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Ownership Structure and Investor Behavior

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1 Abstract

The purpose of this study is to investigate the trading behavior of five major investor groups on the Norwegian stock exchange namely governments, individuals, financial firms, non-financial firms, and foreign investors. Previous research indicates that some investor types move prices towards fundamentals. This result is consistent with the hypothesis that these investors are better equipped or informed than others which might lead them to reap greater payoffs in the long run.

In this study we uncover that individual investors prefer stocks with high return, and correspondingly to pick stocks with higher risk. We also find that foreign investors have a positive correlation with returns, and infer that this result indicates their ability to choose winning stocks on the basis of superior information. These findings are in line with previous research, but have been extended by looking at several investor types at once. However, our dataset does not allow us to find any clear pattern concerning financial firm behavior.

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2 Introduction

The motivation to write this paper lies in the emergence of the importance of behavioral finance and empirical anomalies discovered in recent research. Our dataset allows us to investigate the holdings among different investor groups on the Oslo Stock Exchange, and their relationship with stock returns and volatility. Furthermore we investigate whether or not the specific behavior of the different investor groups can be viewed as rational or whether behavioral finance related theories better explain the results of our empirical work. By analyzing the role of ownership structure we hope to increase the understanding of how different investors influence stock prices both in terms of returns and volatility. This should lead us to understand the major dynamics linked with great equity market fluctuations and the causes of market volatility.

Traditional finance theory promotes theories of the efficient market hypothesis and rational investors. A rational investor is in this paper defined as an agent who has clear preferences and models uncertainty through expected values. He weighs the feasible actions and always performs with the purpose of obtaining the optimal outcome for himself. The most important assumptions underlying the efficient market hypothesis are completeness, transitivity, independence axiom, and perfect information. Together, these assumptions form the behavior of the agent. The assumptions vary in terms of feasibility, such as the assumption that individual investors operating alone in a home office hold as much information as for instance a large investment bank as Goldman Sachs is believed to hold. Although not all information collected by Goldman Sachs may be of relevance or of significant value, we find the assumption intangible.

From rational choice theory, Eugene Fama (1970) drew the efficient market hypothesis stating that financial markets reflect all available information through prices on assets, and instantly change to reflect new relevant information. The resulting consequence is an inability by any investor to outperform the market through anything other than information unknown by the market or sheer luck. The efficient market hypothesis does not require all agents to be rational, but that on average they have rational expectations leading the market as a whole always being correct. This allows for the possibilities that while some investors overreact, others underreact to new information.

Empirical analyses have found several problems with the efficient market hypothesis, causing behavioral finance economists to propose psychology based theories on how social and emotional factors affect market prices. For example, traditional finance theory has failed to explain why stock market bubbles have occurred in the past. This leads to the possibility that biased individual investors and rule-bound institutions may create prices that deviate significantly from fundamental values. Such deviations may create good trading opportunities for more sophisticated or better informed investors. Explanations for observed market outcomes contrary to rational expectations and market efficiency include, within economic behavior anomalies as herding, overconfidence, and smart money vs. noise trader models.

Previous studies argue that individual investors are less sophisticated and more risk averse than institutional investors (Dennis and Strickland, 2002). Hence, it is due to these traits that it is the individual investor who reacts and sells in times of financial distress, causing sharp drops in equity prices. Other research concludes that even though institutional investors are perceived as more sophisticated, they usually have a short investment horizon. Institutional investors often also portray what can be described as a herd mentality, in other words meaning that they sell when their peers are selling, which may occur during sharp market decline. Dennis et al. (2002) amongst many also present the findings that a risk-averse manager would rather follow the herd than go out on a limb, even if the manager's information should lead him towards a different action.

Even though most of the prior empirical findings have been concentrated on these two types of investors, there has been research on the influence of other investor types as well. Investigation on the behavior of foreign investors have found that they often employ a momentum strategy (Grinblatt and Keloharju, 2000), but without significantly influencing volatility in the market (Coppejans and Domowitz, 2000). Other research argues that such strategies contribute to a destabilizing effect on the financial markets (Dornbusch and Park, 1995).

Our results indicate that foreign investors have a positive relation to stock returns and a negative relation to volatility. We connect these results to theories of behavioral finance by analyzing the following month's return. The findings are consistent with foreign investors possessing information allowing them to exploit under- and overpricing in the market. This knowledge might lead foreign

investors to herd by reacting to the same information about fundamental values and drive prices towards these new and more correct values. The end result is behavior that influences financial markets by stabilizing them and making them more efficient. Although spurious herding is a behavioral finance theory, one should be careful with branding foreign investors as irrational.

Furthermore, we find that individuals have a negative relation to stock returns and a positive relation to volatility, which is the opposite of what we found concerning foreign investors. Previous studies have found this behavior to be a consequence of bounded rationality and the notion that individuals are attracted to buying and selling stocks with high volume and return statistics, thereby contributing positively to volatility. Our results also coincide with theories of smart money – noise trader models where individuals behave as noise traders that react to variables not connected to the fundamental values of stocks. High participation by these signals lower expected returns and coincidently lower participation by smart money. Although these theories are based on irrational behavior, individuals can still be perceived as rational, as the observed behavior may simply be a consequence of less sensitive demand curves like Ødegaard (2009) argues.

3 Literature review

Most of the relevant theoretical and past empirical studies are concentrated around institutional investors and their behavior, as they are often considered to be sophisticated investors. In this paper we concentrate on several investor types.

In his working paper, Ødegaard (2009) studies the relationship between changes in the ownership fractions of different investor groups and the return on stocks. The dataset, much like ours, consists of monthly flows from five distinct investor groups on the Norwegian Stock Exchange. In addition to confirming the findings of Sias, Starks, and Titman (2006) – to be presented later, he also finds that domestic institutional and foreign investors seem to have similar effects on return, since foreign investors are also institutional investors. Furthermore, Ødegaard (2009) discovers a pattern where individuals and non-financial firms act as offsetting investor groups, with their ownership fractions negatively correlating with returns. An interpretation of this behavior could provide conclusions of irrational behavior, but he argues that it may as well be the result of individuals and non-financial firms having a less sensitive demand curve.

