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Trading activity and Overconfidence: First Evidence from a large European Database

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Trading activity and Overconfidence:

First Evidence from a large European Database

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Abstract

We investigate the presence of overconfidence for 43 958 individual investors using a large brokerage account database between 1999 and 2006. We employ three methodologies to gauge overconfidence and our main results show that independently of the methodology considered, individual investors are subject to overconfidence and consequently trade too frequently. Securities investors are buying are systematically underperforming those they are selling on follow-up periods; investors are clearly not making profitable trades.

JEL Classification : G 10

Résumé

Nous étudions la présence de surconfiance pour 43 958 investisseurs individuels à partir d'une base de données de transactions individuelles sur la période 1999-2006. Trois méthodes visant à évaluer la rentabilité des stratégies d'investissement retenues par les investisseurs sont mises en œuvre et nos résultats montrent que quelle que soit la méthodologie considérée, les investisseurs individuels sont surconfiants et échangent trop fréquemment. Les stratégies adoptées par ceux-ci sont en moyenne sous-optimales, les titres achetés sous-performant systématiquement les titres vendus sur différents horizons d'investissement.

JEL Classification : G 10

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I. Introduction

Trading volume appears high on financial markets. For example, latest figures published by NYSE-Euronext in 2009 acknowledge that on average, 1.5 million securities have been traded each day in Europe. While this volume seems disproportionate to investors' rebalancing and hedging needs, proponents of behavioral finance suggest that one possible explanation to this phenomenon is overconfidence (see De Bondt and Thaler ,1995).

Overconfidence is a concept borrowed from psychology. In a broad manner, overconfidence can manifest itself in the following forms: miscalibration of probabilities, better than average effect, illusion of control and unrealistic optimism.

Miscalibration is the difference between the accuracy rate and probability assigned that an answer is correct. Overconfidence is a particular form of miscalibration in which the assigned probability that the answer is correct exceeds the true accuracy of answers. Overconfidence in terms of miscalibration is generally measured by asking people to construct confidence intervals for several uncertain quantities. The usual finding is that people's probability distributions are too tight and that the assigned probability is greater that the proportion of correct answers (Lichtenstein *et al.*,1982). Concerning stock markets, it has been found that when people are asked to define confidence intervals for the return of an index or a stock, they usually underestimate volatility **(**DeBondt, 1998, Hilton, 2001**,** Glaser *et al.*, 2005)

The better than average effect hints to the fact that people believe that they are above average and that individuals have unrealistic positive views of themselves (Taylor and Brown,

1988, Cooper *et al*., 1988). One famous example comes from Svenson (1981). While asking a group of US students to grade their driving skills, the author highlights that 50% of the participants rank themselves among the 30% of drivers with the highest driving safety.

Illusion of control relates to the observation that people tend to believe they can influence events which are in fact governed mainly by chance. An example of this illusion is given by Langer (1975), Miller and Ross (1975) or Presson and Benassi (1996) ; they show that people are ready to pay a higher price for a lottery ticket they can choose themselves, as if this could yield a more favorable result. Moreover, if these individuals expect certain outcomes and these outcomes do occur, they are prone to assign them to their doing rather than to luck and reaffirm they can control events purely random events. Finally, overconfidence can lead to a form of unrealistic optimism. People believe that they have better chances than others to be confronted to positive events in their future life and particularly for their financial investments (Benartzi, Kahneman and Thaler, 1999). On the other hand, they think that others are more likely to face unfavorable events such as burglary or accidents.

Odean (1999), Barber and Odean (2001), Barber and Odean (2002) and Glaser and Weber (2007) show that overconfidence can lead to excessive trading on financial markets. Odean (1999) analyzes trading records of 10 000 individual investors in the US. The author considers that overconfidence relates to the miscalibration of the accuracy or precision of financial information. He formulates the following hypothesis. Over defined horizons, the securities these investors buy should outperform those they sell by at least enough to cover transaction costs. On the opposite, an overconfident trader who, for example, overestimates the precision of his information, may trade even if transaction costs are not taken care of. The author thus tests for overconfidence by determining whether, over appropriate horizons,

