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HOW DO DIFFERENT TYPES OF INVESTORS REACT TO
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JEL Classification: G10, G12, G14

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How do different types of investors react to new financial statement information?

Anders Ekholm^{*}

Abstract

The study contributes to our understanding of the forces that drive the stock market by investigating how different types of investors react to new financial statement information. Using the extremely comprehensive official register of share holdings in Finland, we find that the majority of investors are more probable to sell (buy) stocks in a company after a positive (negative) earnings surprise, and show a bias towards buying after the disclosure of new financial statement information. Large investors, on the other hand, show behavior opposite to that of the majority of investors in the market. Further, foreign investors show behavior similar to that of domestic investors. We suggest investor overconfidence and asymmetric information as possible explanations for the documented behavior.

JEL classification: G10; G12; G14

Keywords: investor behavior, financial statement information; market reaction

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1 Introduction

It seems safe to say that most academics and practitioners within financial economics agree that new earnings information has strong implications for the market value of a company¹. Especially, the dazzling resources continuously invested by market participants in financial statement analysis bear evidence to the importance of earnings in valuation. Given this, we know surprisingly little about how different investors do in fact interpret and react to new earning figures. A straightforward assumption to make would be that all types of investors, on average, react homogeneously to new earnings information. This view obeys the classical market efficiency literature in which all investors are fully rational individuals that process new information objectively. However, recent research by for instance Daniel, Hirshleifer and Subrahmanyam (1998), Odean (1998b), and Hong and Stein (1999) indicates that investors may not be fully rational in the strict traditional sense. More specifically, investment decisions may be affected by psychological biases, such as overconfidence. To the best of our knowledge, this is the first study that directly investigates how different types of investors react to new financial statement information.

Empirical evidence at odds with fully homogeneous investors is gathered by Lee (1992), who investigates whether differences can be detected between small versus large trades after the disclosure of earnings news. He finds that positive (negative) surprises increase the fraction of large buy (sell) transactions, and that small transactions on average increase irrespectively of the news. However, since the

¹ A number of theoretical and empirical studies document a strong relationship between earnings and company value. See for instance Ohlson (1995) for a theoretical discussion and Lev (1989) for a survey of some empirical findings.

investors behind the trades remain anonymous, he cannot distinguish between the different types of investors behind the transactions. Booth, Kallunki and Martikainen (1999) find that small “sell” trades increase after negative earnings surprises, but as in the case of Lee (1992) they cannot distinguish the different types of investors behind this behavior due to the limitations of the employed data set. Using a subset of the transaction database employed in this study, Grinblatt and Keloharju (2000) investigate how different types of investors’ buy and sell behavior can be explained by past returns. They document differences in the behavior of different investor groups, showing that foreign investors tend to be momentum investors whereas Finnish investors primarily rely on contrarian investment strategies. In a study contemporaneous to this study, Cohen, Gompers and Vuolteenaho (2001) use quarterly data to investigate the trading between large and small US investors as a function of changes in accounting return on equity (ROE) of the traded companies. They find that large investors buy (sell) shares from (to) smaller investors as a response to increases (decreases) in accounting return on equity. However, they cannot distinguish between the different types of investors beyond “large” and “small” investors.

Equipped with an extremely comprehensive transaction data set from Finland, containing detailed information on a daily basis including virtually all transactions in stocks in Finland during the period December 28 1994 to May 30 2000, we set out to get a glimpse into the minds of different types of investors with respect to how they interpret and react to new earnings information. We hence seek to document whether indications of behavioral patterns can be documented for different types of investors, or whether all investors on average react homogeneously. This study contributes to earlier and contemporaneous literature in at least the following. 1) The Finnish Central

Securities Depository central register provides accurate classification of investors into different groups of investors. We can hence discriminate between different types of investors on a much more detailed level than just “small” and “large “ investors. 2) We employ daily transaction data and exact financial statement disclosure dates. This enables accurate event study analysis, which minimizes measurement errors due to other information than the investigated. 3) We use the latest available² analysts’ consensus earnings estimates to proxy expected earnings. These estimates are published on a monthly basis in a major Finnish financial newspaper, hence ensuring that they actually are available to all market participants³.

We find that behavioral differences indeed can be detected for different groups of investors. Positive (negative) earnings surprises increase the probability of households and countries and international organizations decreasing (increasing) their holdings. On the other hand, positive (negative) earnings surprises increase the probability of large investors increasing (decreasing) their holdings. The majority of investors show a bias towards increasing their holdings after the disclosure of new financial statement information, irrespective of the information. However, large investors show a bias towards decreasing their holdings after the disclosure of new financial statement information. Our findings hence indicate that large investors act as antagonists to the majority of investors with respect to new financial statement information.

² These estimates are on average approximately two weeks, but at most one month, old.