Badrinath, Kale, and Noe (1995) find that cross-autocorrelations in equity returns may be induced when interest is shown by institutional investors, and that the level of institutional ownership along with size, may play a significant role in determining cross equity price dynamics. Specifically, returns on stocks with high levels of institutional ownership lead by as much as two months the returns on stocks with lower levels of institutional ownership. These findings of institutional ownership leading to higher returns are confirmed by Sias et al. (2006) as they find strong correlation between changes in institutional ownership and the quarterly, monthly and even weekly returns from the same period. This result makes sense intuitively as institutional investors as a group can contribute to buy the price up by adding to their holdings. Here it is vital to stress the importance of recognizing that the demand of stock from one group of investors must be offset by the supply from another group of investors. If the effect from non–institutional selling investors does not nullify the increased returns from institutional investors buying stock, this may be due to institutions being better informed than others. This information will then be portrayed through their trading. Edelen and Warner (2001) also find similar evidence. Specifically, mutual funds primarily show a positive relationship between monthly flows and market returns. They also show

that returns appear to follow flow within the day, consistent with causality running from flow to return.

Boyer and Zheng (2009) show the relation between aggregate stock returns and net purchases of equity from different investor groups. Their sample period is from 1952 to 2004, but has been divided into two sub periods since they differ greatly in average returns and equity ownership across investor groups. Using a correlation test and regression analysis they find strong evidence that, especially for the latter period, the relation between quarterly returns and flows are positive and significant for mutual funds and foreign investors. They claim that a positive correlation between investor flows and stock market returns is consistent with the following ideas: 1) the investor group drives price changes through non-informational trades or 2) the investor group has superior information relative to others and affect prices through informed trading, and thus confirming the findings of Sias et al. (2006)

When it comes to past studies on volatility characteristics, which is the second part of our study, the articles augmenting for institutional investors contributing to stabilization or destabilization of asset prices are numerous and inconclusive. On the one hand, it is possible to argue that individual investors are less sophisticated and more risk averse than institutions. The individual investor is the one that reacts and sells during a sharp market drop. Alternatively, arguments could be that institutional investors, although more sophisticated, have shorter time-horizons. This leads them to herd together with their peers and sell during a market decline because “an unprofitable decision is not as bad for reputation when others make the same mistake”. In that case, institutions add to market volatility, but herding and positive feedback trading may also lead to faster price adjustment towards fundamental values. Then institutions contribute to more efficient and stable markets.

On the other hand Sias (1996) surprisingly finds evidence that institutional investors are associated with riskier securities. The direction of the relationship between institutional investors and volatility indicate that increased institutional holdings result in higher volatility. Earlier academic literature suggests an opposite relationship with institutional investors playing a stabilizing role in financial markets. For one, institutions are governed by “Prudent Man” rules and thus cannot place a higher fraction of their capital in high-volatility stocks.

Second, a higher degree of institutional ownership implies a more effective information gathering and assessment. Finally, institutional investors are regarded and probably are more rational than individual investors. The results of Sias were therefore inconsistent with academic theory at that time, but have later gotten support from an article by Dennis et al. (2002). They concluded that institutional investors contribute to market volatility. The results from this analysis were that institutional investors sold off more than individual investors causing more negative returns for stocks. Correspondingly, institutional investors also bought more than individual investors when stock prices soared. Another interesting result from this article is that after the event of a large market drop, the abnormal returns continued in the same manner. This is highly relevant since instead of institutions simply selling off on the day of the event, which could be a result of prices adjusting to their new fundamental values and thus making the markets more efficient, the evidence of abnormal returns following the event of a large market drop indicate driving prices below their fundamental values. The findings are consistent with the idea that institutions herd together and use momentum of the day to contribute to market volatility.

Bohl and Brzeszczynski (2006) find evidence of institutional investors' behavior stabilizing stock prices when analyzing the introduction of Polish pension funds on the Polish stock market. Their view is that institutional investors are informed investors who speed up the adjustment of stock prices to new information, and thereby making the financial market more efficient. Also, institutional investors may stabilize stock prices by countering individual investors' irrational behavior. Cohen, Gompers, and Vuolteenahoo (2002) also argue for a stabilizing effect of institutional ownership. Their findings conclude with institutions responding positively to cash-flow news by buying shares from individual investors and exploiting an under-reaction pattern. This indicates that institutional investors push stock prices towards fundamental values, and therefore exhibit a stabilizing, rather than a destabilizing effect.

Rubin and Smith (2009) argue that the relation between firm-level volatility and institutional ownership depends on three separate factors being 1) institutional sophistication, 2) institutional preference for low volatility, and 3) institutional increased turnover levels.

Coppejans et al. (2000) addresses the impact of foreign ownership on price volatility. Their analysis of cross-listed stock series yields results illustrating an increase in variance of returns following international cross-listing. While previous studies concluded with the increase in variance resulting from an increase in information, their analysis is able to separate the effect into volatility due to cross-listing, net of any volume and liquidity effects. In other words they find that foreign ownership does not affect volatility in absence of cross-listing. The same results are what Choe, Kho, and Stulz find in their analysis of the Korean market in 1999. In addition to finding clear tendencies of herding and positive feedback trading, and claiming that foreign investors are mainly institutional, no evidence is found of whether or not their trading behavior negatively influences the stability of asset prices.

4 Data

Our data is collected from three sources. Our main source is an extraction from Verdi Papir Sentralen (VPS) and covers aggregated ownership data from 2000 to 2007, which is presented on a monthly basis. This extraction was provided to us by BI the Norwegian School of Management. VPS is the Norwegian Central Securities Depository, and its main task is to develop and maintain a reliable, efficient infrastructure for the securities market. We chose to study this time period as it represents both a bear and bull market. On the other hand, this time phase also covers events that might be non-reoccurring, such as the 9/11 terrorist attacks on the World Trade Center.

Our dataset differentiates between five distinct investor types and show their aggregate holdings of specific companies that have been listed on the Norwegian Stock Exchange. The different investor types are:

- Government
- Individual
- Financial firm
- Non Financial firm
- Foreign investor

We have decided to create a sample that resembles the OBX index by focusing on companies that at some point during our sample period have been included in the OBX index, and been listed on it for more than 3 months. This left us with a time series that runs for 91 months with a total of 2749 monthly observations. Not every company is present for the whole time period since some companies were not introduced on the stock exchange until later years. The reason we have chosen the companies listed on the OBX is mainly due to the fact that these are the largest and most liquid stocks on the Norwegian Stock Exchange, and therefore they will be the most representational for our research. Since some companies have been delisted and new ones have been included on the OBX we ended up with 39 different companies.

The companies that have been delisted have usually been acquired by another domestic or foreign company. Usually when a public listed company is acquired, a premium over the current market price has to be paid – and this often leads to a price hike. After the offer has been listed the price will eventually stabilize as the

acquiring firm starts to gather more shares. This development might give a biased result towards a certain type of ownership and returns.

The other source of data we have used is Thompson's DataStream, where we collected the stock prices of these companies over the given period. This data was then used to calculate returns and standard deviation of the returns, which again was used as an indicator of risk concerned with the company equity. We also collected data concerning the daily returns and volatility of the OBX, in addition to the amount of debt and market capitalization of the different companies listed on the index.

The third source we have used is Oslo Børs homepage. Here we have extracted data concerning the Fama and French 3 factor model, and then in particular the SMB and HML variables.

4.1Variables

4.1.1 Dependent variables

Return: Return variable show the monthly return of each month. This variable is the dependent variable throughout the first part of this study.

Volatility: Volatility variable has been generated by calculating the annual standard deviation of daily log returns presented on a monthly basis. This variable is the dependent variable throughout the second part of this study.

4.1.2 Independent variables: Ownership fractions

The focal point of our study is the variable Ownership. All companies listed on the Norwegian Stock Exchange must register their outstanding equity with VPS by law, and every transaction is electronically monitored and recorded. The only exception to this law is foreign investors, who are permitted to use a nominee account with an international securities dealer. Here only the aggregate of the nominee account are registered at VPS. At each date we are able to observe the number of stocks owned by every owner type. While this data is made anonyms, each owner is given a unique owner code. This code permits us to observe the owner groups' holdings over time. Due to this type of registration we will get four types of domestic investors, while only getting one foreign investor which may consist of the four domestic types.

Government variable consists of every type of state ownership on the Norwegian Stock Exchange, which is through both direct ownership, and public pension funds.

Financial firm variable consists of private banks, insurance companies, pension funds, and mutual funds. We have not been able to distinguish between these different types of investors, and they are treated as a homogenous group. We are aware that these investors might behave in quite diverse manners, and portray different characteristics.

Non Financial Firm variable consists mainly of Norwegian companies, which can be divided into 2 subgroups. The first group includes industrial corporations and their strategic investments, while the other group is high net wealth individuals operating on the stock exchange through a holding firm.

Individual variable is private persons living in Norway conducting transactions on the Norwegian Stock Exchange.

Foreign investor variable are investors not registered as a Norwegian entity, and consists of all the 4 aforementioned variables registered outside of Norway. As mentioned these cannot be distinguished and are therefore treated as a homogenous group. Based on prior studies which have been conducted (Bøhren and Ødegaard, 2001) we will assume that this group mainly consists of foreign institutional investors.

4.1.3 Control Variables

Leverage: This variable consists of total long-term and short-term debt over market value of common equity. This is a good variable to use along side of volatility when considering the riskiness of the company.

Market capitalization: This variable consists of the amount of outstanding shares multiplied by the share price. This variable is a good indication when considering risk, as previous research has discussed the size effect and its relation to risk.

Excess market return: This is one of three factors in the Fama and French three factor model. Excess market return is calculated as market return (OBX return) minus the risk free rate (3 month NIBOR).

SMB factor: This is one of three factors in the Fama and French three factor model. SMB shows the spread in returns between small and big sized firms. The size of the firm is based on its market capitalization.

HML factor: This is one of three factors in the Fama and French three factor model. HML shows the spread in returns between value and growth stocks. HML argues that value stocks outperform growth stocks.

5 Methodology

Past studies have usually concentrated on institutional investors and their impact on equity prices. As discussed earlier prices get a hike when institutional investors as a group increase their holdings, and that equity prices move in the same direction as the stocks institutional investors increase or decrease their holdings in.

We will in this paper investigate the following hypothesis: Observed behavior is driven by informed traders moving prices toward their fundamental value, alternatively the observed behavior is a result of herding, correlated trading by certain investor groups pushing prices temporarily away from fundamentals.

Sias et al. (2006) have tried to explain these effects by 3 different possibilities. The first 2 possibilities are described as a temporary liquidity effect and/or finite elasticities. Their third explanation, which is most relevant to our hypothesis, is that some investor types are better informed than others, and that this information is revealed through their trading.

To conduct this analysis we first look for indications of behavior through a cross sectional analysis by dividing the companies in our dataset into three groups. We rank the companies by the average return they have achieved in our sample period and place them in the corresponding group they belong to. Group 1 then consists of companies that have achieved a relative high return compared to the other companies in our dataset. Correspondingly group 3 consists of companies that have achieved a relative poor return compared to the other companies in our dataset. This way we are able to showcase the average ownership fractions for the different groups. We run similar cross sectional analyses with respect to volatility, market capitalization, and leverage.

Furthermore we compare the return on the stock and a measurement of demand from the different investor types. The demand will be measured by the amount of the security that is held by the different investors. Changes in this will indicate changes in demand. Price pressure from institutions is a likely explanation for contemporaneous co-movement between these variables. Whether price pressures from institutions is due to correlated trading moving prices away from fundamentals, or whether informed traders move prices towards fundamentals is tested by analyzing the following month's returns. If the price movements are the

results of temporary changes with prices moving away from fundamentals, we would expect to see prices moving back to their initial basis. We would in that case expect to see an opposite relation in comparison to our initial regression. If however prices are moving towards fundamentals, the relation should remain the same. The latter result is in line with the expectation of institutional investors moving prices towards fundamentals, or in other words that institutional investors contain information that enables them to exploit under- or overpricing in the market.

To test the relationship between the different owner types and their returns, we conduct an OLS regression, where returns are set as the dependent variable and the changes in the holdings of the different owner types are set as the independent variables.

$$Return_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_t + \varepsilon$$

$$Return_t = \alpha + \beta_1 \Delta Government_{t-1} + \beta_2 \Delta Individual_{t-1} + \beta_3 \Delta Financial_{t-1} + \beta_4 \Delta International_{t-1} + \beta_5 \Delta NonFinancial_{t-1} + \varepsilon$$

To test for the robustness of our OLS regression we include the three Fama and French factors since these are widely known as significant return contributors.

$$Return_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_t + \beta_6 Excess\ market\ return_t + \beta_7 Size\ (SMB)_t + \beta_8 Book - to - market\ equity\ (HML)_t + \varepsilon$$

We also intend to study the relationship between volatility and investor holdings. We start out exploring investor preferences by conducting a cross sectional analysis as aforementioned. This offers an understanding of what preferences the different investor groups have. The average holding of each investor group in the portfolios will give us an indication of a relationship. An investor group with a high average holding in the companies with highest volatility will indicate that this investor group has a preference for high volatility.

In order to confirm the patterns indicated in the cross-sectional analysis we will conduct an OLS regression also similar to the one where returns were the dependent variable. If any of the ownership groups have an influence on volatility we expect to see a contemporaneous positive or negative relationship. Here we used standard deviation as the dependent variable and the changes in the holdings of the different owner types as independent variables.

$$Std\ dev_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_t + \varepsilon$$

To test the robustness of our OLS regression we include company market capitalization and company leverage ratio as risk factors.

$$Std\ dev_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_t + \beta_6 Market\ cap_t + \beta_7 Leverage\ ratio_t + \varepsilon$$

6 Results

6.1 Descriptive statistics

Variable	N	Min	Max	Mean	Std. Dev
Return	2749	-0.797	1.683	0.019	0.155
Std. Dev	2698	0.023	3.587	0.436	0.295
Government	2749	0.000	82.562	13.401	21.147
Individual	2749	0.187	50.468	8.413	9.893
Financial	2749	0.394	87.596	16.041	11.069
International	2749	1.056	93.990	43.502	24.046
Nonfinancial	2749	0.172	80.141	18.644	19.860

Table 1. Descriptive Statistics. This table gives a sample overview of the different investor holdings. N = Number of observations. Min = Lowest observation. Max = Highest observation. Mean = Average of all observations. Std. Dev = Volatility of observations.

From the descriptive statistics of our dataset we can see that ownership among the different investor groups is dominated by foreign investors with an aggregate ownership fraction of 43.50 %, while individual investors constitute an average ownership fraction of 8.41 %. Given the fact that foreign investors have considerably increased their stake in the Norwegian stock market during the past years, the results do not come as a complete surprise. All investor groups are also at some stage represented with a very small and very large aggregate holding in a respective stock, ranging from around 1 % to between 80 % and 90 %. Individuals are the only exception with a maximum holding of 50 %. There can be several explanations for this, but the most viable one is that individual investors seldom are the majority owners in a company, and that there usually are some big institutional investors that dominate. The scenario with huge ownership of International/Financial/Nonfinancial often occurs during a takeover process, which can last several months. On the other hand the Norwegian government takes on two different roles when it invests. It sometimes acts as a normal investor, going after the highest riskadjusted return, but on the other side it often takes a more strategic role. This role is often taken upon when the company is seen as an important asset for the Norwegian economy, and due to this the government can get quite skewed ownership. The maximum and minimum monthly returns and standard deviations are at some points extreme, but their averages are close to what other studies have found in the past. All descriptive statistics are averages and has not been weighted according to the company's market capitalization or any other factor for that matter.

6.2 Cross section analysis

To get an indication of what preferences the 5 distinct investors we are studying have, we have run some cross sectional analyses to investigate their behavior and characteristics. The first analysis we conducted was on what kind of return the different investor types expected. To simplify, we have assumed that the return they achieved was the current best estimate available to them.

To conduct our cross sectional analysis we first divided the companies in our test period in 3 different groups, ranked with regards to their achieved return. Group 1 is the group with the highest return, and group 3 is the group with the lowest return. The results can be seen in table 2. The table shows that foreign investors and individual investors are the ones that have an overweight in the companies that have yielded the highest returns, while the government has a clear overweight in the companies that have yielded the lowest return. These returns have not been adjusted for risk, and therefore we feel it cannot be concluded if these returns have been achieved due to stock picking ability or just due to the fact that the different investors have different methods of perceiving risk. Investors might comprehend the riskiness of a company in different manner, and thus assemble portfolios with different levels of risk. Due to this they will then achieve the returns according to the risk connected with their investments, which may vary. The other investor groups do not show a clear indication of which portfolio they belong too, and the preferences they have.

Return Owner type	Group 1	Group 2	Group 3
Government	4.1277	15.1823	26.619
Individual	12.9792	6.1904	4.7172
Financial	10.3187	18.2268	13.4248
International	53.2508	42.7098	34.2455
Nonfinancial	19.3503	17.8249	20.7524

Table 2. Cross sectional analysis with respect to Returns. The companies in our dataset are ranked and divided into 3 groups according to the returns they have achieved over our test period. The companies that achieved the highest returns are placed in group 1 and the companies with the lowest returns are placed in group 3. The table yields average investor holdings in the 3 groups.

To investigate this further, we made 3 new groups, where we divided the different companies according to their riskiness. The risk is represented by the annual standard deviation of the daily log returns presented on a monthly basis. The companies with the highest standard deviation where placed in group 1, and the ones with the lowest in group 3. The results we extracted on this cross sectional

analysis can be seen in table 3. The results we gained from this analysis match the findings of Ødegaard (2009) to some extent. There are some minor differences when it comes to financial investors, but these can be due to him operating with a longer time series and with an extra variable. He operates with the variable mutual funds, which we have included in the variable financial. Our results clearly illuminates that the government does not invest in highly volatile companies. The reason for this can be many, and as earlier discussed the government usually has a long time horizon on its investments along with a strategic social element. On the other end of the scale we find the individual investor, who has a clear overweight in volatile companies, and this might to some extent explain their high expected return. The other investors do not show a clear indication on which portfolio they belong too, as they have almost the same level in all groups.

Volatility			
Owner type	Group 1	Group 2	Group 3
Government	2.7408	9.781	24.8022
Individual	12.5726	7.1167	4.3242
Financial	17.8631	14.1406	15.5754
International	49.5339	42.5435	40.7271
Nonfinancial	17.2916	26.4181	14.5711

Table 3. Cross sectional analysis with respect to Volatility. The companies in our dataset are ranked and divided into 3 groups according to their volatility. The companies that achieved the highest volatility are placed in group 1 and the companies that achieved the lowest volatility are placed in group 3. The table yields average investor holdings in the 3 groups.

Since our last analysis of risk did not give any clear indication of what preferences all the investors had, we decided to run additional tests. Therefore we chose to look closer at the leverage of the different companies, as leverage is a well known risk factor. The companies were divided into 3 groups according to their leverage. The companies with the highest leverage ratio where put in group 1, and the ones with the lowest leverage ratio were put in group 3. The results we extracted are shown in table 4. We can from these results see that government prefers companies with lower leverage, this is in line with the findings we got in our previous analysis. The other investors, besides individuals still do not seem to have any clear pattern, as it continues showing that the rest of the investors are spread all over the three groups. It would seem like individuals are polarized, but this test does not give any explanation to why, and supplementary tests are needed to investigate this further.

Leverage Owner type	Group 1	Group 2	Group 3
Government	8.2609	16.7783	15.1898
Individual	9.7734	2.9218	12.1025
Financial	15.429	13.6205	18.5581
International	49.6047	40.0988	40.7686
Nonfinancial	16.9321	26.5807	13.381

Table 4. Cross sectional analysis with respect to Leverage. The companies in our dataset are ranked and divided into 3 groups according to their leverage. The companies that had the highest average leverage are placed in group 1 and the companies with the lowest average leverage are placed in group 3. The table yields average investor holdings in the 3 groups.

To further test the characteristics of the companies the different investors preferred, we investigated the size of the companies they invested in. 3 new groups where created according to company size, with the largest companies being located in group 1 and the smallest companies being placed in group 3. The results are shown in table 5. Our results from this analysis clearly match the ones found by Ødegaard (2009). Here we unmistakably see that government as an investor has a clear overweight in larger companies, which can be due to their large strategic stake in companies like Statoil, Hydro, Telenor and DNBNOR, which are the largest companies in their respective sectors. This might explain the low volatility investments that the government has done, as larger companies tend to be less volatile. On the other end of the scale we yet again find the individual investor, who has a clear overweight in smaller companies. This result is consistent with the pattern of individuals investing in stocks with higher volatility and high returns, as it is empirically shown that small and medium sized firms yield a higher return than larger enterprises. It can seem like the foreign investors prefer small and medium sized enterprises over larger companies, but there is no strong indication of this. The other investors do not show a clear indication on which group they belong too, and this is in contrast to the findings of Ødegaard (2009). We believe this is due the fact that we are looking at the largest and most liquid stocks on the Norwegian exchange that we get these results, as all companies on the OBX are considered large.

Market capitalization			
Owner type	Group 1	Group 2	Group 3
Government	30.6056	4.4087	8.4928
Individual	4.3662	5.5172	14.8295
Financial	11.3538	17.6339	18.2772
International	31.4433	54.4793	42.0301
Nonfinancial	22.2311	17.9609	16.3704

Table 5. Cross sectional analysis with respect to Market capitalization. The companies in our dataset are ranked and divided into 3 groups according to their market capitalization. The companies with the highest average market capitalization are placed in group 1 and the companies with the lowest average market capitalization are placed in group 3. The table yields average investor holdings in the 3 groups.

Correlation Matrix

Variable		Return	Standard Deviation	ΔGovernment	ΔIndividual	ΔFinancial	ΔInternational	ΔNon Financial
Return	Correlation	1	-0.115**	-0.021	-0.071**	-0.048*	0.099**	-0.031
	Significance 2-tailed		0.000	0.277	0.000	0.011	0.000	0.105
	N	2749	2698	2749	2749	2749	2749	2749
StandardDeviation	Correlation		1	0.025	0.046*	-0.04	-0.46*	0.036
	Significance 2-tailed			0.201	0.017	0.839	0.017	0.058
	N		2698	2698	2698	2698	2698	2698
ΔGovernment	Correlation			1	-0.002	0.029	-0.248**	-0.043*
	Significance 2-tailed				0.899	0.129	0.000	0.025
	N			2749	2749	2749	2749	2749
ΔIndividual	Correlation				1	-0.387	-0.228**	0.222**
	Significance 2-tailed					0.000	0.000	0.000
	N				2749	2749	2749	2749
ΔFinancial	Correlation					1	-0.563**	-0.258**
	Significance 2-tailed						0.000	0.000
	N					2749	2749	2749
ΔInternational	Correlation						1	-0.514**
	Significance 2-tailed							0.000
	N						2749	2749
ΔNon Financial	Correlation							1
	Significance 2-tailed							
	N							2749

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

Table 1. This matrix shows the correlations between the variables: Return, Volatility, ΔGovernment, ΔIndividual, ΔFinancial, ΔInternational and ΔNon-Financial. It also shows if the results display significance at the 0.01 level or the 0.05 level, in a 2-tailed test.

The correlation matrix yields indications more or less in line with our expectations. The government and non-financial firm owner groups seem not to influence return to the extent that they can be called significant contributors. This is not too surprising as these investors, even though they possess almost a third of total holdings in the market, are often long-term investors with relatively few transactions. The indication of a negative influence on return by individual investors and positive influence on return by foreign investors (internationals) is in line with our expectations and the same result as Ødegaard (2009) got. More surprising though is the indication that demand by financial firms influence returns in a negative way. This is the opposite of what we expected. The correlations between standard deviation and changes in ownership fractions indicate a positive relation between individuals and volatility and a negative relation between foreign investors and volatility. As with returns correlations, government and non-financial firms are insignificant contributors. Financial firms do not seem to have an impact on volatility, a result we find somewhat surprising.

6.3 OLS regression: Return vs. changes in investor holdings

When running the OLS regression as illustrated under our methodology section, we find that some of the owner groups are not significant contributors as was indicated by the correlation matrix. After we remove the insignificant contributors we end up with the following model:

Model Summary		Return	
R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
0.013	0.012	0.153571	1.987

Table 6A. The table presents the model summary for the OLS equation of Return = ΔIndividual + ΔFinancial + ΔInternational + ε. This model is based on data presented in our data section, and looks at the relationship between the changes in investor holdings and their effect on returns.

Coefficients					
	Un-standardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	t	Sig.
Constant	0.018	0.003		6.095	0.000
ΔIndividual	-0.009	0.003	-0.076	-3.014	0.003
ΔFinancial	-0.003	0.002	-0.047	-1.567	0.117
ΔInternational	0.003	0.001	0.055	1.944	0.052

Table 6B. The table presents the coefficient summary for the OLS equation of Return = ΔIndividual + ΔFinancial + ΔInternational + ε. This model is based on data presented in our data section, and looks at the relationship between the changes in investor holdings and their effect on returns.

The model has a low explanatory power with an adjusted R-square of 0.012, but this is expected as our dependent variable is noisy. Furthermore, the model tells us that foreign firms have a positive relation to returns. This is as expected based on previous studies and the correlation matrix which has been discussed previously. This correlated behavior could be the result of spurious herding, where informed investors react to the same fundamental information (Bikhchandani and Sharma, 2001). Alternatively the herding behavior is caused by situations where the investors' decisions depend on the actions of other investors. Even though herding is a behavioral finance theory, investors portraying this behavior may not need to be irrational investors. The implication of institutional investors not wanting to risk their reputation by "standing out from the crowd" and follow a different strategy than their peers may cause rational investors to follow the behavior of other institutional investors. Also, some institutional investors may believe that their peers are better informed than themselves and therefore put faith in their behavior to be the best alternative. Finally, it may be a result of institutional investors having similar preferences for stocks as previously discussed. By analyzing next month's return we might get indications of whether the correlated behavior is caused by spurious herding because of similar information sets or whether investors try to imitate each other's actions.

The relation between individual holdings and returns is negative. Our results might coincide with a smart money – noise trader model. The basic idea behind this model is that the market consists of sophisticated informed investors called smart money, and noise traders who trades in response to variables not related to fundamentals. In relation to our results foreign investors would be smart money while individuals would be noise traders. Noise traders occasionally bid stock prices up or down, pushing prices away from their fundamental value and causing smart money with information on fundamental value to temporarily take part in or leave the market. In brief, high noise trader participation signals lower expected returns, and lower participation by smart money investors. As Ødegaard (2009) argues though, one should be careful with labeling this behavior as irrational since it may as well be a result of less sensitive demand curves. Given that holdings of institutional foreign owners have a positive relation to return, one might infer that our observed behavior is consistent with a hypothesis that individual investors' behavior simply is a result of total supply of stocks being constant.

We are however surprised to find that our model yields a negative relation between financial firms and returns. This is the opposite of our expectations and what previous studies have found. We have no other explanation besides the notion that we have some sort of bias in our sample causing this effect. Still, this result is not the strongest since the coefficient is slightly insignificant.

Coefficients

	Un-standardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	t	Sig.
Constant	0.018	0.003		6.001	0.000
ΔIndividual	-0.016	0.003	-0.140	-5.559	0.000
ΔFinancial	-0.005	0.002	-0.092	-3.093	0.002
ΔInternational	0.001	0.001	0.026	0.913	0.361

Table 7. The table presents the coefficient summary of the OLS equation of Return = $\Delta Individual_{t-1}$ + $\Delta Financial_{t-1}$ + $\Delta International_{t-1}$ + ε. This model is based on data presented in our data section, and looks at the relationship between the changes in investor holdings at t-1 and their effect on returns.

The results of regressing next month's return against changes in ownership fractions is summarized above. This is to test whether prices are moving towards fundamentals, as depicted in the methodology section. As we can see the relation remains the same, a result coherent with the interpretation that institutional investors possess information that enables them to exploit under- and overpricing in the market. The relation between financial firms and returns is still negative and in addition, the relationship between changes in foreign investors' holdings and returns is no longer significant[1].

To test the robustness of our model we decided to include the three Fama and French factors as control variables.

[1] A test regression of $Return_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_{t+} \beta_6 \Delta Government_{t-1} + \beta_7 \Delta Individual_{t-1} + \beta_8 \Delta Financial_{t-1} + \beta_9 \Delta International_{t-1} + \beta_{10} \Delta NonFinancial_{t-1} + \varepsilon$ was ran without any significant change in the result.

	Un-standardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	T	Sig.
Constant	0.53	0.003		18.354	0.000
ΔIndividual	-0.011	0.003	-0.098	-4.363	0.000
ΔFinancial	-0.003	0.001	-0.058	-2.213	0.027
ΔInternational	0.001	0.001	0.026	1.022	0.307
Excess market return	1.009	0.036	0.471	27.759	0.000
HML	0.039	0.057	0.012	0.689	0.491
SMB	-0.016	0.076	-.004	-0.209	0.834

Table 8. The table presents the coefficient summary of the OLS equation of Return = ΔIndividual + ΔFinancial + ΔInternational + Excess Market Return + HML + SMB + ε. Excess Market Return is calculated by deducting the 3 month Nibor rate from the market return. This model is based on data presented in our data section, and looks at the robustness of our previous model.

All initial independent variables have the same relation to returns as before adding the Fama and French factors, but the foreign investor holdings are no longer a significant contributor to returns. One should therefore be careful with putting too much faith on the explanations surrounding foreign investor behavior we have come up with in the discussions earlier.

When testing the classical assumptions underlying OLS regression we do not find any signs of multicollinearity with no excessive collinearity in the correlation matrix and VIF values all well below 5.

	Collinearity Statistics	
Variables	Tolerance	VIF
ΔIndividual	0.559	1.790
ΔFinancial	0.403	2.484
ΔInternational	0.449	2.228

Table 9. VIF Test. OLS: Return = ΔIndividual + ΔFinancial + ΔInternational + ε. This test is based on the data that has been presented in the previous tables and on the data that is presented in our data section. A VIF value under 5 indicates no signs of multicollinearity.

There is no sign of autocorrelation either with a durbin-watson d-statistic of 1.987, or very close to 2. We also found no indications of heteroskedasticity when looking at a plot between standardized predicted and actual residuals.

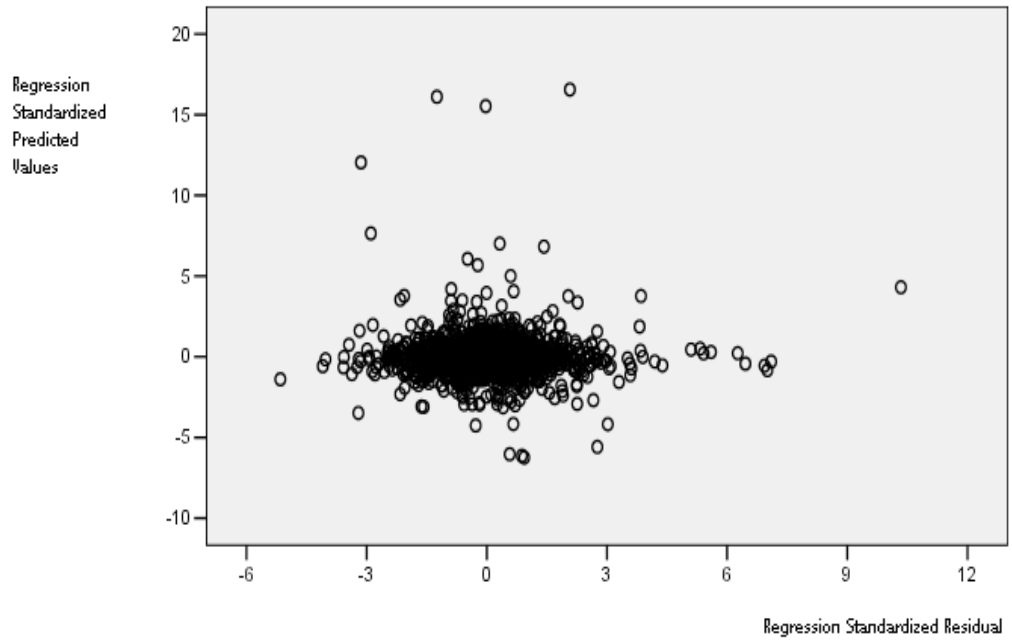

Figure 1 shows a plot of our regression standardized predicted values against our regression standardized residuals.

6.4 OLS regression: Standard deviation vs. changes in investor holdings

When we run a regression on volatility against changes in ownership fractions we get results that echo what we found when regressing returns vs. changes in ownership fractions. We find here that the only two significant contributors to volatility are individuals and foreign investors. The relationships are consistent with what we expected with individuals having a positive relationship with volatility and foreign investors influencing volatility in a negative way.

Model Summary		Volatility	
R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
0.003	0.003	0.295027	0.624

Table 10A. The table presents the model summary for the OLS equation of Volatility = ΔIndividual + ΔInternational + ε. This model is based on data presented in our data section, and looks at the relationship between the changes in investor holdings and their effect on volatility.

Coefficients

	Un-standardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	t	Sig.
Constant	0.437	0.006		76.685	0.000
ΔIndividual	0.008	0.004	0.037	1.886	0.059
ΔInternational	-0.003	0.002	-0.037	-1.893	0.058

Table 10B. The table presents the coefficient summary of the OLS equation of Volatility = ΔIndividual +ΔInternational + ε. This model is based on data presented in our data section, and looks at the relationship between the changes in investor holdings and their effect on volatility.

The result that individual investors positively contribute to volatility may be caused by their affection towards buying attention grabbing stocks (Barber and Odean, 2005). The hypothesis that human beings have bounded rationality and cannot comprehend all the information available in the market lead them to buying stocks that grab their attention and therefore contribute to the volatility already caused by other investors. This inference is also coherent with individuals behaving as noise traders when they trade in response to variables not related to fundamentals, for instance high volume or return statistics[2].

Our result that international investors have a negative contribution to volatility supports the findings and discussions in the earlier return vs. ownership part. If institutions herd and drive prices away from fundamental values, then they might contribute to increase returns volatility. Since we found indications of spurious herding as a consequence of investors reacting to the same information, we would expect to see investors speeding up the process towards fundamental values and making financial markets more efficient. Our results support those of Bohl et al. (2006) and Cohen et al. (2002) finding a stabilizing effect of institutional investors on stock prices. Also, in a smart money – noise trader model informed investors would stabilize financial markets by countering irrational behavior of individual investors.

To test the robustness of our model we decided to include market capitalization of the company and the corresponding leverage ratio as control variables.

[2]A test regression of $Std\ dev_t = \alpha + \beta_1 \Delta Government_t + \beta_2 \Delta Individual_t + \beta_3 \Delta Financial_t + \beta_4 \Delta International_t + \beta_5 \Delta NonFinancial_{t+} \beta_6 \Delta Government_{t-1} + \beta_7 \Delta Individual_{t-1} + \beta_8 \Delta Financial_{t-1} + \beta_9 \Delta International_{t-1} + \beta_{10} \Delta NonFinancial_{t-1} + \varepsilon$ was ran without any significant change in the result.

Coefficients

	Un-standardized Coefficients		Standardized Coefficients		
Variables	B	Std. Error	Beta	T	Sig.
Constant	0.488	0.007		71.123	0.000
ΔIndividual	0.015	0.004	0.069	3.528	0.000
ΔInternational	-0.004	0.002	-0.041	-2.075	0.038
Market cap.	-0.000012	0.000	-0.207	-10.799	0.000
Leverage ratio	-0.070	0.008	-0.167	-8.699	0.000

Table 11. The table presents the coefficient summary of the OLS equation of Volatility = ΔIndividual + ΔInternational + Market Cap + Leverage ratio + ε. This model is based on data presented in our data section, and looks at the robustness of our previous model.

All initial independent variables are still significant and the relationships have not changed after inclusion of the control variables.

Testing the classical assumptions give cause for concern when it comes to serial correlation with a durbin-watson d-statistic at 0.624. The consequence of serial correlation is inflated standard errors of the calculated coefficients, which again leads to unreliable hypothesis testing. We are therefore unable to say with certainty that individuals or foreign investors actually have a significant influence on volatility.

	Collinearity Statistics	
Variables	Tolerance	VIF
ΔIndividual	0.948	1.055
ΔInternational	0.948	1.055

Table 12. VIF Test. OLS: Volatility = ΔIndividual + ΔInternational + ε. This test is based on the data that has been presented in the previous tables and on the data that is presented in our data section. A VIF value under 5 indicates no signs of multicollinearity.

Multicollinearity does not seem to be a problem in our dataset based on collinearity diagnostics and VIF values. Based on a plot of the residuals we also found heteroskedasticity not to be a problem.

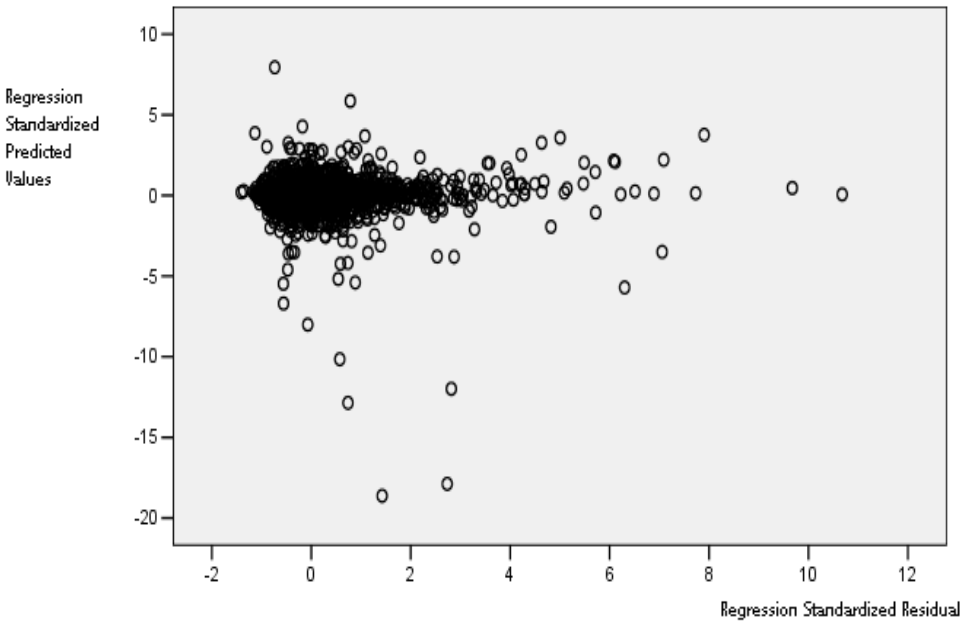

Figure 2 shows a plot of our regression standardized predicted values against our regression standardized residuals.

7 Conclusions

This study analyzes the relationship between returns, standard deviation, and the holdings of five different owner types on the Norwegian Stock Exchange.

Our dataset tries to replicate the inclusions of the OBX index which consists of the 25 most liquid stocks on the Norwegian stock market. The period we have selected to analyze is characterized by both bear and bull markets in order to fully represent long term behavior of investors.

The cross sectional analysis indicates a preference for small, volatile companies with a high expected return among individual investors. Our OLS model confirms this pattern with a significant positive influence on volatility following a higher ownership fraction of this group of investors. This result is consistent with past research and literature with Barber et al. (2005) proving that day trading behavior of individual investors contributes to stock volatility. The hypothesis that individuals have bounded rationality might contribute to this behavior. Furthermore we find a negative relationship between individuals and stock return. This result might coincide with a smart money – noise trader model where high noise trader participation signals lower expected returns. The result is also consistent with the findings of Ødegaard (2009), but as he argues one should be careful with labeling these investors as irrational, when it just as well might be a consequence of less sensitive demand curves.

Foreign investors seem to have an opposite relation to stock return and volatility, with a negative relation between volatility and foreign investor holdings and a positive relation between stock returns and foreign investor holdings. By analyzing the following month's return we are able to indicate that this behavior is caused by foreign institutional investors exploiting under- and overpricing in the market through superior information. We connect these results to the theory of spurious herding where informed investors trade on the basis of the same fundamental information, drive prices towards fundamental values, and thereby act in a stabilizing way on financial markets. Since this group consists mainly of institutional investors, this result is consistent with the previous studies augmenting for a stabilizing role of institutions on the stock market. The result is also consistent with Ødegaard's (2009) findings of a positive relationship between stock returns and ownership fraction of foreign investors.

The behavior of financial firms, which was the most important investor group we wanted to analyze, yielded either insignificant or somewhat surprising results, but no clear overall pattern. The cross sectional analysis showed polarized preferences and the OLS regression indicated a negative relation between stock return and financial firms' holdings, a result not in line with previous literature. As discussed in the data section we suspect that our dataset is possibly not representative for this group of investors.

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