securities investors buy outperform securities they sell by at least enough to cover transaction costs. The author shows that this is clearly not the case. For example, even before considering transaction costs, for the entire sample over a one year horizon, the average return to a purchased security is 3.3% lower than the average return to a security sold. Investors are not making profitable trades; they should trade less. Barber and Odean (2001) investigate overconfidence by using a "gender approach" ; they show that men are more overconfident than women. This behavior reduces net returns earned by men by 2.65% per year. Barber and Odean (2002) obtain similar results by analyzing the trading behavior of individual investors who switch to online trading. These investors earned exceptional returns in the period preceding their online debuts, beating the market by an average return of 2.4% on a yearly basis. The authors show that after going online, these investors trade more actively and less profitably; they underperform the market. Overconfidence can explain these observations: when people succeed, they often give themselves too much credit for their success. Failures, on the other hand, are blamed to others or to misfortune. It is likely that these investors thought that the excellent returns they earned before going online were due to their investment skills. Being "aware" of their talent, they increased their trading activity after going online and suffered from poor portfolio performance.

Finally, Glaser and Weber (2007) investigate the link between overconfidence and trading volume in an innovative way. The authors ask approximately 3000 online broker investors to answer an internet questionnaire designed to measure the following forms of overconfidence : miscalibration, the better than average effect, illusion of control and unrealistic optimism. Simultaneously, they compute several measures of trading volume of these individual investors (number of trades, turnover, etc). In a last step, they evaluate the correlation between the overconfidence scores they observe and the measures of trading

volume. For instance, Glaser and Weber (2007) gauge "miscalibration" by asking general knowledge and stock market forecasts questions. Participants are asked to provide confidence intervals when answering questions. The "better than average effect" is measured by asking questions concerning skills and performance relative to others. An example of such a question is "*What % of customers of your discount brokerage house have better skills than you at identifying stocks with above average performance in the future?*" Results show that individual investors who think they are above average in terms of investment skills or past performance trade more. However, surprisingly, measures of miscalibration are unrelated to measures of trading volume. This conclusion is particularly striking because researchers incorporating overconfidence typically rely on the miscalibration literature to motivate this assumption.

However, even if the presence of overconfidence has been studied in a number of countries, no such research has yet been carried out in France. Furthermore, the only European empirical research dealing with the subject on individual data concerns 3 079 accounts (Glaser and Weber, 2007). Our paper fits this loophole by investigating the trading records of 43 958 individual investors at a French discount brokerage house between 1999 and 2006 and thus is the most comprehensive in the European context. The paper is organized as follows. Section II describes the data and introduces the methodology. Section III is devoted to the description of our main results and comments and section IV brings the concluding remarks.

II – Data and methodology

The main data is provided by a large French discount brokerage house. We obtain transaction records for all active[3] accounts over the period 1999-2006, that is 9 619 898 trades with 5 074 732 buy orders and 4 545 166 sell orders for 92 603 individual investors. The data is contained in three files: trades, investors and fees. The trades files combines the following data for each trade : ISIN code of the asset, type of asset (common stocks, certificates, warrants), buy-sell indicator, short sale indicator, quantity and amount in Euros, account type (traditional versus tax-free account or French Plan d'Epargne en Actions (PEA)) and the media used to place the order. The investors file gathers demographical information about the investors: date of birth, sex, place of living, among others. The fees file contains monthly fees paid by each investor and indicates whether they are trade fees or short sales fees.

In order to test for overconfidence, we extract a dataset containing only trades on European common stocks. This dataset includes 4 714 702 trades, with 2 482 190 buy orders and 2 232 512 sell orders made by 43 958 investors over 2 031 assets. For each stock we build a file containing historical daily prices over the period 1999-2006. In this respect, securities' ISIN codes are used to collect price data and information on splits and dividends through SIX-Telekurs -Fininfo[4].

[3] Over the period 1999-2005, active accounts are those with at least one transaction over 2 years (consecutive or not). For the last year of the sample, accounts are active if they hold at least one transaction over the entire year.

[4] http://www.six-telekurs.fr/

The typical investor is a man (78.28 %), 47.9 years old on average. Table 1 describes some preliminary statistics. The average number of assets per trade is 495. Over the whole dataset period, investors realize 107 trades on average amounting to 3 945 € per trade (3 784 € for buy orders and 4 106 € for sell orders). Most of the trades relate to French stocks (94%), followed by trades of stocks from the Netherlands (4,1%) and from Luxembourg (0.7%). Over 1999-2006, the most commonly traded French, Dutch and Luxembourgish securities are respectively Alcatel-Lucent, Stmicroelectronics and Arcelor-Mital. Finally, on average investors are active 4.83 years over 8.

Table 1 about here

To test for overconfidence, we use the methodology proposed by Odean (1999). Over defined horizons, the stocks bought by investors should outperform those they sell by at least enough to pay the costs of trading. On the other hand, overconfident traders may hold mistaken beliefs about potential gains and buy and sell stocks even if these trades do not cover transaction costs. Investors may express overconfidence in two different manners. Following Odean (1999), either they overestimate the precision of private information or/and they have biased interpretation of publicly available information. If traders are informed but overestimate the accuracy of this information, they are not likely to face losses beyond the loss of transaction costs. On the opposite, if instead (or in addition) to being overconfident in the precision of information, investors overestimate their ability to interpret information; they may incur average losses beyond transaction costs.

In order to test for overconfidence, we decide to test if investors overestimate their ability to interpret information and determine whether the securities bought by the investors in the

dataset outperform those they sell when trading costs are ignored. Note that the average trading costs paid by the investors, excluding the bid-ask spread is about 0.25%.

We look at return horizons of 3 months, 6 months and 1 year. To calculate the average returns to securities bought (sold) by the investors over the T (T = 3 months, 6 months and 1 year) trading period subsequent to the purchase, we index each purchase (sale) transaction with a subscript i, $i= 1,\ldots,N$. Each transaction is composed of a security j_i and a date t_i. If the same stock is bought (sold) in different accounts on the same day, each purchase (sale) is counted as a distinct observation. The average return to the securities bought and sold over the T trading period is:

$$R_{P,T} = \frac{1}{N}\sum_{i=1}^{N}\prod_{\tau=1}^{T}\left(1+R_{j,t_{i+\tau}}\right)-1 \qquad (1)$$

where $R_{j,t}$ is the daily return for security j on date t. We compare the average returns on securities bought and sold to the average amount of trading costs paid by investors.

We test whether over the same horizons, the average returns to securities bought are less than the average returns to securities sold, ignoring transaction costs. More formally, we test :

H_0: Average returns to securities bought ≥ Average returns to securities sold

This assumption compares the average return to stocks bought and sold over subsequent periods. Returns are averaged over trading histories of investors and across investors. Many securities are bought or sold on more than one date and may even be bought or sold by the same investors on the same day. Suppose for example an investor sells a stock at a given date t and that 2 months later, another investor sells the same stock. Returns on this stock over a 3 month period are not independent because the periods overlap for 2 months. Thus, any

statistical test which requires independence of observations cannot be employed. Statistical significance is thus estimated by conducting a Wilcoxon signed rank test of differences. We look at each investor in the dataset separately and determine for each of the chosen horizons (T=3 months, 6 months, 1 year) the average returns earned by the investor on the stocks bought and sold. We thereby construct distributions of average returns on securities bought and sold. The Wilcoxon test allows to compare the different distributions. Note that this test uses both the information on the direction and the relative magnitude of the differences of returns earned by the same investor on the stocks he purchases and stocks he sells. The null hypothesis is the following:

H'_0: X and Y are samples from populations with the same medians and the same continuous distributions.

This first methodology allows the computation of equally-weighted average returns. In order to complete our results and compare the average returns on portfolios bought and sold, we additionally measure the weighted average returns on securities bought and sold. More precisely, we basically follow the same steps as the ones involved in the methodology described before except that at the end, we report weighted average returns. These returns on portfolio bought (sold) are computed in the following manner. Looking at the total amount of euros spent by investors on securities bought (sold) over the period 1999-2006, we value the *weight* of each buy (sell) transaction. The weight of the buy transaction *j* is:

$$P_j = \frac{Total\ amount\ of\ euros\ spent\ by\ investors\ on\ transaction\ j}{Total\ amount\ of\ euros\ spent\ by\ investors\ on\ buy\ orders}$$

The weighted average returns to securities bought (sold) then refers to the sum of the returns earned on each transaction j multiplied by the appropriate weights P_j. As before, we test :

H''$_0$: Average weighted returns to securities bought ≥ Average weighted returns to securities sold

We estimate statistical significance by conducting a Wilcoxon sign rank test of difference.

Finally, to check the robustness of our results, we also gauge the profitability of purchases and sales by using a calendar time method. We construct calendar-time portfolios consisting of all purchase (sale) events during a "portfolio formation period" (3 months and 6 months). To be more precise, each time a purchase (sale) occurs during the formation period, we assign this security to the calendar-time portfolio. The same security may have been bought or sold several times during the "portfolio formation period". If this is the case, each purchase is counted as a separate observation. Each position is weighed equally. Finally, we calculate the "Buy" ("Sell") portfolio return for the calendar month subsequent to the formation period. Rolling forward the formation period by one month, a time-series of calendar-time portfolio returns for month t+1 is obtained.

Based on the calendar-time approach, we calculate two measures of performance. The first one is simply the average monthly calendar time return on the "Buy" portfolio minus the "Sell" Portfolio. We test whether the average return on the "Buy" portfolio is less than the one to the "Sell" portfolio. The second performance measure is Jensen's alpha (Jensen, 1969). We perform the following regression:

$$R_{B,t} - R_{s,t} = \alpha_p + \beta_p (R_{M,t} - R_{f,t}) + \varepsilon_{p,t} \quad (2)$$

where

$R_{B,t}$ is the monthly return on the calendar-time portfolio based on purchases

$R_{S,t}$ is the monthly return on the calendar-time portfolio based on sales

$R_{M,t}$ is the monthly return on a market index, the DJ EURO STOXX 50

$R_{f,t}$ is the monthly returns on BTAN

β_p is the market beta and $\varepsilon_{p,t}$ the regression error term.

III Results

(i) Average returns to securities bought and sold

Table 2 report the principal results. Panel A presents the average returns to securities bought and sold for the three follow-up periods we consider (*T= 3 months, 6 months, 1 year*). Panel B gives results for the Wilcoxon test.

The results in Panel A show that for all three horizons we study the average returns to securities bought are lower than to securities sold. For example, for the whole sample, over a 6 month period, the average return to a purchased security is 3.105 % lower than to a security sold. These results are particularly striking: stocks investors are buying are underperforming stocks they are selling even before taking into account transaction costs. In other words, investors are clearly not making profitable trades: they not only are paying transaction costs to trade but they are also making poor portfolio choices. Overconfidence in the ability to interpret information may be a good explanation for these findings.

Panel B gives indications about the statistical significance of our results. We denote (A) [resp. (B)] the distribution of average returns earned by each individual investor on purchased (resp. sold) stocks over a 3 month period subsequent to the purchase (sale). (C) [resp. (D)] is the distribution of average returns on bought (resp. sold) securities over a 6 month period. Finally, (E) [resp. (F)] refers to the distribution of average returns on purchased

(resp. sold) stocks over a 1 year horizon. V is the number of ranks of positive differences. As N = 43 958 is a large sample size, the number of the ranks of positive differences, V, is approximately normal. Results show that the distributions of average returns to bought and sold securities are significantly different, whichever period considered (*T= 3 months, 6 months, 1 year*), H'_0 is rejected at all three horizons at a 1% level.

(ii) Weighted average returns to securities bought and sold

Table 3 presents the results obtained for weighted average returns. Panel A reports the average weighted returns to securities bought and sold for the three follow-up periods (*T= 3 months, 6 months, 1 year*). Panel B gives results for the Wilcoxon test.

Table 2 about here

Table 3 about here

The results bring further evidence of overconfidence in the trading behavior of our individual investors. Panel A show that for all three horizons we study (*T= 3 months, 6 months, 1 year*), the average weighted returns to securities bought are again lower than to securities sold. For example, for the whole sample, over a 6 month period, the average return to a purchased

security is 1.926% lower than to a security sold. