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Trading Behaviour of Finnish Households: Activity, Performance and Overconfidence[1]

ABSTRACT

One of the questions in recent stock market research has been the analysis of trading activity, and its profitability effects. It is hypothesized that investors trade excessively in the sense that their trading strategies underperform the passive "buy-and-hold" strategy. We have analysed the trading activity and portfolio performance of Finnish households from the beginning of July 1996 to the end of June 2000 with accurate data. We find that those who trade more perform worse than their less active associates. Men appear to be more active traders in terms of their portfolio turnover as well as their trading frequency. Also, the profitability of their trading is weaker than that of women. Finally, trading skills seem to get better with age.

JEL classification: D14; G19
Keywords: *trading activity; portfolio performance; overconfidence*

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1. INTRODUCTION

The investors in the financial markets are traditionally assumed to be fully rational or at least all the irrational behaviour is assumed to be random. Investors' rationality is in itself a sensible assumption and makes theories easier to build. Even so, while our databases have become more accurate, it has been possible to find systematic irrational actions of investors that are caused by common human behaviour and are known from everyday life. This makes sense because it is hard to believe that people in the financial market, even though they can be very skilled, could always process information accurately without letting human nature affect their behaviour.

In recent research the high level of trading volume has attained attention. For example, Barber and Odean (2000) find that in their sample the households turn their portfolio over 75%[1] annually. Is this the trading activity that is needed for rational trading needs? Barber and Odean end up with the conclusion that it is not. However, there are of course several reasons for rational investors to trade, and the most obvious reason is to improve portfolio performance by buying stock that are going to increase or selling those that are going to decrease. Other reasons can be, for example, rebalancing the risk of the portfolio, increase in the size of the portfolio, liquidity demands, and tax-loss selling.

Recently, researchers have developed models that recommend a new reason for high trading and that is investor overconfidence. Overconfidence is a departure from rationality. In the models of Benos (1998), Odean (1998b), Capallé and Sákovics (2003), and Gervais and Odean (2001)[2] it is suggested that investors suffer from overconfidence and this leads to excessive trading. This hypothesis is in concord with the observed high trading activity in the financial markets that maybe cannot be explained by the rational trading needs. These models of overconfidence propose that overconfident investors will trade more than rational investors. These models also predict that investors trade to their detriment.

Human nature obviously affects our behaviour. Overconfidence is one of the psychological factors known to affect our everyday life and also well documented. It means that people are usually more confident than correct. In other words, they are wrong when they believe that they are right. The models of investor overconfidence, like models of Benos (1998), Capellé and Sákovics (2003), Odean (1998b), and Gervais and Odean (2001) are tied to the behavioural elements proposed by psychologists. Psychological studies show that overconfidence

1 Calculated from the value of trading.

2 Other models of investor overconfidence, see e.g. De Long, Shleifer, Summers, and Waldman (1991), Hirshleifer, Subrahmanyam, and Titman (1994), Kyle and Wang (1997), Wang (1998), Daniel, Hirshleifer, and Subrahmanyam (1998, 2001), and Hirshleifer and Luo (2001).

affects our behaviour in many ways (for example, Alpert and Raiffa 1982; Lichtenstein, Fischhoff, and Phillips 1982; Fischhoff, Slovic, and Lichtenstein 1977; Griffin and Tversky 1992) and this overconfidence is also found in many professional fields[3].

Psychological studies show that the concept of overconfidence should also fit well in the financial markets because overconfidence is greatest when people are dealing with difficult tasks and feedback is noisy (Lenney 1977). It can be argued with confidence that buying and selling securities comply with the attributes above. There is also evidence that men are more overconfident than women typically in the masculine topics (e.g. Lundeberg, Fox, and Punccohar 1994; Deaux and Emswiller 1974; Beyer and Bowden 1997). In the financial matters men are argued to feel more talented (Prince 1993). Additionally, so-called self-attribution bias is shown to be bigger with men (e.g. Beyer 1990). Based on these studies we can expect that men will be more overconfident when they are acting in the financial markets than women[4].

There are a growing number of empirical studies that deal with private investors' return performance. Odean (1999), and Barber and Odean (2000, 2001, 2002) approach the question of private investor performance from the behavioural point of view analysing investors in the U.S. markets. The main effort in these studies is to test the model of overconfidence by Odean (1998b). This model predicts that more overconfident investors trade too much and hurt their net performance compared to 'buy-and-hold' benchmark. In this model investors overestimate the precision of their private signals. However, Odean (1998b) points out that investors' overconfidence in the financial markets may also result from overestimating their abilities to correctly interpret public signals. If investors overestimate the precision of their private signals the worst outcome from trading is to have zero expected gross returns and expected net losses equal to trading costs. On the other hand, if investors misinterpret information they can make losses beyond trading costs. Odean's (1999) study uses trades of 10 000 individual investors from one discount brokerage house from 1987 to 1993. He finds that the stocks the investors sell, subsequently outperform the stocks they buy. This means that overconfidence in the precision of their private information is not enough to explain this result. Investors are also misinterpreting public information. This implies that those investors would do better if they traded less. In other words, they trade too much.

Barber and Odean (2000) have analysed the trading activity and performance of more than 66 000 households from one brokerage house from 1991 to 1996. Instead of trade-based analysis, they calculate portfolio performance for all investors on a monthly basis. Their re-

3 See wide review to empirical literature of overconfidence in Odean (1998b), and Daniel, Hirshleifer, and Subrahmanyam (1998).
4 See accurate review to literature in Barber and Odean (2001).

sults show further evidence that the investors trade too much. Households seem to hurt their performance, both gross and net.

Barber and Odean (2001) classify investors to those who are proposed to be more overconfident and to those who are assumed to be less overconfident. Namely, they partition their data on gender. They use the same database as Barber and Odean (2000) from discount brokerage house during 1991 to 1996 and their data includes over 35 000 households. Their results show that men trade more and have worse gross and net performance than women. So, the results back up the hypothesis that more overconfident investors trade too much and as a consequence have worse performance compared to 'buy-and-hold' performance. They also find that younger investors' trading activity is greater than that of older investors, and their performance is worse. The result is in concord with the model of Gervais and Odean (2001), if we believe that age is a proxy for experience. The model of Gervais and Odean (2001) looks at trader overconfidence in a dynamic setting where overconfidence is caused by the self-attribution bias. The implications from the model are that overconfidence decreases with experience and market increases raise overconfidence because investors confuse "brains" with the bull market. Therefore, bull markets are followed by increased trading activity. This claim is studied by Statman and Thorley (1999).

Barber and Odean (2002) studied over 1600 investors who switched from phone-based trading to online during 1990s. Before switching those investors were performing well, but after the switch they traded more actively, more speculatively, and showing worse performance than before. These findings can, according to authors, be explained by the overconfidence caused by the self-attribution bias and by the illusion of knowledge and control (e.g. Langer and Roth 1975; Miller and Ross 1975). Overconfidence may also be augmented by cognitive dissonance (e.g. Festinger 1957; Blanton, Pelham and Carvallo 2001).

From the point of view of this study especially interesting are the works of Grinblatt and Keloharju (2000, 2001a, 2001b). These studies employ the same unique database than our study. These inquiries study investor behaviour from different points of view. Grinblatt and Keloharju (2001a) analyse the trading behaviour of private investors and institutions; namely disposition effect, tax-loss selling, and the effect of historical price patterns. Grinblatt and Keloharju (2001b) additionally analyse the effects of demographic factors to stockholdings and trades. Finally, Grinblatt and Keloharju (2000) analyse how past returns influence the tendency to buy and sell[5].

5 The return performance and investor behaviour have been evaluated also in Shapira and Venezia (2001), Odean (1998a), Schlarbaum, Lewellen and Lease (1978a, 1978b) and Lewellen, Lease and Schlarbaum (1977).

We search answers basically to the same questions as Barber and Odean (2000, 2001). Do more overconfident people trade more and how those who trade the most perform? We extend the previous literature in the following ways. Our database includes all domestic households that are investing in the Finnish security market. No previous study around the same question uses data that include all the investors in one country[6]. Also, we include in our activity analysis another dimension of trading activity. Besides the turnover ratio that is used in the previous studies, we use the trading frequency as another measure of trading activity.

As stated above, gender and age can be hypothesised to be factors that cause differences between peoples' overconfidence. In this study, following the research design created by Barber and Odean (2001), we analyse the differences in trading activity and gross performance between men (young) and women (old). To do this, we partly replicate the cross-sectional analysis and time-series approach in the study of Barber and Odean (2001). However, our analysis is done with very comprehensive and accurate data, and a somewhat more precise approach is applied when measuring the return performance and trading activity of investors.

Barber and Odean (2000, 2001) ignore intra-month trades and assume that all trades are made at the end of the month. While in the previous studies the performance and trading activity measurements have been carried out using monthly position statements, we have calculated households' portfolio performance and trading activity in daily basis. Therefore, we believe that our results are more reliable and clear.[7]

The remainder of the paper is organized as follows. In Section 2, we describe our accurate and comprehensive data and explain our research design. Section 3 presents and interprets our empirical results, and Section 4 concludes.

2. DATA AND RESEARCH METHODS

2.1 Description of the data

We use in our study the central register of shareholdings for Finnish stocks in the Finnish Central Securities Depository (FCSD) from the 1.7.1996 to the 31.6.2000[8]. The database is called Book Entry System. It is electronically registered and contains the shareholdings of all Finnish

6 In their studies Barber and Odean (2000, 2001) analyse the trading behaviour of investors with discount brokerage accounts. These investors are good for testing the hypothesis of overconfidence because these investors do not get advices from the brokers.

7 However, for the sake of reliability we ignore the returns from intra-day trading.

8 See accurate description of the data in Karhunen and Keloharju (2000). The whole database includes observations from the beginning of 1995 to the end of 2000. We have cut our observations from the beginning because the data is not comprehensive in those periods. For example all the firms were not included in the data at first and at the beginning the trading activity were remarkably low because of the recession.

investors in daily basis for all public companies that are included in this paperless system. So, it is possible to define the portfolios for each stockholder at any point of time in daily basis. At the sample period, practically all of stock market capitalization is represented in the Book Entry System. The data consists of about 25 million direct ownership records and includes more than one million individuals and institutions. In addition to investor identification number the data includes variables for example for gender, birth year and country residence. So, we can observe all the needed variables directly from the database.

There are a few limitations in this data considering our research problem. First, we cannot observe investors' indirect investments. In addition to their direct investments, investors can also have investments through financial institutions. These investments are not detectable. Secondly, we have to focus to the domestic private investors because unlike the Finnish investors to whom the Book Entry System requires compulsory registration the foreigners are partly freed from registration. Hence, they are not registered in such detail and they cannot be separated from each other. Thirdly, we can take under examination only the stocks quoted in Helsinki Stock Exchange (HEX).

We focus in our research to the behaviour of private investors[9]. To be more specific, we include in our sample households (82 units), households of entrepreneurships (17), farmers (15 488), other entrepreneurships (39 462), wage earning households (785 146) and other households (182 510). This means that we have altogether 1 022 705 investors to be analysed. In our data period, there are in all 1 096 315 registered investors. Thus, domestic households form over 93% of all investors. These investors have made 14 196 070 trades during the sample period. In all, there have been made 29 427 566 trades and, therefore, households have made about 48% of all trades. On an average, households have made 13.8 trades during the whole data period.

Despite the fact that the database is electronically registered, we were forced to leave some observations out of our examination because, in the database, there were some observations which didn't include gender variable or the information of the birth year. Also, we left out of our inquiry investors who hold only the stocks of HPY[10].

Our data consists of investor-years, i.e. each observation corresponds to a one-year trading history and performance of an individual investor. In order to better maintain the commensurability of the observations we include in the data only those observations that repre-

9 Our interest in this dataset includes 6 categories of investors. These categories are chosen so that they would most optimally represent private investors.

10 The HPY was a telephone co-operative in the Helsinki area. People who opened an own telephone connection bought a share of the HPY. When HPY turned into a public company, these shares were changed into common stocks. HPY is currently Elisa Communications.

sent a portfolio that is kept over the whole one-year period. In other words, if an investor creates her portfolio, or sells the whole portfolio during the year, the observation is excluded from the data. This procedure naturally excludes from our study a lot of active investors. These excluded investors represent a wide spectrum of investors. However, the commensurability of our measures is much higher. In addition, we have excluded from the data the investors under 20 years old and investors older than 80 years. It is quite likely that investors under 20 years and above 80 years do not make a significant part of their investment decisions independently. Our research period from the beginning of July 1996 to the end of June 2000 gives us four one year periods, which we pool and thus one investor might be represented in the data four times.

At this point our dataset includes 1 460 532 observations. From this group we have additionally excluded investors who make more than 50 trades on the yearly basis because extremely active trading may cause measurement problems by the growing probability of intraday trading. There are 2 427 such observations. That means that at this point there are 1 458 105 observations in our data. This includes 1 161 822 observations representing investors who have not made any transactions at all in the particular year, and 296 283 representing "active" investors who have made at least one trade per year. We estimate our models for both the whole sample, and the sub-sample that includes only the "active" investors. We report the results concerning the latter analysis. The results from the former analysis are consistent with the reported results.

In Table 1 we represent some descriptive statistics of the data. In each row, the statistic corresponding to the sample of the "active" investors only is provided first, and the statistic representing all the investors in the parentheses. We have divided investors to young (from 20 to 40 years old), middle aged (40–60) and old (60–80) men and women. The number of male investors in each age category is higher than the number of female investors, and also the proportion of the active investors higher for male categories. The number of male and female investors is highest for the middle-aged category. Male investors hold more stocks than female investors, and the number of stocks is monotonically increasing with age. However, this is not so clear with all investors included. The same interpretation is true also for the mean and median portfolio value. The portfolio value of active investors is much higher than for the whole data and also the number of stocks included in the portfolio is higher for the active investors.

2.2 Research methods

2.2.1 Trading activity

In order to separate active traders from the less active we have to calculate some measure of trading activity. There are several possible ways to measure trading activity. Our study em-

TABLE 1. Descriptive statistics.
In each row, the statistic corresponding to the sample of the "active" investors only is provided first, and the statistic representing all the investors in the parentheses. We divide investors to young (from 20 to 40 years old), middle aged (40–60) and old (60–80) men and women. Our research period from the beginning of July 1996 to the end of June 2000 gives us four one year periods, which we pool and thus one investor might be represented in the data four times.

	Young (20–40)		Middle-aged (40–60)		Old (60–80)	
	Females	Males	Females	Males	Females	Males
Number of investors	22 089 (165 891)	56 010 (218 689)	46 045 (265 884)	94 707 (363 803)	29 341 (205 366)	48 091 (238 472)
Portion of active investors%	13.3	25.6	17.3	26.0	14.3	20.2
Average # stocks	3.4 (1.8)	3.7 (2.2)	4.0 (2.2)	4.7 (2.7)	4.5 (2.3)	5.2 (2.6)
Median # stocks	2.5 (1.0)	2.9 (1.2)	3.0 (1.1)	3.5 (1.9)	3.2 (1.0)	3.9 (1.8)
Mean portfolio value (1000 €)	47.9 (12.5)	53.3 (19.5)	73.8 (22.4)	90.4 (34.9)	108.2 (31.5)	116.5 (40.0)
Median portfolio value (1000 €)	8.6 (1.6)	9.9 (2.0)	13.8 (2.9)	19.8 (4.2)	20.2 (3.5)	25.5 (4.0)

ploys two measures. First, we use a similar turnover (TO) measure as Barber and Odean (2001) but on daily basis. The daily turnover ratios for every investor are calculated by summing up the daily sales turnover and daily purchase turnover both weighted by one half. Daily sales turnover is calculated as the value of stocks sold divided by the value of the portfolio held at the beginning of the day. Values are calculated using closing prices from the previous day. Daily purchase turnover is calculated as the value of purchased stocks divided by the value of the portfolio at the end of the day. Values are calculated using closing prises in that same day. These daily turnover ratios are then summed up and divided by the number of trading days in the year (250) to get an average daily turnover ratio for every investor.

Our own measure of trading frequency (TF) is calculated as summing up the number of sale and purchase days and dividing this sum by the trading days in year. We argue that this measure brings out another dimension of trading activity besides the turnover discussed above. Overconfidence is argued to cause unnecessary trading because traders overestimate the precision of information or assess the information completely wrong. Those who are most overconfident would then trade more aggressively because they overestimate their expected profits and make fruitless trades. In other words, they trade more frequently. It is possible to trade

frequently with low TO ratios, if the investor makes small trades. However, this kind of investor should be considered as an active trader. We also use a product of turnover and trading frequency (TOTF) as an additional variable to describe trading activity. With this measure we can trace out the most active investors, those who have high turnover and make trades frequently.

2.2.2 Return calculations and benchmark portfolio

All our return calculations are gross returns[11]. We have calculated every investor's gross return index and the value of the portfolio on a daily basis. First, for every investor and every stock we have calculated the number of shares in the portfolio on a daily basis. Secondly, when the investors have made a transaction, the transaction price has been used to calculate the stock return. Otherwise the daily closing price has been applied. In the case of more than one transaction per day the weighted average of the trading prices is applied. Finally, the daily return of investor's portfolio has been calculated as the value weighted average of the returns of individual stocks.

To measure the profitability of trading we need to have some benchmark that can be used in comparing the performance of investors' portfolios. We use a "passive-portfolio" benchmark to calculate the abnormal returns for the households. This benchmark is similar to that proposed by Barber and Odean (2000, 2001), Lakonishok, Shleifer, and Vishny (1992) and Grinblatt and Titman (1993). It doesn't capture any risk characteristics and is unmoved by the investors' risk preferences.

The contents of the "passive-portfolio" is updated once a year at the end of June, and includes the shares of stocks the investor had in her portfolio on that particular day. The portfolio is kept intact for the next twelve months, and tells how the investor had performed if not traded at all during that period. In our version of the approach the stocks acquired via IPOs during the period are included in the "passive-portfolio", however. In our research period there have been a significant number of IPOs. These IPOs have been so profitable that if they were not included in the "passive-portfolio" our results would be distorted. Only the market transaction based changes in the portfolio, buying and selling the stocks are considered as deviations from "buy-and-hold" strategy. So, loosely speaking secondary market actions are only regarded as active trading.

11 Previous studies (Barber and Odean 2000, 2001, 2002) analyse both gross and net returns by applying trading cost approximations. The investors in our dataset are customers to several brokerage houses and they have many alternative channels to do transactions. Therefore, in our case the trading cost approximations would be even more biased, and we have decided to use only gross returns in our analysis.

We calculate the abnormal returns for every investor by extracting "passive-portfolio" returns from the actual returns. There are at least two reasons to use this benchmark. First, there is continuous arm wrestling going on with the appropriate risk measures. This benchmark does not measure such risk factors that investors do not consider as risk. Secondly, this benchmark allows us to compare two trading methods for the same investor. These methods are "buy-and-hold" trading and observed trading. So, with the abnormal returns calculated using this measure we assess the consequences of trading. If there is no trading, abnormal returns are zero. This is why there is not much point to include totally passive investors in our analysis. Their abnormal returns are zero by definition.

There are essentially three ways how to make better abnormal "passive-portfolio" returns. First, investors can sell stocks that are going to be bad for the portfolio returns. Secondly, investors can buy stocks that are going to heal up the portfolio performance. Thirdly, investors can sell shares and replace them by buying shares that are going to perform better. When they make better abnormal "passive-portfolio" returns they can make good timings or their security selection ability is good. In both cases it is quite likely that they somehow assess information.

3. RESULTS

3.1 Categorical analysis

The models of overconfidence predict that the more overconfident investors will trade more and as a consequence, hurt their performance through trading. They are also claimed to hold riskier portfolios. Psychological studies and economical theories of overconfidence show that men are more overconfident than women and overconfidence decreases with experience (e.g. Barber and Odean 2001; Gervais and Odean 2001). If we accept age as a proxy for experience we can make the following hypothesis: men (young) trade more than women (old), men (young) hurt their performance more trough trading than women (old) and men (young) hold riskier portfolios than women (old). The above hypothesis can be tested very straightforwardly with our data.

We first divide our sample into men and women. These categories we divide further into smaller subcategories by age. Altogether we have six categories: young men/women, middle-aged men/women, and old men/women. We calculate average turnovers, number of trading days, "passive-portfolio" abnormal returns, raw-returns and portfolio volatilities for these categories and differences in these measures between the categories on daily basis. We first calculate averages for each investor separately for each year. Next, we pool these "observations" over the years and categorize them as described above. Finally we take averages of the variables over these categories separately.

Table 2. Trading activity, raw returns and portfolio volatility.
We first calculate the values of the variables for each investor separately for each one-year period from the beginning of July 1996 to the end of June 2000. Next, we pool these observations over the years and categorize them as described above. Finally, we take averages of the variables separately in each category. Measures are annualised for the sake of clarity. P-values are in parenthesis.

Panel A: trading activity

Age	Number of observations		Average annualised turnover		Differences in turnover	Average number of trading days per year		Differences in trading days
	Females	Males	Females	Males	Males–Females	Females	Males	Males–Females
20–40	22 089	56 010	42.9%	66.8%	23.9% [0.000]	3.0	5.1	2.1 [0.000]
40–60	46 045	94 707	39.4%	52.5%	13.1% [0.000]	3.3	4.9	1.6 [0.000]
60–80	29 341	48 091	28.6%	38.0%	9.4% [0.000]	2.8	4.0	1.2 [0.000]

Panel B: Average annualised returns and portfolio volatility

Age	Number of observations		Average "passive-portfolio" abnormal returns		Difference in abnormal returns	Average raw returns		Portfolio volatility		Difference in portfolio volatility
	Females	Males	Females	Males	Females–Males	Female	Male	Females	Males	Males–Females
20–40	22 089	56 010	–0.2% [0.035]	–1.4% [0.000]	1.2% [0.000]	43.2% [0.000]	42.0% [0.000]	40.5%	41.4%	0.9% [0.000]
40–60	46 045	94 707	0.1% [0.025]	–0.1% [0.005]	0.2% [0.000]	43.1% [0.000]	38.2% [0.000]	39.4%	38.4%	–1.0% [0.000]
60–80	29 341	48 091	0.8% [0.000]	0.6% [0.000]	0.2% [0.046]	41.5% [0.000]	36.4% [0.000]	38.0%	37.2%	–0.8% [0.000]

In Table 2 we represent the results of our calculations. Panel A shows the results of averaged trading activities. Turnover ratios are annualised for the sake of clarity and presented at columns four to six. In each age category men have higher turnover ratios than women, and the difference is highly statistically significant. However, the turnover ratios are decreasing with age. On an average, women turn their portfolio 37% annually and men turn their portfolio 53% annually. If we take into account also those who do not trade at all, we get average turnover rates 5.5% for women and 12.8% for men.

In columns seven to nine we present the average number of trading days in our categories, and the differences between men and women. Trading frequency (number of trading days) and turnover ratios seem to give similar results. Men trade more frequently than women in all age subcategories and the differences are highly significant. As was the case with turnover rate, trading frequency is decreasing with age.

These results are in concord with the overconfidence model and with the results of Barber and Odean (2001)[12]. Men are claimed to be more overconfident than women, and it is detectable from our results that men trade more than women do. It is also claimed that overconfidence decreases with experience, and we see from our results that young investors trade more than old. However, in relative terms, men seem to decrease their trading activity more than women, when they get older. It must be noticed, however, that the trading activity of men still remains higher than that of women. The turnover ratio is 14.3 percentage units lower for old women than for young women and 28.8 percentage units lower for old men than young men. The number of trading days for old women is only 0.2 trading days per year lower than for young women and 1.1 trading days lower for old men than for young men.

Age as a proxy for experience is more or less imprecise. We do not know whether old investors have participated stock market, when they were younger. However, we argue that it is still possible that people learn from other experiences, and this learning can also be valuable in the stock markets. Their confidence level is perhaps more precisely calibrated because of learning in other walks of life.

In Panel B we represent the average annualised returns and portfolio volatilities. The fourth and fifth columns show the average ”passive-portfolio” abnormal returns. Rational models argue (e.g. Grossman and Stiglizt 1980) that investors should trade only when they at least can cover their transaction costs. This means that they should earn positive abnormal ”passive-portfolio” returns. We see from Panel B that only old men and middle aged and old women

12 Surely, some accounts are not managed by the owner. In order to avoid this problem Barber and Odean (2001) also studied the behaviour of single people. Our data does not enable this kind of an analysis.

earn statistically positive abnormal returns at least at 5% confidence level. Young and middle-aged men earn statistically highly significant negative returns. It means that they are loosing even before transaction costs. Young women are not making positive abnormal returns, either their abnormal returns are not very significantly different from zero. We can say for sure that young and middle aged men and young women are making poor trading; they would earn higher returns, if they traded less. This is what the model of overconfidence (Odean 1998b) predicts. They may be overestimating their abilities to correctly interpret public signals. The abnormal returns seem to increase when the investors get older. This result can come from learning.

Overconfidence in the precision of investors' private information is not enough to explain the results of young men and women and middle-aged men. Odean (1999) points out that the reason for negative abnormal returns is that investors must be misinterpreting information. So, investors are acting when they are completely wrong, not only when they are too overconfident about the precision of their information. Investors can be too overconfident about their trading methods; they can, for example, have overconfident but erroneous beliefs in momentum or contrarianism. This can in fact be the case. Grinblatt and Keloharju (2001a) have analysed the determinant of transactions in Finnish stock markets and report that past returns are one determinant for trading and domestic investors are more contrarian. An investor can buy a stock, which she believes is going to reverse. But this never happens and as a consequence she earns negative "passive-portfolio" abnormal returns.

The sixth column in Panel B shows the differences in abnormal returns between men and women. Men earn lower abnormal returns in all age categories. The differences are statistically significant at 1% and 5% levels. Because men trade more (see Panel A) they should have higher abnormal returns in order to cover their higher trading costs. However, we see that this is not the case. The difference is biggest for young people. Young women earn 1.2% higher abnormal returns than men. There is no sign that men would earn higher returns than women. As a consequence, men do hurt their performance trough trading more than women. This is again in concord with the hypothesis established in this study.

Raw-returns are not very interesting, because our hypothesis says nothing about raw-returns. However, we bring them out in columns seven and eight in Panel B. Men earn raw-returns from 36.4% to 42% and women from 41.5% to 43.2%. So, women earn also higher raw-returns than men.

The overconfidence model of Odean (1998b) argues that more overconfident investors hold riskier portfolios. We study whether there are differences in the idiosyncratic risk between men and women. We have estimated average portfolio volatilities for young, middle aged, and old men and women. The results are shown in columns nine to eleven in Panel B.

The portfolio volatilities differ statistically significantly. However, only young men hold higher portfolio volatilities and the situation reverses for older people.

3.2 The stability of abnormal returns

We calculated the measures presented in Table 2 also for each year separately. This analysis shows that our results are quite stable except for abnormal returns. We present the results for average "passive-portfolio" abnormal returns divided into four years in Table 3. We see that for the periods that end in 1997 and 1998, women and men earn only negative returns that are statistically different from zero. The differences between men and women show that men earn statistically significantly lower abnormal returns.

In the period that ends in 1999, both men and women earn negative abnormal returns in all age categories. Returns are statistically significant at 1% level. The differences between men and women are statistically significant for middle-aged and old people. These differences show that women earn lower abnormal returns. These results show that our results are not strictly stable and are not in concord with our hypothesis.

In the period that ends at the end of June 2000 the results are again different. Young men earn –2.1% annual abnormal returns that are statistically significant. At the same time women earn statistically zero abnormal returns so that the difference is statistically significant 2.4% annually. The middle-aged women earn statistically significant abnormal returns. They earn 1.15% annually. At the same time men earn statistically zero abnormal returns annually. The difference in this age category is statistically significant 0.81% annually. Old men and women earn statistically significant positive abnormal returns 2.55% and 2.09% annually, respectively. This is the only time when men earn positive returns. So, this is the only time when men possibly cover their trading costs.

We can summarise our results as follows. Men earn zero or negative abnormal returns except the old men in the period that ends in 2000. So, for most of the cases men earn negative returns. These results are in concord with the hypothesis established in this study. Men trade too much. They would have higher returns, if they traded less. The same is mostly true also for women. There are two cases when women earn statistically significant positive abnormal returns. We cannot take responsibility for the net returns because we do not have data about trading costs.

According to our hypothesis men (young) should earn less than women (old) because they are more overconfident and trade more. There are only two cases when our results do not back up this hypothesis for the gender hypothesis. There are two statistically significant cases where women earn lower returns, 0.62% and 0.59% difference in 1999 between middle-aged and old men and women. In the last period there are quite high statistically different abnormal

TABLE 3. The stability of the abnormal returns.
The averages of the variables are calculated separately for one-year periods from the beginning of July 1996 to the end of June 2000. The values of the variables are annualised for the sake of clarity. P-values are in parenthesis.

Average annualised returns 1996–97					
Age	Number of observations		Average "passive-portfolio" abnormal returns		Difference in abnormal returns
	Females	Males	Females	Males	Females–Males
20–40	3 064	7 585	0.08% [0.626]	–0.5% [0.000]	0.46% [0.002]
40–60	6 520	13 952	–0.32% [0.000]	–0.30% [0.000]	–0.02% [0.823]
60–80	3 982	6 680	–0.18% [0.103]	–0.19% [0.028]	0.01% [0.930]
Average annualised returns 1997–98					
Age	Number of observations		Average "passive-portfolio" abnormal returns		Difference in abnormal returns
	Females	Males	Females	Males	Females–Males
20–40	4 230	9 787	–0.30% [0.065]	–0.76% [0.000]	0.46% [0.023]
40–60	9 035	18 085	–0.15% [0.474]	–0.42% [0.000]	0.27% [0.030]
60–80	5 904	9 520	–0.31% [0.006]	–0.70 [0.000]	0.39% [0.008]
Average annualised returns 1998–99					
Age	Number of observations		Average "passive-portfolio" abnormal returns		Difference in abnormal returns
	Females	Males	Females	Males	Females–Males
20–40	5 143	13 446	–1.3% [0.000]	–1.03% [0.000]	–0.27% [0.238]
40–60	10 700	23 717	–1.19% [0.000]	–0.57% [0.000]	–0.62% [0.000]
60–80	7 141	12 650	–0.93% [0.000]	–0.34% [0.000]	–0.59% [0.000]
Average annualised returns 1999–2000					
Age	Number of observations		Average "passive-portfolio" abnormal returns		Difference in abnormal returns
	Females	Males	Females	Males	Females–Males
20–40	2 652	25 192	0.30% [0.127]	–2.10% [0.000]	2.4% [0.000]
40–60	19 790	38 953	1.15% [0.000]	0.34% [0.528]	0.81% [0.000]
60–80	12 314	19 241	2.55% [0.000]	2.09% [0.000]	0.46% [0.006]

returns between men and women. Young, middle-aged, and old men earn 2.4%, 0.81% and 0.46% lower abnormal returns annually, respectively.

Much of our results concerning the difference between different age groups seem to come from the last period. In this period old and middle aged investors earn much higher abnormal returns than is any other period. Our categorical analyses show that older investors earn quite high abnormal returns. The last period is more or less responsible for that result.

The portfolio volatility seems to be higher only for young men. So, this is not completely in line with our hypothesis but results mostly support our hypothesis and the theory of overconfidence; men hurt their performance through trading more than women and most likely this is true for young men.

3.3 The regression results

To confirm the results above and to include other explanatory variables we approach our research problem with another analysis. To assess what factors have an effect on trading activity we pool the investor-year observations and estimate the parameters of two regression models. We consider mean daily turnover ratio (TO-ratio or TO) and trading frequency ratio (TF-ratio or TF) as dependent variables. As independent variables we have chosen gender dummy (men=1), age, average logarithmic market value of the portfolio, average number of stocks in the portfolio, and dummy variables for each year.

Almost all of our estimates are highly significant. There are two cases when the estimates are significant at 5% level and one case when the estimate is significant at 10% level. Only in two cases the estimates are not significant. In all other cases they are significant at 1% level. The R-squares of the models are quite low in some cases. When comparing them to those by Barber and Odean (2001), it can be noticed that their R-squares are even lower, however.

The results for mean daily turnover are in line with our hypotheses. The results show that the mean daily turnover for men is 15.7% higher. Also, daily turnover declines by 0.5 % per year that we age. So, 20 years of aging, which is the distance between our age categories, causes 10% decrease in turnover. Portfolio value and the number of stocks have negative effect on mean daily turnover. Mean daily turnover decreases when logarithmic portfolio value increases and decreases when the number of stocks increases.

The third column shows the results for TF-ratio. TF-ratio is 0.5% higher for men. This means 1.25 trading days per year. TF declines 0.02% per year when the investor gets older. This means 0.4% decline for every 20 years, which means one trading day. One unit increase in logarithmic portfolio value increases TF 0.24% and one unit increase in the number of stocks in the portfolio increases TF by 0.14%. So, trading frequency does increase when investors' portfolio size or the number of stock increases but the trade size decreases as the analysis of

TABLE 4. The regression results.
The regression models are estimated over the sample of pooled observations that describe one-year period behaviour and performance of individual investors. Standard deviations are in parenthesis. Symbols ***, **, and * indicate significance at 1, 5, and 10 percent levels, respectively.

	Dependent variable				
Independent variables	**TO (annualised)**	**TF**	**Abnormal returns (annualised)**	**Raw returns (annualised)**	**Portfolio volatility (annualised)**
Intercept	0.7862*** [0.0238]	–0.0133*** [0.0004]	–0.0700*** [0.0023]	–0.1122*** [0.0050]	0.1902*** [0.0018]
1997–98	0.0383*** [0.0100]	0.0008*** [0.0001]	–0.0022** [0.0009]	–0.0439*** [0.0020]	0.0771*** [0.0007]
1998–99	0.0468*** [0.0091]	0.0010*** [0.0001]	–0.0055*** [0.0009]	–0.5231*** [0.0021]	0.1690*** [0.0007]
1999–00	0.1291*** [0.0084]	0.0055*** [0.0001]	0.0071*** [0.0008]	–0.2511*** [0.0022]	0.2598*** [0.0006]
Gender	0.1565*** [0.0058]	0.0051*** [0.0001]	–0.0036*** [0.0006]	–0.0419*** [0.0012]	0.0008* [0.0004]
Age	–0.0053*** [0.0002]	–0.0002*** [0.0000]	0.0003*** [0.0000]	–0.0010*** [0.0000]	–0.0006*** [0.0000]
Portfolio value (ln)	–0.0157*** [0.0021]	0.0024*** [0.0000]	0.0054*** [0.0002]	0.0328*** [0.0004]	0.0100*** [0.0002]
# stocks	–0.0103*** [0.0009]	0.0014*** [0.0000]	–0.0002** [0.0001]	0.0037*** [0.0002]	–0.0121*** [0.0001]
TO (annualised)	–	–	–0.0028*** [0.0002]	–0.0001 [0.0005]	0.0018*** [0.0001]
TF	–	–	–0.1499*** [0.0152]	0.6804*** [0.0325]	–0.0094 [0.0119]
TOTF	–	–	–0.0323*** [0.0043]	–0.1389*** [0.0092]	0.0106*** [0.0034]
Portfolio volatility (annualised)	–	–	–	1.1072*** [0.0050]	–
Adj. R^2 (%)	0.8%	13.7%	1.0%	33.0%	46.2%

the turnover in the second column shows. Those who have bigger portfolios, make more frequent but smaller trades.

The results of trading activity back up the hypothesis in this study and the results above. Men trade more than women and the young trade more than the old. But we do not have any hypothesis concerning portfolio value or the number of stocks. They are included as control variables. It is possible that our results are explained by other characteristics. We include port-

folio value and the number of stocks as independent variables. These variables are significant but they do not cancel out our other variables.

At the fourth column we present our results concerning the abnormal annualised returns. To assess what factors have an effect on abnormal annualised returns, we launch again a pooled regression analysis. We consider average abnormal annualised returns as a dependent variable. As independent variables we choose gender dummy (men = 1), age, average logarithmic market value of the portfolio, average number of stocks in the portfolio, TO-ratio, TF-ratio, the product of TO and TF (TOTF or TOTF-ratio), and dummy variables for each year.

The results show that men hurt their performance more than women through trading. The mean annualised abnormal return is 0.36% lower for men. Investors' abnormal annualised returns improve by 0.03% per year. This means that investors abnormal returns get 0.6% better for every 20 years that they age. These results back up our hypotheses; men hurt their performance trough trading more than women and old people hurt their performance less than young.

When we explain abnormal annualised returns by trading activity measures, the results back up the hypothesis that more trading hurts performance. If TO-ratio increases by one percentage unit the abnormal returns decrease by 0.0028% annually. The effect of TF-ratio is similar. If TF-ratio increases by one percentage unit, the abnormal returns decrease by 0.15%. One percentage unit increase in TOTF-ratio decreases abnormal returns by 0.03%. All of our activity measures therefore show that more trading is hazardous. It is unprofitable to increase the size of the trades and the frequency of the trades.

We explain average raw returns with the same independent variables and add portfolio volatility as another variable. Men and older investors earn lower raw-returns. These results are also detectable from Table 2. Those who have bigger portfolios and more stocks, earn higher raw-returns. The estimate of TO-ratio is not significant, but TF-ratio is highly significant. So, those who trade more frequently, earn higher raw-returns. TOTF-ratio is also significant. Those who make big trades frequently, earn lower raw-returns. One percent increase in portfolio volatility increases raw-returns 1.1% annually.

Finally, we explain annualised portfolio volatility. We use again the same independent variables as for the previous two dependent variables. Portfolio volatility is higher for men than for women. This estimate is, however, significant only at 10% level. The difference is 0.08% annually. Portfolio volatility decreases by 0.06% per year as investor get older. Trading activity increases portfolio volatility. If TO-ratio increases one percentage unit, portfolio volatility increases 0.002% annually. However, the estimate of TF-ratio is not significant. These results show that those who trade the most measured by the trade size or by the TOTF, also hold more idiosyncratic risk. The difference is marginal, however. The difference between men

and women is not so clear. The estimate is significant only at 10% level. This result was not clear in Table 2 either. Only young men seem to hold higher portfolio volatility.

3.4 Discussion

Investors trade excessively in the sense that they would do better, if they traded less. The overconfidence is the possible reason for this excessive trading. This means that the overconfidence about the information causes unnecessary trading. Investors are trying to make better profits but fail, because they are overconfident. But what if investors are trading for other reasons than to make better profits? There are, as mentioned at the beginning, several reasons for a completely rational investor to trade other than to make better profits. They can rebalance their risk, increase the size of the portfolio, they can have liquidity needs, they can trade for tax reasons, and also trading can be entertaining.

We argue that the other reasons than trading for entertainment are not very tempting explanations for our results. Of course they count a part of the trading but it is not very likely that they count for example the turnover rate of the young men that is almost 70% annually. However, trading for entertainment is something that we cannot rule out. For example young women earn raw-returns that are 43.2% annually and young men earn raw-returns that are 42% annually. From the raw-returns women have lost 0.2% through trading before transaction costs and men have lost 1.4% before transaction costs. It may be that they understand this drawback of trading, but do not care, because it is so small a portion of raw-returns, and trading is entertaining. But this drawback can be much higher if we take transaction costs into account. Older investors do not trade, at least not so much, to their detriment. They are maybe learning or they do not get so much satisfaction from trading any more. As Barber and Odean (2001a) point out, those who trade for entertainment believe that they have trading skills. So, they can still be overconfident. The better performance of older investors might come from learning or from lower satisfaction from trading. Otherwise, they might not change their behaviour. In any case, the overconfidence still remains as a plausible explanation of our results.

4. CONCLUSION

We have tested one model of behavioral finance, the model of overconfidence. The previous studies in behavioral finance and psychological studies show that overconfidence increases trading activity and hurts performance. This is because overconfident investors are more confident than correct. Investors may be too overconfident about the precision of their private information or they may misinterpret the public information.

Men are claimed to be more overconfident than women in security market. It is also claimed that overconfidence decreases with experience. It is hypothesized that men therefore trade more than women and hurt their performance more through trading. If we accept age as a proxy for experience we can also argue that the young will trade more and hurt their performance more through trading than the old. It is also claimed that more overconfident investors bear more risk.

We have tested the hypothesis derived from overconfidence with a very accurate and comprehensive data. Our database includes all the private domestic investors in Finland. Our results show that men (young) trade more than women (old) and hurt their performance more than women (old). It is not clear whether men hold more idiosyncratic risk. However, this seems to be true for young men. Portfolio volatility seems to increase a little with trading volume. This result is in line with the overconfidence hypothesis. Regardless of gender or age those who trade the most are also hurt the most. Overconfident investors trade too much. They would do better, if they traded less. Our results therefore support the behavioral model of overconfidence. ■

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