³ Cohen, Gompers and Vuolteenaho (2001) use changes in accounting return on equity (ROE) as a proxy for cash-flow news. This approach implicitly states that last period’s ROE is the best estimate for this period’s ROE, which is an assumption somewhat at odds with the existence of a financial analyst industry.

The study is organized as follows. Section 2 describes the data. Section 3 discusses the implemented methodology. Results are displayed in Section 4 and further analyzed in section 5. Finally, section 6 summarizes the paper.

2 The data

The total data set used in the study consists of four subsets: 1) the Finnish Central Securities Depository central register data set, 2) realized fiscal year earnings figures, 3) analyst consensus fiscal year earnings forecasts, and 4) annual report disclosure dates for the investigated companies.

2.1 The Finnish Central Securities Depository Central Register data set

The employed transaction data set is, to the best of our knowledge, one of the most comprehensive and complete transaction data sets that have been employed in this field of research up to this date. The Finnish Central Securities Depository central register contains virtually all transactions for the stocks of listed Finnish companies during the time period December 28 1994 to May 30 2000 with daily accuracy. The data set covers approximately 97% of the total market capitalization of the Helsinki Stock Exchange as of the beginning of the sample period, as reported by Grinblatt and Keloharju (2000), and further expands to cover all traded companies from the middle of the investigated period onwards. The Finnish Central Securities Depository central register is the official register of ownership, controlled by the Finnish Financial Supervision Authority, and can hence be viewed as extremely reliable and accurate. Altogether the data set consists of 25,400,767 transactions for a total of 1,050,412 different investors, complete with transaction information (notification date, price,

volume etc.) and investor characteristics information (investor type, birth year, postal code, sex etc.). A settlement lag of three trading days is conventional on the Helsinki Stock Exchange and the date stamps in the data set include this lag, which is adjusted for in the empirical analysis presented below. Due to this three-day settlement lag, the transactions in the database are stamped between January 2 1995 and June 2 2000, and the initial balance as of December 27 1994 is stamped as January 1 1995.

Investors are categorized into six major groups according to their legal status. These six groups are further divided into several subgroups according to more specific characteristics. All Finnish individuals and institutions are required to register their holdings in their own name, but foreigners can choose to act in the name of a nominee. The holdings of foreigners that choose to act in a nominee name are pooled together into larger pools with the holdings of the nominee. However, the data set contains information that can be utilized to discriminate between transactions executed by foreigners and by the nominee itself. The task of disintegrating the foreigners acting in nominee names further into different subtypes, such as individuals and institutions, is however made impossible by nominee registration. Further, the register does not separate indirect shareholdings through financial institutions, such as mutual funds. Indirect holdings are registered in the names of the financial institutions, and are thus treated as property of the financial institutions in this study. This is well in line with the purpose of this study, as financial institutions by Finnish law must have full control of the investment policy of their indirect holdings.

2.2 *Analysts' consensus earnings estimates and realized earnings figures*

Analysts' consensus pre-tax profit, or earnings, estimates for the fiscal years 1998 and 1999 for the majority of the companies listed on the Main List on the Helsinki Stock Exchange are obtained from the Finnish financial newspaper *Arvopaperi*⁴. *Arvopaperi* is one of the leading financial newspapers in Finland specializing in investment issues. The fact that the analysts' consensus estimates are actually published in the *Arvopaperi* newspaper ensures that not only institutional investors, but also households, have access to these estimates, which is crucial to the reliability of the study. Realized earnings figures corresponding to the analysts' consensus estimates, discussed above, are also retrieved from the *Arvopaperi* newspaper. As both the estimates and the realized figures originate from the same source, maximal computational congruency between these figures can be achieved.

Altogether we have 78 pairs of estimates and realized earnings figures for the fiscal year 1998 and 89 pairs for the fiscal year 1999. Our sample hence spans $78 / 112 = 70\%$ and $89 / 115 = 77\%$ of the companies listed on the Helsinki Stock Exchange Main List in the beginning of 1999 and 2000 respectively.

2.3 *Disclosure dates*

We retrieve official annual report disclosure dates for all companies listed on the Main List on the Helsinki Stock Exchange during the years 1999-2000 from the

⁴ The consensus estimates are gathered from 6 major banking firms operating in Finland and published monthly. The banking firms are: Conventum Ltd., Enskilda Securities Ltd., FIM Pankkiiriliike Ltd., Mandatum Ltd., ArosMaizels Ltd., and Opstock Ltd..

Helsinki Stock Exchange. These disclosure dates should be viewed as extremely reliable as they are continuously updated as changes occur.

3 Methodology

The question of whether behavioral differences between different groups of investors exist can be tackled by estimating a model with an investor reaction proxy as dependent variable and an earnings surprise proxy as independent variable for each group of investors.

3.1 Investor reaction

Investors' reactions to the disclosure of new financial statement information for a certain company C is gauged by first identifying all investors who have traded in the company stock during the week after the disclosure, including the day of disclosure, from the Finnish Central Securities Depository central register. The net holdings before (${}^I_C NH_{t-1}$) and after (${}^I_C NH_{t+6}$) the event are then calculated for each investor separately by aggregating the initial balance and all transactions up to, and including, time $t-1$ and $t+6$. Apparently, even though events that occur only during the years 1999-2000 are analyzed, we are forced to process through the whole Finnish Central Securities Depository central register for each investor and event from the initial balance as of December 27 1994, to be able to aggregate net holdings.

An investor reaction proxy ${}^I_C R_{t,t+6}$ can then be calculated for investor I , company C and disclosure date t according to the following:

$${}^{I,C}R_{t,t+6} = ({}^{I,C}NH_{t+6} - {}^{I,C}NH_{t-1}) / {}^{I,C}NH_{t+6} \quad \text{if} \quad {}^{I,C}NH_{t+6} - {}^{I,C}NH_{t-1} > 0 \quad (1)$$

$${}^{I,C}R_{t,t+6} = ({}^{I,C}NH_{t+6} - {}^{I,C}NH_{t-1}) / {}^{I,C}NH_{t-1} \quad \text{if} \quad {}^{I,C}NH_{t+6} - {}^{I,C}NH_{t-1} < 0 \quad (2)$$

$${}^{I,C}R_{t,t+6} = 0 \quad \text{if} \quad {}^{I,C}NH_{t+6} - {}^{I,C}NH_{t-1} = 0 \quad (3)$$

where ${}^{I,C}R_{t,t+6}$ is the reaction proxy for investor I and company C for the time period t to t+6, ${}^{I,C}NH_{t+6}$ is the net holding in company C for investor I at time t+6, and ${}^{I,C}NH_{t-1}$ is the net holding in company C for investor I at time t-1

The above defined measure ${}^{I,C}R_{t,t+6}$ hence expresses the following. If investor I has increased his/her net holding in stock C during the time period t to t+6, the measure expresses the fraction of the final position at time t+6 that has been acquired during the event window. On the other hand, if investor I has decreased his/her net holding in stock C during the time period t to t+6, the measure expresses the fraction of the initial position at time t-1 that has been sold out during the event window. Finally, if investor I has traded in stock C during the time period t to t+6, but not changed his/her net holding, the measure takes the value 0. Clearly, the above defined investor reaction proxy will be a continuous function taking values [-1, 1]. Further, the investor reaction proxy is symmetric, which is important in order to not introduce a bias in the variable.

An obvious alternative when measuring investor reaction is to calculate the simple change in ${}^{I,C}NH$ during the time period t to t+6. The above defined approach is however preferred for one fundamental and two econometric reasons. First, we believe that the investor reaction proxy defined in equations (1), (2) and (3) better expresses how

investors themselves perceive their actions⁵. Second, if we employ the simple changes methodology an econometric problem occurs when the initial position ${}^L C_{NH_{t-1}}$ equals 0 (division by zero). Third, the simple changes methodology by default induces a systematic bias in ${}^L C_{R_{t,t+6}}$ since the distribution is asymmetric, taking values $[-1, \infty[$ when ${}^L C_{NH_{t-1}} \neq 0$.

Another alternative when measuring investor reaction is to employ a discrete framework, by for instance assigning the reaction proxy variable the value 0 for decreases in holdings and 1 for increases in holdings. However, by moving into a discrete framework we would lose the magnitude of the reaction, as the only the direction of the investor reactions would remain. The above proposed and in this study employed way of measuring investor reaction enables us to measure both the direction and the magnitude of the investor reactions, however avoiding the pitfalls of the simple changes methodology.

3.2 *Earnings surprises*

Positive versus negative earnings surprises are identified by calculating the difference between the latest analysts' consensus earnings estimate and the corresponding realized figure. As was pointed out earlier, analysts' estimates are updated monthly, which ensures high validity for the estimates. The deviation between analysts' consensus estimates and actual outcomes are calculated as

⁵ This argument is primarily derived from the situation where we have small denominators. For instance, if an investor owns 100 shares and then acquires 1000 more, the percentage change would be $1100 / 100 - 1 = 1000\%$. The corresponding measure according to equation (1) would on the other hand take the value $(1100-100) / 1100 = 91\%$, which seems somewhat more intuitive.

$${}^C\text{ES}_t = ({}^C\text{EA}_t - E[{}^C\text{EA}_t]) / |E[{}^C\text{EA}_t]| \quad (4)$$

where ${}^C\text{ES}_t$ is the earnings surprise for company C at time t, ${}^C\text{EA}_t$ are earnings for company C at time t, and $E[{}^C\text{EA}_t]$ is the latest analysts' consensus earnings estimates for company C at time t. The absolute value for $E[{}^C\text{EA}_t]$ is used in equation (4) since the denominator might otherwise take negative values, leading to rather unintuitive results⁶.

Descriptive statistics in Table 1 reveal that the estimates on average have been quite unbiased with a mean of -3.4% and a median of 0.0% . The mean earnings surprise is insignificant, deviating $-3.4\% / 2.6\% = -1.29$ standard deviations from zero, as should be expected for skilled analysts.

[Please insert Table 1 here]

3.3 Regression models

Models with the investor reaction proxy as dependent variable and the earnings surprise proxy variable as independent variable are OLS estimated for each group of investors separately along the specification

$${}^I, {}^C\text{R}_{t, t+6} = a + b {}^C\text{ES}_t + e \quad (5)$$

⁶ If we for instance have a negative analysts' consensus earnings estimate and a positive realized figure, not using the absolute value for the analysts' consensus earnings estimate yields a negative surprise proxy even though the realized earnings figure exceeds the analysts' consensus earnings estimate.

where ${}^I C R_{t, t+6}$ is the reaction proxy for investor I and company C during time period t to t+6, a is the estimated constant, b is the parameter estimate for ${}^C ES_t$, ${}^C ES_t$ is the earnings surprise proxy for company C at time t, and e is the error term. All models are routinely estimated using the White (1980) heteroscedasticity-consistent covariance matrix to minimize the effects of possible heteroscedasticity.

4 Results

The total data set, created according to the specifications given above, consists of 53,631 observations. Descriptive statistics presented in Table 2 reveal that transactions executed by households constitute the largest single group with 44,050 observations. Further, transactions executed by companies and financial institutions claim a fair share of the total data set with 5,628 and 2,568 observations, respectively. General government (0.88%), nonprofit organizations (0.98%) and countries and international organizations (0.72%) are by far the smallest groups in terms of number of observations.

[Please insert Table 2 here]

Regression results for the different investor main categories in Table 3 reveal several interesting findings with respect to how different types of investors behave under new financial statement information.

[Please insert Table 3 here]

As can be observed in Table 3, companies do not show a systematic behavioral pattern with respect to the size of earnings surprises. However, the very significantly positive constant of 0.07 suggests that companies more frequently increase rather than decrease their stock holdings after the disclosure of new financial statement information, irrespective of the information contained in the earnings figures.

The behavior of financial institutions and general government is rather similar to that of companies, as the significantly positive constants 0.03 and 0.08 indicate that both groups are more keen to increase than to decrease their holdings after the arrival of new financial statement information, but that no systematic behavioral pattern can be recorded with respect to the earnings surprise proxy variable. It is noted that the parameter estimate for the earnings surprise proxy for financial institutions is close-to-significantly positive. However, a further analysis of five subgroups of the financial institution investor category (not reported) fails to document any evidence suggesting a positive relationship between earnings surprises and changes in stock holdings for any of these subgroups.

Nonprofit organizations is the only investor category that does not show any systematic behavior after the disclosure of new financial statement information, which is indicated by the insignificant constant and parameter estimate.

The results for households are extremely interesting; households seem to be more likely to decrease (increase) their holdings after a positive (negative) earnings surprise. This is revealed by the very significantly negative parameter estimate for the earnings surprise proxy (-0.22). In addition, households appear to be keen to increase their holdings after the disclosure of new financial statement information as indicated by the very significantly positive constant (0.14).

Finally, as revealed by the significantly negative parameter estimate for the earnings surprise proxy (-0.28), countries and international organizations also appear to be more likely to decrease (increase) their holdings after a positive (negative) earnings surprise. Furthermore, countries and international organizations on average increase their holdings after the disclosure of new financial statement information, as indicated by the very significantly positive constant (0.11). The behavior of countries and international organizations is hence rather similar to that of individual investors.

In summary, we find that investors in all but one of the six investigated categories have a bias for increasing their holdings during the week after the disclosure of new financial statement information. Further, we find that households and countries and international organizations are more likely to decrease (increase) their holdings after positive (negative) earnings surprises. Since we know that markets have to clear we also know that there must exist one or several groups that systematically show opposite behavior. These groups are more eager to sell than to buy during the week after the disclosure of new financial information and show a positive correlation between earnings surprises and changes in stock holdings. Since the behavioral patterns documented above are quite homogeneous for all the different investigated investor categories, it seems that this group of opposite behavior must include rather large investors to fulfill the market clearing condition.

4.1 A further analysis of large investors

As a consequence of the above-presented results, a new investor category, large investors, is created by gathering 10% of the observations with the largest net holding, in number of shares, at time $t-1$ for each company separately. The identification of large

investors is done for each company separately in order to avoid having the data set excessively dominated by transactions in large companies, such as Nokia, which certainly attract much of the activity from large investors. Investor size is hence defined as a relative measure among investors that trade in the same company.

The distribution of events for the new investor category over the earlier investigated investor categories is displayed in Table 4. When comparing Table 4 with the corresponding statistics for the total sample in Table 2, it is apparent that all investor categories except for households represent significantly larger fractions of the total transactions in the large investors group than in the total sample. Households are significantly less represented in the large investors category, as might well be expected. Worth noting is also that the fraction of financial institutions is more than 5 times greater in the large investors sample than in the total sample (25.62% versus 4.79%).

[Please insert Table 4 here]

Regression results for the large investors category, displayed in Table 5, point towards that large investors systematically show behavior opposite to that of the majority of investors on the market, with respect to new fundamental information. The very significantly positive parameter estimate for the earnings surprise proxy (0.09) indicates that positive (negative) earnings surprises increase the probability of large investors increasing (decreasing) their holdings. In addition, the significantly negative constant (-0.22) demonstrates that large investors on average are keener to decrease rather than to increase, their holdings after the disclosure of new financial statement information.

[Please insert Table 5 here]

The positive correlation between earnings surprises and investor reaction gains support from Lee (1992), as he documents a positive correlation between large buy (sell) orders and positive (negative) earnings news. Further, Cohen, Gompers and Vuolteenaho (2001) also document that large investors increase (decrease) their holdings in a stock in response to positive (negative) financial statement information being disclosed. However, Grinblatt and Keloharju (2000) report that foreign investors pursue momentum strategies with respect to past returns, as opposed to all other investor groups. Clearly, an important question is whether foreigners dominate the above investigated large investor category. As foreign investors can appear among companies, financial institutions, households, and countries and international organizations, an investor-specific analysis of the large investors category is needed to be able to detect the fraction of foreign investors in the large investor category. An investor specific analysis of the large investors category reveals that foreign investors constitute merely 12.5% of the transactions in the large investors category. Hence, it does not at first glance seem very plausible that foreign investors dominate the behavior of the large investor category, but a further analysis of foreign investors is certainly needed.

4.2 A further analysis of foreign investors

The analysis above indicates that foreign investors do not dominate the large investor category. However, it remains extremely interesting to investigate the behavior

of foreign investors, irrespective of their size, as a separate investor category. A new investor category denoted foreign investors is created by extracting all transactions executed by foreigners from the total data set, through an investor-specific procedure. The distribution of events over the six major investor categories for the foreign investor category, displayed in Table 6, reveals that the majority of the transactions executed by foreigners belong to the financial institutions investor category. This is quite an expected observation as foreigners acting under nominee registration appear in this investor category.

[Please insert Table 6 here]

Regression results for the foreign investors category, displayed in Table 7, indicate that foreign investors show rather similar behavior as the majority of other investors with respect to new earnings information. The insignificantly negative parameter estimate for the earnings surprise proxy (-0.07) indicates that foreign investors do not show a systematic behavior with respect to earnings surprises. Further, the significantly positive constant (0.04) shows that foreign investors have a bias for increasing their holdings after the disclosure of new financial statement information.

[Please insert Table 7 here]

Altogether, we find that foreign investors show behavior highly similar to that of the majority of investors in the market. This is an extremely important finding as it

supports the conclusion that large investors, irrespective of origin, act as antagonists to the rest of the market with respect to new financial statement information.

5 Conclusions

Our results deviate from the traditional view of homogenous investor behavior, as we find that systematic differences in behavior can be documented for different types of investors under new financial statement information. Even though the investigated data set is of impressive size, hence reducing the risk of spurious results due to a biased sample, some plausible explanation always enhance the validity of empirical findings. In the following, we try to present some rationale for the central observations in this study.

5.1 Investor overconfidence?

We find that positive (negative) earnings surprises increase the probability of households and countries and international organizations decreasing (increasing) their holdings. Large investors, on the other hand, show opposite behavior with respect to earnings surprises, and hence act as counterparts to households and countries and international organizations with respect to earnings surprises. These findings imply that some categories of investors systematically estimate the impact of new earnings information differently than other categories. It seems clear that these differences cannot be a consequence of investors' estimation accuracy, since we then should witness differences in the variance of the estimation errors, not in the means. The big question is hence without doubt *why* we witness systematic differences in investor estimation error,

and the resulting systematic differences in behavior, between different categories of investors.

Overconfidence, meaning that individuals overweight the importance of their private information versus new public information, is a well-established psychological phenomenon⁷. Overconfidence has been documented for individuals in an array of different professions such as nurses, engineers, attorneys and market professionals, as discussed by Daniel, Hirshleifer and Subrahmanyam (1998). Daniel, Hirshleifer and Subrahmanyam (1998) and Odean (1998b) find that investor overconfidence can be used to explain several empirical findings such as auto-correlation in stock returns and under-reaction to new information both of which contradict the traditional view of the stock markets. Further, Gervais and Odean (2001) and Wang (2001) theoretically argue that overconfident investors can survive in the stock market. What does investor overconfidence then imply for the trading behavior of different types of investors in the context of new public information?

Let us assume that the stock market is populated by two types of investors, S and U, of which S are less overconfident than U. Both S and U can access private information $^{PRI}I_{t-1}$ and public information $^{PUB}I_{t-1}$ at time t-1. The value they view as correct for a company is determined as a function, $^Sf(\bullet)$ for investors of type S and $^Uf(\bullet)$ for investors of type U, of both types of information.

$$^SV_{t-1} = ^Sf(^{PRI}I_{t-1}, ^{PUB}I_{t-1}) \quad (6)$$

$$^UV_{t-1} = ^Uf(^{PRI}I_{t-1}, ^{PUB}I_{t-1}) \quad (7)$$

⁷ Odean (1998b) provides a good overview on research in overconfidence.

In equilibrium, the value perceived as correct by the two types of investors of a company at time $t-1$, when no new information is available on the market, equals the market value.

$$^S V_{t-1} = ^U V_{t-1} = V_{t-1} \quad (8)$$

At time t new public information $^{PUB} I_t$ arrives to the market, which would to the fully rational investor indicate a shift $^{PUB} \Delta V_t$ in the value of the company. However, since the two types of investors S and U are overconfident, they will give the new public information less weight than the fully rational investor. The perceived new value is thus

$$^S V_t = V_{t-1} + ^S w * ^{PUB} \Delta V_t \quad \text{where} \quad 0 < ^S w < 1 \quad (9)$$

$$^U V_t = V_{t-1} + ^U w * ^{PUB} \Delta V_t \quad \text{where} \quad 0 < ^U w < 1 \quad (10)$$

Since investors of type S are less overconfident than investors of type U , investors of type S give more weight to new public information than investors of type U , thus $^S w > ^U w$. We now get

$$^S V_t > ^U V_t \quad \text{if} \quad ^{PUB} \Delta V > 0 \quad (11)$$

$$^S V_t < ^U V_t \quad \text{if} \quad ^{PUB} \Delta V < 0 \quad (12)$$

$$^S V_t = ^U V_t \quad \text{if} \quad ^{PUB} \Delta V = 0 \quad (13)$$

Hence, when public information interpreted as positive (negative) by the fully rational investor is received by the market, the value perceived as correct by the less overconfident investors S will be higher (lower) than the value perceived as correct by the more overconfident investors U. If the new public information is interpreted as neutral by the fully rational investor, all investor types will agree on the value of the company. It is important to note that the conclusions also hold when investors of type S are fully rational investors ($s_w = 1$). The implications for transaction behavior under new fundamental information are apparent: when the market receives positive (negative) public information regarding a company, less overconfident investors will buy (sell) company stock from (to) the more overconfident investors, until a new valuation equilibrium is reached. Consequently, if we observe systematic deviations between different types of investors with respect to their reaction to new public information, we may suspect differences in overconfidence between the different types of investors.

In the context of this investor overconfidence framework, our findings would indicate that large investors are less overconfident (or even fully rational) than households and countries and international organizations. If rationality can be seen as a measure of sophistication, we can conclude that large investors are more sophisticated investors than their counterparts. This conclusion seems intuitive, as large investors certainly can be expected to be the most professional ones⁸. The findings are well in line with the overconfidence literature, as presented by for instance Odean (1998b).

⁸ However, Griffin and Tversky (1992) present some evidence that experts tend to be more overconfident than relatively inexperienced individuals.

Grinblatt and Keloharju (2000) find that household investors pursue “contrarian” strategies with respect to past returns. We can now shed some light over the following hypothesis that they put forward:

“Our result could be part of a larger phenomenon in which unsophisticated investors, as a rule, are overly eager to cash out on winning stocks or to buy losing stocks or both, whereas sophisticated investors are patient enough to do the opposite. If it is true that unsophisticated investors react to past returns in this fashion, then they should similarly exhibit contrarian overreaction to other types of information, such as earnings announcements.”

Grinblatt and Keloharju (2000): page 66

It thus seems possible that Grinblatt and Keloharju (2000) are correct in that their findings are part of a larger phenomenon in the stock market. Our evidence suggests that this larger phenomenon possibly is investor overconfidence, a well-established psychological phenomenon.

5.2 *Asymmetric information?*

We find that the majority of investors are biased towards increasing their holdings during the week after the disclosure of new financial statement information, independent of the earnings information. Large investors on the other hand show opposite behavior, displaying a bias towards decreasing their holdings in the same situation. This is an observation that may be explained by asymmetric information between different types of investors. It seems possible that large investors can access more detailed analysis, or even inside information, on companies and hence can better anticipate future financial statement information. These better informed investors would

thus be less averse towards increasing their holdings before the disclosure of new financial statement information than less informed investors, as their uncertainty regarding the future information is decreased by detailed analysis. Consequently, more informed investors would capitalize their investments, and on average decrease their holdings, when the new information becomes public and less informed investors become more active. The less informed investors, in this case the majority investors in the market, would hence act as counterparts to the more informed investors by on average increasing their holdings. This finding could indicate that the finding of Lee (1992), that small buy transactions increase after the disclosure of new financial statement information, is a function of asymmetric information in the stock market.

5.3 Domestic versus foreign investors

After the disclosure of new financial statement information foreign investors show behavior that is very similar to that of the majority of investors in the stock market. This observation would imply that foreign investors on average are as sophisticated or unsophisticated as domestic investors, and hence that it is investor size that correlates with investor sophistication. Indeed, this conclusion seems as a very intuitive one in the global financial market where large investors around the world have access to highly similar tools and analysis.

6 Summary

Although stock market reaction to new financial statement information has been extensively investigated, our knowledge of how different types of investors behave under new financial statement information is extremely limited. The traditional strict

view of investor rationality would not allow any systematic behavioral differences between different types of investors. However, well-documented psychological biases, such as overconfidence, leave the door open for behavioral differences under new financial statement information. Clearly, an improved knowledge of how different types of investors actually react to new financial statement information is an essential step in the process of gaining a better understanding of the forces driving the stock market.

Equipped with the official register of daily accuracy of virtually all share holdings in Finland, combined with analysts' consensus earnings forecasts and corresponding realized earnings figures, we investigate whether systematic behavioral differences can be documented for different types of investors. We find that behavioral differences indeed can be detected for different groups of investors. Positive (negative) earnings surprises increase the probability of households and countries and international organizations decreasing (increasing) their holdings. Further, positive (negative) earnings surprises increase the probability of large investors increasing (decreasing) their holdings. The majority of investors have a bias for increasing their holdings after the disclosure of new financial statement information, irrespective of the information. However, large investors have a bias for decreasing their holdings after the disclosure of new financial statement information. Our findings hence suggest that large investors act as antagonists to the majority of investors with respect to new financial statement information. We further find evidence indicating that foreign investors show behavior similar to that of the majority of domestic investors.

We offer investor overconfidence as a possible explanation for the documented differences in behavior with respect to new financial statement information. Further, we suggest that information asymmetries exist between different types of investors prior to

the disclosure of new earnings information. More specifically, large investors appear to be less overconfident and better informed than the majority, but not all, other investors. Furthermore, foreign investors seem to be rather equal to domestic investors in their behavior under new earnings information. In conclusion, the findings of this study add to the mounting evidence suggesting investor heterogeneity.

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Table 1 – Descriptive statistics for earnings surprises

Table 1 displays descriptive statistics for earnings surprise proxies derived from analysts' consensus earnings estimates and realized earnings figures, retrieved from the Finnish financial newspaper Arvopaperi. The earnings surprise proxy is defined as the percentage difference between the actual earnings figure and the analysts' consensus estimate for a certain company and fiscal year. More specifically, the earnings surprise proxy for company C and fiscal year t is defined as ${}^C\text{ES}_t = ({}^C\text{EA}_t - E[{}^C\text{EA}_t]) / |E[{}^C\text{EA}_t]|$, where ${}^C\text{ES}_t$ is the earnings surprise proxy for company C and fiscal year t, ${}^C\text{EA}_t$ is the actual earnings for company C at time t, and $E[{}^C\text{EA}_t]$ is the latest analysts' consensus earnings estimates for company C and fiscal year t. The absolute value of $E[{}^C\text{EA}_t]$ is used in the denominator, since negative values of $E[{}^C\text{EA}_t]$ would produce counterintuitive results. The analysts' consensus estimates, which are collected from six major banking firms operating in Finland, are computed and published on a monthly basis by Arvopaperi newspaper. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

Mean	-3.4%	Kurtosis	24.94	Maximum	63.0%
Median	0.0%	Skewness	-3.59	Count	167
Standard deviation	33.8%	Minimum	-273.2%	Standard error	2.6%

Table 2 – Distribution of investor reactions for main investor categories

Table 2 displays the distribution of investor reactions to the disclosure of Finnish companies earnings over the six major investor categories defined by the Finnish Central Securities Depository central register. An investor reaction is defined as a pair of data items, where the first data item is proxy for how the investor reacts to the second data item, which is the company earnings surprise proxy. The investor reaction proxy expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company. The earnings surprise proxy measures the deviation of the reported earnings from the analysts' consensus earnings forecast. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

	<i>Frequency</i>	<i>Relative</i>
Companies	5,628	10.49%
Financial institutions	2,568	4.79%
General government	471	0.88%
Nonprofit organizations	526	0.98%
Households	44,050	82.14%
Countries and international organizations	388	0.72%
Total	53,631	

Table 3 – OLS regression results for main investor categories

Table 3 displays the OLS regression estimates for the six major investor categories defined by the Finnish central securities depository central register. An investor reaction proxy, which expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company, is OLS regressed against an earnings surprise proxy, which measures the deviation of the reported earnings from the analysts' consensus earnings forecast. More specifically, the model ${}^I C R_{t, t+6} = a + b {}^C ES_t + e$ is estimated, where ${}^I C R_{t, t+6}$ is the reaction proxy for investor I and company C during time period t to t+6, a is the estimated constant, b is the estimated parameter estimate for ${}^C ES_t$, ${}^C ES_t$ is the earnings surprise proxy for company C at time t, and e is the error term. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

Companies				Nonprofit organizations			
	<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>		<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>
Earnings surprise	-0.04	-1.26	0.21	Earnings surprise	0.00	-0.03	0.98
Constant	0.07	6.63	0.00	Constant	0.04	1.34	0.18
R ²	0.0%			R ²	0.0%		
Number of obs.	5,628			Number of obs.	526		
Financial institutions				Households			
	<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>		<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>
Earnings surprise	0.05	1.58	0.12	Earnings surprise	-0.22	-17.89	0.00
Constant	0.03	2.54	0.01	Constant	0.14	34.91	0.00
R ²	0.1%			R ²	0.8%		
Number of obs.	2,568			Number of obs.	44,050		
General government				Countries and international organizations			
	<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>		<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>
Earnings surprise	0.00	0.03	0.98	Earnings surprise	-0.28	-2.40	0.02
Constant	0.08	3.50	0.00	Constant	0.11	2.85	0.00
R ²	0.0%			R ²	1.5%		
Number of obs.	471			Number of obs.	388		

Table 4 – Distribution of investor reactions for large investors

Table 4 displays the distribution of large investors reactions to the disclosure of Finnish companies earnings over the six major investor categories defined by the Finnish Central Securities Depository central register data set. Large investors' reactions were defined as observations where the net holding in the stock belongs to the largest 10% of all observations for the stock in the total sample. An investor reaction is defined as a pair of data items, where the first data item is proxy for how the investor reacts to the second data item, which is the company earnings surprise proxy. The investor reaction proxy expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company. The earnings surprise proxy measures the deviation of the reported earnings from the analysts' consensus earnings forecast. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

	<i>Frequency</i>	<i>Relative</i>
Companies	1,069	20.09%
Financial institutions	1,363	25.62%
General government	329	6.18%
Nonprofit organizations	239	4.49%
Households	2,246	42.22%
Countries and international organizations	74	1.39%
Total	5,320	

Table 5 – OLS regression results for large investors

Table 5 displays the OLS regression estimates for large investors. An investor reaction proxy, which expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company, is OLS regressed against an earnings surprise proxy, which measures the deviation of the reported earnings from the analysts' consensus earnings forecast. More specifically, the model ${}^I{}_C R_{t,t+6} = a + b {}^C ES_t + e$ is estimated, where ${}^I{}_C R_{t,t+6}$ is the reaction proxy for investor I and company C during time period t to t+6, a is the estimated constant, b is the estimated parameter estimate for ${}^C ES_t$, ${}^C ES_t$ is the earnings surprise proxy for company C at time t, and e is the error term. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

	<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>		
Earnings Surprise	0.09	4.10	0.00	R ²	0.4%
Constant	-0.22	-34.52	0.00	Number of obs.	5,320

Table 6 – Distribution of investor reactions for foreign investors

Table 6 displays the distribution of foreign investors reactions to the disclosure of Finnish companies earnings over the six major investor categories defined by the Finnish Central Securities Depository central register data set. Foreign investors' reactions are identified by an investor-specific examination the total investor reaction data set. An investor reaction is defined as a pair of data items, where the first data item is proxy for how the investor reacts to the second data item, which is the company earnings surprise proxy. The investor reaction proxy expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company. The earnings surprise proxy measures the deviation of the reported earnings from the analysts' consensus earnings forecast. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

	<i>Frequency</i>	<i>Relative</i>
Companies	70	3.22%
Financial institutions	1,011	46.55%
General government	0	0.00%
Nonprofit organizations	0	0.00%
Households	703	32.37%
Countries and international organizations	388	17.86%
Total	2,172	

Table 7 – OLS regression results for foreign investors

Table 7 displays the OLS regression estimates for foreign investors. An investor reaction proxy, which expresses how a certain investor changes his/her holding in a certain company during the week after the disclosure of new earnings figures for the company, is OLS regressed against an earnings surprise proxy, which measures the deviation of the reported earnings from the analysts' consensus earnings forecast. More specifically, the model ${}^I{}_C R_{t,t+6} = a + b {}^C ES_t + e$ is estimated, where ${}^I{}_C R_{t,t+6}$ is the reaction proxy for investor I and company C during time period t to t+6, a is the estimated constant, b is the estimated parameter estimate for ${}^C ES_t$, ${}^C ES_t$ is the earnings surprise proxy for company C at time t, and e is the error term. Altogether 167 earnings disclosures for the fiscal years 1998 and 1999 for companies listed on the Main List on the Helsinki Stock Exchange were investigated.

	<i>Estimate</i>	<i>t-value</i>	<i>p-value</i>		
Earnings Surprise	-0.07	-1.55	0.12	R ²	0.1%
Constant	0.04	2.86	0.00	Number of obs.	2,172