0.118)	(0.118)
Historic 6m Return			0.669***		-0.556***	-0.556***
			(0.133)		(0.197)	(0.196)
Historic 12m Return				0.350**	-0.104	-0.102
				(0.171)	(0.179)	(0.178)
Flagfund						0.001*
						(0.000)
Observations	2254	2254	2254	2254	2254	2254
R^2	0.039	0.121	0.058	0.042	0.158	0.159

In this table we present the coefficients from regression on our dependent variable, foreign capital asset change (FORP). Our independent variables are historic returns for 1-, 3-, 6- and 12-month. In addition we also control for size, time effect, artificial inflow, flagfund and change in capital assets for last month (TOTPt1, FORPt1 and LOCPt1). All control variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.3.3 Local change in capital assets

Table 6 represents the last results from the regressions in this section. The structure is the same as before, the focus will still be on column 6, where we include all control variables. The only difference is that the dependent variable is now LOCP. We observe that in column 1 the coefficient is negative and not significant. Column 2 and 3 are almost the same as for FORP. The coefficient for historic 12-month return is no longer significant.

When we again include all variables we end up with the most adequate coefficients. The sign is still consistent with the previous regression for FORP (see table 5), but with impaired magnitude. A 0.01 increase in 1- and 3-month historic return, predicts -0.00683 and 0.01564 coefficients in LOCP. Both are significant within a 99 per cent confidence interval.

Table 6 – Historic returns predictability of LOCP

	LOCP	**LOCP**	**LOCP**	**LOCP**	**LOCP**	**LOCP**
SIZE	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Artificial Inflow	0.000	-0.000**	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TOTPt1	-0.086	0.012	-0.035	-0.075	-0.069	0.029
	(0.158)	(0.148)	(0.156)	(0.161)	(0.144)	(0.147)
FORPt1	0.028	-0.023	0.011	0.026	0.009	-0.013
	(0.040)	(0.041)	(0.041)	(0.041)	(0.039)	(0.039)
LOCPt1	0.180	-0.129	0.056	0.161	0.230*	0.067
	(0.152)	(0.140)	(0.144)	(0.146)	(0.138)	(0.144)
Historic 1m Return	-0.009				-0.773***	-0.683***
	(0.114)				(0.140)	(0.137)
Historic 3m Return		0.962***			1.562***	1.564***
		(0.114)			(0.168)	(0.167)
Historic 6m Return			0.602***		-0.172	-0.172
			(0.138)		(0.218)	(0.215)
Historic 12m Return				0.180	-0.363	-0.356
				(0.186)	(0.223)	(0.220)
Flagfund						0.003***
						(0.001)
Observations	2280	2280	2280	2280	2280	2280
R^2	0.006	0.039	0.016	0.007	0.056	0.075

In this table we present the coefficients from regression on our dependent variable, local capital asset change (LOCP). Our independent variables are historic returns for 1-, 3-, 6- and 12-month. In addition we also control for size, time effect, artificial inflow, flagfund and change in capital assets for last month (TOTPt1, FORPt1 and LOCPt1). All control variables are described in section 4.3 Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.3.4 Pearson Chi-squared test

In table 5, column 6, we see that the 1-, 3- and 6-month historic return can predict FORP next month on a significant level. In table 6, column 6, we see that the 1- and 3-month historic return can significantly predict LOCP.

Even though some of the coefficients are significant by themselves, we need to find out if foreigners are significantly different from locals. By using the Pearson Chi-squared we can test the difference between the independent variables, FORP and LOCP, and see if they are significantly different from zero.

Table 7 – Pearson Chi-Squared test – Historical regressions

			Column					
			1	**2**	**3**	**4**	**5**	**6**
Historic Returns	**t1**	Chi2	0.33				0.21	0.80
		Prob>Chi2	0.57				0.65	0.37
	t3	Chi2		3.36			5.30	5.24
		Prob>Chi2		0.07			0.02	0.02
	t6	Chi2			0.15		1.92	1.91
		Prob>Chi2			0.70		0.17	0.17
	t12	Chi2				0.55	0.93	0.89
		Prob>Chi2				0.46	0.33	0.35

In this table we present the results from Pearson Chi-Squared test. Column 1-6 tests if the coefficients FORP and LOCP from table 5 and 6 are significant different from zero. If [Prob>Chi2] < 0.10 we reject the hypothesis H_2, while in cases where [Prob>Chi2] > 0.10 we do not reject hypothesis H_2.

In the Chi-squared test, column 6, we see that the 1-, 6- and 12-month historic return yield a probability above 0.10. We therefore *fail to reject* the hypothesis H_2; hence we cannot distinguish between the estimated coefficients from foreigners and locals.

In the regression with historic 3-month average, we get a Chi-squared of 5.24 which gives us a probability of 0.02. Our Pearson Chi-squared test tells us that we can *reject* the hypothesis H_2; hence that foreigners and local coefficients are different from each other. The FORP coefficient estimate is not only positive, it is also significant larger than the LOCP coefficient.

5.3.5 Summary of findings

In the regressions for FORP and LOCP we are not able to distinguish between foreigners and locals at 1-, 6- and 12-month historic return, even though we find several significant coefficients. But for 3-month historic return, our final results states that there is strong evidence that historic return predict larger changes in *foreign* capital assets than locals. This implies that foreigners chase performance and are more volatile, compared to locals.

5.4 Change in Capital Assets Predictability of Return

In this section we test our null hypothesis H_3. It states that; changes in *foreign* capital assets do not predict return better than locals. The results are divided into four parts, where the first three shows the results from predicting 1-, 3- and 6-month return with changes in capital assets. Finally, we evaluate the H_3 using the Pearson Chi-Squared test to see if the difference between FORP and LOCP estimated coefficients are significant different from zero.

Our dependent variables are forward 1-, 3- and 6-month return, and they are presented horizontally. The independent variables are total, foreign and local changes in capital assets. In addition we also control for size, time effect, historic return and flagfund.

5.4.1 Forward 1-month return

In table 8, column 4, we see that the foreigners have a significant positive coefficient against forward 1-month return, but the locals do not. This can be explained through information. The foreigners clearly have some information, or better information, that makes them able to invest in more profitable funds than locals. In the fourth column we see that a 0.01 increase in FORP predicts a significant increase of 0.015 next month, holding all other variables constant. By following changes in capital assets, we see that the foreign investors are able to transfer their information to the market. If the foreigners increase their capital, forward 1-month return is expected to be positive. If they decrease their capital, it is expected to be negative. LOCP is not able to predict significant 1-month return, and therefore they either do not have the same information, or they are not able to generate profit from it.

Table 8 – Forward 1-month return

	Forward 1-month return			
SIZE	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Historic 1m Return	-0.072**	-0.075**	-0.072**	-0.075**
	(0.032)	(0.033)	(0.032)	(0.033)
Historic 3m Return	0.623***	0.605***	0.625***	0.602***
	(0.071)	(0.074)	(0.071)	(0.074)
Historic 6m Return	-0.396***	-0.380***	-0.396***	-0.379***
	(0.056)	(0.059)	(0.056)	(0.059)
TOTP	0.005			0.004
	(0.006)			(0.007)
FORP		0.016**		0.015*
		(0.008)		(0.008)
LOCP			0.004	-0.000
			(0.007)	(0.008)
Flagfund				-0.000
				(0.000)
Observations	2473	2258	2479	2252
R^2	0.069	0.070	0.068	0.070

In this table we present the coefficients from regression on our dependent variable, forward 1-month return. Our independent variables are total, foreign and local changes in capital assets (TOTP, FORP and LOCP). In addition we also control for size, time effect, historic returns and flagfund. All control variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.4.2 Forward 3-month average return

When we investigate the forward 3-month average return in table 9, we observe that both the foreigners and the locals have positive significant coefficients. The foreigners continue to increase their advantage, but we also see that the locals now have a positive significant relation between LOCP and predicted return. Column 4 shows that a 0.01 increase in FORP predicts an increase in monthly average return of 0.040 the next three months, while LOCP predicts 0.014, holding all other variables constant.

Table 9 – Forward 3-month average return

	Forward 3-month average return			
SIZE	-0.000**	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	0.000*	0.000**	0.000*	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Historic 1m Return	-0.197***	-0.189***	-0.194***	-0.180***
	(0.020)	(0.020)	(0.020)	(0.020)
Historic 3m Return	0.943***	0.887***	0.938***	0.864***
	(0.042)	(0.043)	(0.042)	(0.043)
Historic 6m Return	-0.451***	-0.424***	-0.450***	-0.420***
	(0.033)	(0.034)	(0.033)	(0.034)
TOTP	0.015***			0.003
	(0.004)			(0.004)
FORP		0.042***		0.040***
		(0.005)		(0.005)
LOCP			0.019***	0.014***
			(0.005)	(0.004)
Flagfund				-0.000
				(0.000)
Observations	2446	2229	2449	2226
R^2	0.335	0.348	0.335	0.353

In this table we present the coefficients from regression on our dependent variable, forward 3-month average return. Our independent variables are total, foreign and local changes in capital assets (TOTP, FORP and LOCP). In addition we also control for size, time effect, historic returns and flagfund. All control variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.4.3 Forward 6-month average return

The forward 6-month returns have a positive relation with FORP and LOCP. We observe that the coefficients have decreased with 0.006 for both locals and foreigners compared with the forward 3-month return. Column 4 shows that a 0.01 increase in FORP predicts an increase in monthly average return of 0.034, while LOCP predicts 0.008, holding all other variables constant. The reason for the decrease from 3- to 6-month forward can be explained by the longer time period. As an example, a change in capital assets in January can better predict return in March than in July.

Table 10 – Forward 6-month average return

	Forward 6-month return			
SIZE	-0.000***	-0.000**	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Time Effect	0.000	0.000**	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Historic 1m Return	-0.089***	-0.082***	-0.088***	-0.077***
	(0.015)	(0.015)	(0.015)	(0.015)
Historic 3m Return	0.491***	0.441***	0.489***	0.426***
	(0.032)	(0.034)	(0.032)	(0.035)
Historic 6m Return	-0.375***	-0.350***	-0.374***	-0.347***
	(0.035)	(0.037)	(0.035)	(0.037)
TOTP	0.011***			0.002
	(0.003)			(0.003)
FORP		0.035***		0.034***
		(0.005)		(0.005)
LOCP			0.013***	0.008**
			(0.004)	(0.004)
Flagfund				-0.000
				(0.000)
Observations	2352	2141	2355	2138
R^2	0.140	0.155	0.139	0.159

In this table we present the coefficients from regression on our dependent variable, 6-month forward average return. Our independent variables are total, foreign and local changes in capital assets (TOTP, FORP and LOCP). In addition we also control for size, time effect, historic returns and flagfund. All control variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

5.4.4 Pearson Chi-squared test

We find that the FORP can predict 1-, 3- and 6-month return, and LOCP can predict 3- and 6-month return on a significant level. By using the Pearson Chi-squared test we can evaluate if the difference between the coefficients of FORP and LOCP are significantly different from zero. This is our results:

Table 11 – Pearson Chi-squared test Forward Regression

		Forward 1-month return	Forward 3-month average return	Forward 6-month average return
Column 2-3	Chi2	1.6	11.68	14.93
	Prob>Chi2	0.2056	0.0006	0.0001
Column 4	Chi2	1.85	15.19	18.95
	Prob>Chi2	0.1743	0.0001	0.0000

In this table we present the results from Pearson Chi-Squared test of the results from table 8, 9 and 10. The first row tests if the coefficients for locals and foreigners from column 2 and 3 are significant different from zero. The second row tests if the difference between the coefficients for locals and foreigners in column 4 are significant different from zero. If [Prob>Chi2] < 0.10 we *reject* the hypothesis H_3, while in cases where [Prob>Chi2] > 0.10 we *do not reject* the hypothesis H_3.

Table 11, Column 2-3 with forward 1-month return, gives us a Chi-squared of 1.85 with a probability of 0.1743. Based on a 10 per cent significance level, we *fail to reject* the null hypothesis H_3; hence, LOCP and FORP are not different in predicting 1-month return.

In the regressions with forward 3- and 6-month return, we get a Chi-squared of 15.19 and 18.95, respectively. Our Pearson test tells us they are different from each other within a 99.99 per cent confidence interval, and we can therefore *reject* our hypothesis H_3. The FORP coefficient estimate is not only positive, it is also significant larger than the LOCP coefficient.

5.4.5 Summary of findings

In the regression for forward 1-month return we are not able to distinguish between foreigners and locals, even though the foreign coefficient is significant and the local is not. One thing we can take from this is that foreigners make good use of the available information in a 1-month perspective.

In the regressions of forward 3- and 6-month return there is strong evidence that the change in *foreign* capital assets predicts return better than the change in local capital assets. Not only are the coefficients significant positive for foreigners, they are also significant larger than the locals. Since we see good performance for foreigners, we can therefore eliminate the irrational biases, since this would have led to bad performance.

5.5 Risk Strategy Analysis

Finally, we test our null hypothesis H_4 which states: Foreign investors do not outperform local investors, controlling for risk. In section 5.4, we observe that the foreigners have significant positive coefficient estimates in all three regressions, and with the Chi-squared test we find that the difference between FORP and LOCP are significantly different from zero in predicting 3- and 6-month return. From this we can say that foreigners predict return better than locals, but it do not say anything about the risk they are taking. It could simply be because the foreigners have a momentum strategy and the locals do not, or that foreigners invest more in growth firms than the locals. It just tells us that foreigners better predict return because their risk profile is different from the locals.

Let us now take risk into account. To measure risk, we can hold a portfolio of funds and measure it against the market. In each month we find the 5 funds where the FORP is highest and 5 funds where FORP is lowest. After finding the value-weighted average of the HIGH and the LOW FORP, we multiply them with their forward 1-month return. By subtracting the 5 LOW from the 5 HIGH each month, we obtain 78 foreign observations. We did the same for locals. After subtracting the 1-month NIBOR from the portfolios, we are now ready to compare the foreigners and the locals against the market. We use the four-factor model, and this is our results:

Table 12 – Risk strategy with buying 5 HIGH and selling 5 LOW

	Foreign **5 HIGH - 5 LOW**	**Local** **5 HIGH - 5 LOW**
Beta	-0.02285	0.01412
	(0.04432)	(0.03635)
SMB	-0.11700**	-0.02729
	(0.05243)	(0.05700)
HML	0.03808	0.00185
	(0.04895)	(0.05036)
MOM	-0.00428	0.08767**
	(0.05122)	(0.04347)
Alpha	0.00398**	-0.00091
	(0.00190)	(0.00187)
Observations	78	78
R-squared	0.082	0.058

In this table we present the coefficients from the regression with the four-factor model on the buying 5 HIGH and selling 5 LOW strategy. All variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

Once we take into account the different risk profiles of foreigners and locals, do we still get any deviation in terms of performance? We see that the foreign portfolio has a positive significant alpha, which tells us that foreigners gain a positive return on top of the risk. The locals on the other hand, do not have a positive or significant alpha. When the foreigners are investing, adjusting for risk, they give you a positive alpha. This suggests that the foreigners have more information than the locals. These results tell us we can reject the null hypothesis, H_4; hence foreigners outperform the locals when controlling for risk. Excessive risk taking is not the reason for foreigners outperforming the locals, but they have an information advantage.

The approach in table 12 would be difficult to implement, because we cannot short sell a funds since we do not know the composition of the portfolio each month. We would also need to buy and sell funds every month with this strategy, which would give high transaction costs. To cope with this, we do the same regression as before, but now we look on the high and low separately. Then we can see if the alpha comes from the buying side or the selling side, see table 13:

Table 13 – Risk strategy buying the 5 HIGH and buying the 5 LOW

	Foreigners		**Locals**	
	5 HIGH	**5 LOW**	**5 HIGH**	**5 LOW**
Beta	0.48006***	0.50290***	0.51003***	0.49607***
	(0.16234)	(0.16738)	(0.16223)	(0.16582)
SMB	0.31030	0.42730*	0.35772	0.38590
	(0.22683)	(0.23387)	(0.22668)	(0.23169)
HML	-0.08392	-0.12199	-0.09798	-0.09946
	(0.19618)	(0.20227)	(0.19605)	(0.20038)
MOM	-0.30687*	-0.30260	-0.27066	-0.35941*
	(0.18247)	(0.18814)	(0.18235)	(0.18638)
Alpha	0.00401	0.00002	0.00038	0.00136
	(0.00763)	(0.00787)	(0.00762)	(0.00779)
Observations	78	78	78	78
R-squared	0.178	0.170	0.180	0.185

In this table we present the coefficients from the regression with the four-factor model when the buying 5 HIGH and buying 5 LOW. All variables are described in section 4.3. Significance at a 10, 5 and 1 per cent level is indicated as *, ** and *** respectively. To cope with possible heteroscedasticity we use the robust function in STATA.

As we can see there is no longer a significant alpha for foreigners, and the locals are still not significant. We can therefore not say which side the significant alpha comes from.

5.5.1 Summary of findings

In the first strategy, where we buy the 5 HIGH and sell the 5 LOW, foreigners generate a statistically significant monthly alpha of 0.00398, while the locals do not. This tells us that after controlling for the different risk profiles, the foreigners still outperform the locals, which indicate foreign investors have an information advantage.

In the second strategy, where we buy the 5 HIGH and buy the 5 LOW, we cannot distinguish which side the significant alpha comes from. At least we find that the significant alpha do not come from the selling side, which would have complicated the approach on different risk profiles.

6. Results, Discussions and Limitations

6.1 Performance Analysis - Alpha and Backward Rolling Beta

The stock market is often viewed as semi-strong efficient, meaning that stock prices reflect all public information, except insider information (Fama 1970). Most studies on this subject find that few funds outperform the reference index after accounting for transaction costs. In other words, most funds do not generate a positive significant alpha i.e. Carhart (1997). Based on this we formulate our first null hypothesis, H_1; Norwegian equity mutual funds do not generate significant positive alpha, excluding transaction costs.

Active portfolio managers believe that the market sometime is mispriced, and they try to earn this return through stock picking and timing. The fund performance is measured against a reference index, typically an index in the same market segment as the main investments in the portfolio. We make use of the four-factor model (Carhart 1997) to evaluate if the funds achieve a significant positive alpha.

Our results show that, in the time period January 1990 to August 2012, most of the Norwegian funds do not produce a positive significant alpha. In fact, only 6 per cent of them are able to get a significant positive alpha, with a monthly mean and median of 0.0043. Taken into account that an investor also need to pay transaction costs, the excess return above the market is marginal. We also construct an EW portfolio of the 32 funds, to see how an average investor performs. In the time periods 1990-2012 and 1990-2002 we find that the average investor receives a significant alpha of -0.00415 and -0.00637. In the time periods 2002-2008, 2006-2012 and 2008-2012 we also find negative alphas, but no significant results. In the last two time periods, we construct a VW portfolio, which did not yield any significant results. This suggests that the average investor do not receive a reasonable return on their investment. We do not have enough evidence to reject hypothesis H_1, hence Norwegian equity mutual funds *do not* generate significant positive alphas, excluding transaction costs.

From our equally-weighted portfolio we find the 12-month backward rolling beta with the four-factor model and compare it to the market price of OSEFX/MSCI. We find that the betas varies more before 2002 than after, which can be a sign of a shift in the average fund manager strategy after the IT-crisis.

6.2 Foreign and Local Investor Behavior

Our data collected from VFF (2013) gave us an insider view on how the capital asset in funds fluctuates, in the time period January 2006 to August 2012. From this we compare our aggregated total capital adjusted with the market price of the OSEFX/MSCI. In January 2006 total capital was 27 Bill NOK, before it steadily decreased to 23 Bill NOK in June 2008 and increased to 32 Bill NOK in December 2009. In this time period, the financial crisis was at its lowest in February 2009 measured in OSEFX/MSCI NOK. We find that the average investor started increasing his investments in June 2008, before the market shifted. Separating the foreigners from the locals reveals that, in the 18 months leading up to December 2009, the foreigners increased their position with 100 per cent while the locals only increased by 30 per cent. Further on, we see that the foreigners are more volatile in changes in capital assets than locals.

6.3 Historic Returns Predictability of Changes in Capital Assets

The foreign and local investor behaviors raise some interesting questions. It seems that foreigners are more volatile than locals when it comes to changes in capital assets. Does this mean that foreigners value the information and opportunities different than locals, and if so, can historic return predict these changes in capital assets? Under the assumption that all investors should have the same information, we developed our second null hypothesis, H_2; Historic returns do not predict larger changes in *foreign* capital assets than locals.

First we evaluate if historic 1-, 3-, 6- and 12-month return can predict total change in capital assets. Our findings imply that after 1-month of positive return TOTP[5] is predicted to decrease with a coefficient of -0.654. Further on, a 3-month period of positive average return predicts that TOTP increases with a coefficient of 1.654. Both are significant within a 99 per cent confidence interval. We find no significant results that historic 6- or 12- month return predicts TOTP.

After splitting up our investors, in foreigners and locals, we find that a positive historic 1-, 3- and 6-month return predicts a coefficient of -0.828, 1.997 and -0.556 in FORP[6]. An increase

[5] (TOTP) Changes in total capital assets
[6] (FORP) Changes in foreign capital assets

in historic 1- and 3-month return predicts a coefficient of -0.683 and 1.564 in LOCP[7]. Both the foreigners and local results are significant within a 99 per cent confidence interval.

We evaluate if the difference between the foreigners and locals is significantly different from zero. We find that the 1-, 6- and 12-months historic return coefficients yield a p-value above 0.10. We therefore *do not reject* our null hypothesis, H_2; hence we cannot distinguish between the foreign and local coefficients.

In the regression with historic 3-month average, we get a Chi-squared of 5.24 which gives us a p-value of 0.02. Our Pearson Chi-squared test tells us that we *can reject* the hypothesis H_2; hence that foreigners and local coefficients are different from each other. This means that in addition to be positive significant by themselves, the difference between foreign and local coefficients is also significantly different from zero. There is strong evidence that historic 3-month return predicts larger changes in FORP than in LOCP, which means that the foreigners chase performance more than locals.

6.4 Changes in Capital Assets Predictability of Return

In the previous section we find evidence that foreigners chase performance more than locals. This leads us to the following question; do FORP predict return better than LOCP? Since all investors should have the same public information, it would be reasonable to assume that there is no difference. To evaluate this, we postulate our third null hypothesis, H_3; Changes in *foreign* capital assets do not predict return better than locals.

First we evaluate if FORP and LOCP can predict 1-month return. Our results show us that FORP can significantly predict 1-month return with a coefficient of 0.015. We find no significant results for LOCP.

When we look at the forward 3-month return, we observe that both the FORP and LOCP have a monthly positive coefficient of 0.040 and 0.014, significant within a 99 per cent confidence interval. As we can see, the foreigners increase their advantage, but LOCP now also predicts return.

The forward 6-month return shows a positive relation between FORP and LOCP in predicting return. FORP and LOCP predict 6-month return with estimated coefficients of 0.034 and 0.008. The FORP (LOCP) is significant within a 99 (95) per cent confidence interval.

[7] (LOCP) Changes in local capital assets

To investigate if the difference between the coefficients from foreigners and locals are different from zero, we again apply the Pearson Chi-squared test.

The forward 1-month return gives us a Chi-squared of 1.85, which yields a p-value of 0.1743. Based on a 10 per cent significance level, we fail to reject the null hypothesis H_3; hence LOCP and FORP coefficients are not different from each other. One thing we can take from this is that foreigners make good use of the available information in a forward 1-month perspective.

In the regressions with forward 3- and 6-month return, we get a Chi-squared of 15.19 and 18.95. Our Pearson test tells us they are different from each other within a 99.99 per cent confidence interval, and we can therefore reject the null hypothesis. The FORP coefficient estimate is not only positive, it is also significant larger than the LOCP coefficient in predicting the 3- and 6-month return. This tells us that there is strong evidence that FORP predicts good performance better than locals. We can therefore eliminate the irrational biases story, since this would have led to bad performance.

6.5 Risk Strategy Analysis

Our findings in the previous section implies that changes in foreign capital assets predicts 3- and 6-month return better than changes in local capital assets. From this we can say that foreigners predicts good performance better than locals, but it do not say anything about the risk they are taking. Once you take into account the different risk profiles, do we still get any differences in terms of performance? From this we developed our final null hypothesis, H_4, which states that foreign investors do not outperform local investors, controlling for risk. To measure this we did a risk strategy analysis, to see if the difference is due to asymmetric information or simply excessive risk taking. After controlling for risk, we see that the foreign portfolio has a statistically significant monthly alpha of 0.00398, while the locals do not. When the foreigners are investing, adjusting for risk, they give you a positive alpha. This suggests that it is not excessive risk taking that gives foreigners an advantage, it is information. We can therefore *reject* the null hypothesis H_4; hence foreigners outperform locals when controlling for different risk profiles.

The approach above is difficult to implement, since we are buying and shorting mutual funds. We cannot short sell a mutual fund. To cope with this, we do a regression of holding the buying *and* the selling funds separate, to see which side generates the positive alpha. We were

not able to find out which side the significant alpha came from. On the other hand, it strengthens our results that the 5 selling funds do not generate a significant alpha.

6.6 Robustness Testing

As a robustness test we also use OSEFX as reference index, and include the remaining 34 Norwegian equity mutual funds that didn't fulfill our restrictions in section 4.4.1. For all the five time periods, we now observe significant alphas more frequently, and they were generally more negative and less positive. Since an investor can invest 20 per cent abroad, one would think that compared to the OSEFX, the investor will gain a higher alpha because of the diversification effect. On the other hand, the differences are rather small.

Out of the 74 Norwegian funds, there were eight index funds. These funds have alphas approximately equal to zero, and almost none of them are significant as expected since they are tracking the index.

As a robustness test we also calculate the correlation between our alternative indices and EW32, the results was as expected, values close to 1. E.g. the MSCI index from Børsprosjektet and the one from MSCI (2013) have correlation on 0.93.

In the historic and forward regressions in part two we play around with winsorizing, and without this adjustment we rarely observe significant coefficients for the independent variables. In addition the R^2 were approximately zero. We find that a limit of 1 per cent gave acceptable results even though it appears extreme outliers' in changes in capital assets. The difference between 1 and 2.5 per cent winsorizing was minimal.

In section 5.5 we hold an investment strategy with long (short) positions in the 5 funds with highest (lowest) change in capital assets. We investigate if we get consistent results implementing 3 HIGH – 3 LOW and 10 HIGH – 10 LOW strategies, but we observe no significant alphas. This means that we cannot conclude that investors generate significant positive alphas from these strategies.

6.7 Limitations and Suggestions for Further Research

We do not include transaction costs, since it proved difficult to find accurate and reliable data. If transaction costs are included, the performance part of the funds can be more nuanced. Even if a fund produces a positive significant alpha, the excess return can be zero or even negative after including the additional costs of trading.

In the time period 2006 to 2012, when we look on investor behavior, we restrict that each fund must have 12 monthly observations, and at least 50 total investors. This is a limitation, and to expand the data material you can include all funds and do the same analysis for the Nordic countries, Europe etc.

Our regressions in the part with foreign and local changes in capital assets do not distinguish between private and institutional investors. To get a more accurate basis for comparison between foreigners and locals, the data can be split between these two investor types and compare local institutional investors with foreign institutional investors.

When evaluating if the foreigners and locals gain a positive significant alpha when accounting for market risk in section 5.5, we only found this for the 5 HIGH – 5 LOW portfolios. We also tried with 3 HIGH – 3 LOW and 10 HIGH – 10 LOW, which did not yield any significant results for alpha. We only did the risk strategy with forward 1-month return. A risk strategy that looks on 3- and 6-month average return can be implemented, but then you need to revise the control variables.

7. Conclusion

This paper investigates how Norwegian equity mutual funds performed in the time period 1990 to 2012, with the main focus on the time period 2006 to 2012, where we try to reveal differences between foreign and local investor behavior.

By using the four-factor model from Carhart (1997), we find that in the time period January 1990 to August 2012, only 6 per cent of the funds are able to generate a significant positive alpha with an annual mean of 5.16 per cent. Our equally-weighted portfolio, consisting of the 32 funds in our research, reveals that an average investor receives a significant annual alpha of – 4.92 and – 7.64 per cent in the time period 1990 – 2012 and 1990 – 2002. This tells us that Norwegian mutual funds are not expected to generate a positive significant alpha, excluding transaction costs.

The adjusted capital assets, constructed from the data from VFF (2013), suggest that foreigners are more volatile when it comes to changes in capital assets than locals, hence foreigners invests differently than locals. Further, we want to investigate if foreigners outperform locals and see if any differences can be explained by irrational biases, different risk profiles or information advantages.

When evaluating if historical returns can predict changes in capital assets, we find strong evidence that historic 3-month return predicts larger changes in foreign capital assets than locals, which tells us that foreigners chase performance more than locals.

Next, we find strong evidence that change in foreign capital assets predicts 3- and 6-month return better than the change in local capital assets. This means that foreigners have an advantage over the locals, and it is *not* due to irrational biases, since this would have given bad performance.

Finally, controlling for different risk profiles, we find that foreigners generates a positive significant alpha, while locals do not. This emphasize that excessive risk taking is *not* the reason why foreigners outperform the locals and suggests that foreign investors have an information advantage.

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Appendix

A 1 – Model: OSEFX/MSCI – Four-factor model – BETA

Fund name	Jan 1990 - Aug 2012	Jan 1990 - Oct 2002	Oct 2002 - Dec 2008	Jan 2006 - Aug 2012	Dec 2008 - Aug 2012
AFB Aktiv	1.29378***	1.37501***	1.15862***	1.18371***	1.23092***
AFB Kapital	1.22296***	1.18542***	1.16744***	1.18180***	1.22468***
AFB Norge	1.20128***	1.20959***	1.13189***	1.15998***	1.16225***
AFB Norge Pluss	1.16886***	1.15929***	1.12950***	1.15913***	1.16412***
Carnegie Aksje Norge	1.12695***	1.04701***	1.12336***	1.12438***	1.16009***
Delphi Norge	1.11938***	1.16460***	1.01199***	1.06847***	1.13918***
Delphi Vekst	1.12146***	1.18070***	1.00456***	1.05828***	1.13589***
DF Norge 1	1.20247***	1.28030***	1.05411***	1.06065***	1.06733***
DF Norge 2	1.13088***	1.08884***	1.10650***	1.12824***	1.15429***
DF Norge Vekst	1.12781***	1.07272***	1.11435***	1.13134***	1.15750***
DNB 1	1.10717***	1.10039***	1.06149***	1.07005***	1.08471***
DNB 3	1.09520***	1.11254***	1.06081***	1.07066***	1.08435***
DNB Avanse 1	1.15347***	1.19050***	1.10668***	1.07641***	1.13734***
DNB Avanse 2	1.17939***	1.11306***	1.16168***	1.25039***	1.25517***
DNB Selektiv 1	1.11480***	1.07997***	1.04912***	1.04117***	1.17117***
Handelsbanken Norge	1.12421***	1.05891***	1.10391***	1.15885***	1.20243***
Holberg Norge	1.11813***	1.07662***	1.12664***	1.12877***	1.16054***
NB-Aksjefond	1.14506***	1.14034***	1.10846***	1.11123***	1.14395***
Nordea Avkastning	1.21601***	1.13334***	1.20270***	1.11568***	1.14555***
Nordea Kapital	1.13672***	1.11096***	1.12767***	1.11945***	1.14119***
Nordea SMB	1.14802***	1.18891***	1.11951***	0.98574***	1.04027***
Nordea Vekst	1.21542***	1.20356***	1.16966***	1.13442***	1.19300***
ODIN Norge	1.03036***	1.34009***	1.01861***	1.03948***	1.06235***
Orkla Finans Fund	1.03082***		1.02969***	1.03082***	1.05675***
Pareto Aksje Norge	1.32406***	1.40728***	1.21392***	1.13301***	1.21560***
Pareto Verdi	1.23014***	1.29488***	1.15520***	1.05167***	1.10608***
Storebrand Aksje Innland	1.09720***	1.13621***	1.05911***	1.05548***	1.05143***
Storebrand Norge	1.17198***	1.15798***	1.13267***	1.14890***	1.17171***
Storebrand Vekst	1.22797***	1.27677***	1.12168***	1.12486***	1.17939***
Storebrand Verdi	1.02983***	1.09134***	0.99578***	1.01881***	0.99912***
Terra Norge	1.17299***	1.08855***	1.07435***	1.18275***	1.22736***
WW Norge Verdi	1.17247***		1.11936***	1.15385***	1.20960***
Equally Weighted portfolio	1.17437***	1.18413***	1.14135***	1.11962***	1.11790***
Value Weighted portfolio				1.08069***	1.11390***

A 2 – Model: OSEFX/MSCI – Four-factor model – SMB

Fund name	Jan 1990 - Aug 2012	Jan 1990 - Oct 2002	Oct 2002 - Dec 2008	Jan 2006 - Aug 2012	Dec 2008 - Aug 2012
AFB Aktiv	0.23225***	0.52136***	-0.01926	0.11384**	0.05671
AFB Kapital	0.23260***	0.61282***	0.00873	0.10903**	0.04904
AFB Norge	-0.00889	0.03050	-0.13320**	0.08075**	0.04391
AFB Norge Pluss	-0.00972	0.11833*	-0.13469**	0.07963**	0.04698
Carnegie Aksje Norge	-0.04702	0.01055	-0.14575**	0.10058***	0.06873
Delphi Norge	0.25403***	0.32553***	0.11020	0.04971	0.07215
Delphi Vekst	0.24711***	0.28981**	0.12387	0.01165	0.06028
DF Norge 1	-0.03197	0.06930	-0.19188***	0.02010	0.02933
DF Norge 2	-0.03566	0.06247	-0.19603***	0.01904	0.02894
DF Norge Vekst	0.34952***	0.59630***	0.09641	0.00030	0.00895
DNB 1	-0.05410**	-0.00874	-0.18875***	0.12500***	0.07099
DNB 3	-0.08577***	0.01969	-0.19278***	0.12434***	0.06991
DNB Avanse 1	-0.03040	0.03759	-0.17966***	0.02242	0.00158
DNB Avanse 2	-0.02984	0.04598	-0.16782***	0.02224	0.00107
DNB Selektiv 1	-0.01546	0.15672*	-0.14976**	0.11280***	0.06781
Handelsbanken Norge	-0.00668	0.07311	-0.16040***	-0.02031	-0.11938*
Holberg Norge	0.11274*	0.11017	0.04973	-0.05491	-0.10211
NB-Aksjefond	0.03437	0.01664	-0.00613	-0.05873	-0.08897
Nordea Avkastning	-0.05550**	-0.03266	-0.11058**	0.03298	0.01923
Nordea Kapital	-0.01101	0.11125	-0.12684**	0.02782	0.01338
Nordea SMB	0.36049***	0.48371***	0.22683**	-0.09998	-0.17814
Nordea Vekst	-0.03367	-0.00452	-0.09198	0.02867	0.02571
ODIN Norge	0.21954***	0.23258***	0.21976**	-0.09301	-0.09658
Orkla Finans Fund	0.03664	0.10092**	-0.09421	-0.00190	0.00739
Pareto Aksje Norge	0.03640	0.23423	0.02709	-0.04775	-0.03902
Pareto Verdi	0.12265*		0.21838	-0.04872	-0.03804
Storebrand Aksje Innland	-0.09038***	0.02718	-0.19556***	0.11441***	0.08147*
Storebrand Norge	-0.01236	0.03303	-0.12917**	0.04405	0.05180
Storebrand Vekst	0.24767***	0.34332***	0.02547	-0.12418	-0.15324
Storebrand Verdi	-0.16064***	0.00296	-0.27214***	0.16069***	0.07712
Terra Norge	0.04775	0.15130*	-0.20133***	0.02205	-0.10175
WW Norge Verdi	0.07510		0.02852	-0.08381*	-0.10962*
Equally Weighted portfolio	0.05288**	0.09427***	-0.04200	-0.00793	-0.01120
Value Weighted portfolio				0.00246	0.00753

A 3 – Model: OSEFX/MSCI – Four-factor model – HML

Fund name	Jan 1990 - Aug 2012	Jan 1990 - Oct 2002	Oct 2002 - Dec 2008	Jan 2006 - Aug 2012	Dec 2008 - Aug 2012
AFB Aktiv	-0.09017*	-0.06194	-0.06636	-0.01939	0.01195
AFB Kapital	-0.04076	-0.02572	-0.01250	-0.00620	0.03097
AFB Norge	0.01746	0.04359	-0.11779**	0.00978	0.03543
AFB Norge Pluss	-0.01876	0.02825	-0.11833**	0.00663	0.02830
Carnegie Aksje Norge	-0.12790***	-0.19439***	-0.08622	-0.03837	-0.02563
Delphi Norge	-0.14355***	-0.23780***	0.00420	0.06611	0.03114
Delphi Vekst	-0.18435***	-0.36457***	-0.02694	0.09199	0.07672
DF Norge 1	-0.00366	0.03180	-0.05631	0.02907	-0.01320
DF Norge 2	-0.00134	0.03805	-0.05466	0.02902	-0.01573
DF Norge Vekst	-0.15563**	-0.24786**	0.10277	0.02189	0.02033
DNB 1	-0.03338*	-0.01374	-0.12173**	-0.02732	-0.02748
DNB 3	-0.03921	0.01485	-0.12559**	-0.02777	-0.02732
DNB Avanse 1	-0.00271	0.01794	-0.05722	0.01259	0.00644
DNB Avanse 2	-0.00261	0.01763	-0.04509	0.01241	0.00660
DNB Selektiv 1	-0.02009	0.04490	-0.06873	-0.02321	-0.03364
Handelsbanken Norge	-0.02245	-0.00127	-0.11814**	-0.02563	0.03486
Holberg Norge	0.04406	-0.14941	0.03340	0.15490**	0.17993***
NB-Aksjefond	0.06591**	0.01393	-0.01692	0.19848***	0.22977***
Nordea Avkastning	-0.00680	0.01343	-0.08703*	0.02019	0.01704
Nordea Kapital	-0.02839	0.00533	-0.08706*	0.01298	0.00830
Nordea SMB	0.10830*	-0.01192	0.18532**	0.25403***	0.29776**
Nordea Vekst	-0.01304	0.00053	-0.09793	0.03566	0.04261
ODIN Norge	0.16046***	0.12337**	0.23519***	0.14381*	0.18330**
Orkla Finans Fund	0.00897	0.02432	-0.05401	0.03714	0.04765
Pareto Aksje Norge	0.15424***	0.37417	0.12224	0.09779	0.14966**
Pareto Verdi	0.09741		-0.06604	0.09741	0.14854**
Storebrand Aksje Innland	-0.05740**	-0.00076	-0.12255**	-0.05544	-0.04482
Storebrand Norge	-0.00601	0.00940	-0.07933	0.01405	0.01281
Storebrand Vekst	-0.29719***	-0.39294***	-0.09561	0.02544	0.05933
Storebrand Verdi	0.03728	0.18690**	-0.09796	-0.04885	-0.01345
Terra Norge	-0.09751**	-0.24681***	-0.12349**	0.12972**	0.21351***
WW Norge Verdi	0.12503***		0.01614	0.18493***	0.21611***
Equally Weighted portfolio	-0.02847	-0.03577	-0.03807	0.04509	0.03840
Value Weighted portfolio				0.05055	0.07175

A 4 – Model: OSEFX/MSCI – Four-factor model – MOM

Fund name	Jan 1990 - Aug 2012	Jan 1990 - Oct 2002	Oct 2002 - Dec 2008	Jan 2006 - Aug 2012	Dec 2008 - Aug 2012
AFB Aktiv	0.10959***	0.07227	0.10983*	0.11384**	0.05671
AFB Kapital	0.07784*	-0.03695	0.09228	0.10903**	0.04904
AFB Norge	0.05855***	0.04420	0.08035**	0.08075**	0.04391
AFB Norge Pluss	0.05145**	-0.00536	0.07390**	0.07963**	0.04698
Carnegie Aksje Norge	0.11723***	0.10119*	0.10132**	0.10058***	0.06873
Delphi Norge	0.05312	0.09084	-0.06895	0.04971	0.07215
Delphi Vekst	0.05656	0.15000	-0.07601	0.01165	0.06028
DF Norge 1	-0.03932	-0.10175*	-0.01050	0.02010	0.02933
DF Norge 2	-0.03972	-0.09802*	-0.01301	0.01904	0.02894
DF Norge Vekst	0.14751***	0.18347*	0.11678**	0.00030	0.00895
DNB 1	0.04790**	0.01872	0.07138*	0.12500***	0.07099
DNB 3	0.02850	-0.05362	0.07258**	0.12434***	0.06991
DNB Avanse 1	0.00023	-0.03257	0.01699	0.02242	0.00158
DNB Avanse 2	0.01924	-0.01163	0.04112	0.02224	0.00107
DNB Selektiv 1	-0.03591	-0.18143***	0.01874	0.11280***	0.06781
Handelsbanken Norge	0.03946	0.03412	0.07429**	-0.02031	-0.11938*
Holberg Norge	-0.01938	-0.02790	0.04451	-0.05491	-0.10211
NB-Aksjefond	-0.05188*	-0.07685*	-0.02920	-0.05873	-0.08897
Nordea Avkastning	0.00584	-0.00476	-0.01297	0.03298	0.01923
Nordea Kapital	0.02026	0.00708	-0.00834	0.02782	0.01338
Nordea SMB	0.00496	-0.08782	0.09427	-0.09998	-0.17814
Nordea Vekst	0.00270	-0.00915	-0.01802	0.02867	0.02571
ODIN Norge	-0.03126	-0.08129	0.08370	-0.09301	-0.09658
Orkla Finans Fund	0.03569	0.02725	0.03206	-0.00190	0.00739
Pareto Aksje Norge	0.10305**	0.20170	0.17963***	-0.04775	-0.03902
Pareto Verdi	-0.04872		-0.10103	-0.04872	-0.03804
Storebrand Aksje Innland	0.04792*	-0.02090	0.07294**	0.11441***	0.08147*
Storebrand Norge	0.02415	0.00427	0.01697	0.04405	0.05180
Storebrand Vekst	0.06548	0.18906**	-0.09413	-0.12418	-0.15324
Storebrand Verdi	0.10040***	-0.04291	0.23550***	0.16069***	0.07712
Terra Norge	0.02482	-0.01605	0.06434	0.02205	-0.10175
WW Norge Verdi	-0.02815		0.01063	-0.08381*	-0.10962*
Equally Weighted portfolio	0.04908**	0.04566	0.02349	0.02220	0.01567
Value Weighted portfolio				0.01205	-0.01062

A 5 – Transaction costs per month

Fund name	Average total cost per month	Minimum buy (NOK)
AFB Aktiv	0.00127	25 000
AFB Kapital	-	-
AFB Norge	0.00101	25 000
AFB Norge Pluss	0.00058	10 000 000
Carnegie Aksje Norge	0.00100	1 000
Delphi Norge	0.00167	1 000
Delphi Vekst	0.00103	1 000
DF Norge 1	0.00167	1 000
DF Norge 2	0.00104	50 000
DF Norge Vekst	0.00146	1 000
DNB 1	0.00150	1 000
DNB 3	0.00084	2 500 000
DNB Avanse 1	0.00151	1 000
DNB Avanse 2	0.00100	1 000 000
DNB Selektiv 1	0.00168	1 000
Handelsbanken Norge	0.00167	1 000
Holberg Norge	0.00125	3 000
NB-Aksjefond	0.00189	1 000
Nordea Avkastning	0.00167	100
Nordea Kapital	0.00083	1 000 000
Nordea SMB	0.00167	100
Nordea Vekst	0.00167	100
ODIN Norge	0.00167	3 000
Orkla Finans Fund	-	-
Pareto Aksje Norge	0.00042	100 000 000
Pareto Verdi	0.00168	200 000
Storebrand Aksje Innland	0.00050	10 000 000
Storebrand Norge	0.00125	100
Storebrand Vekst	0.00167	100
Storebrand Verdi	0.00167	100
Terra Norge	0.00183	300
WW Norge Verdi	0.00189	300

(Morningstar 2013)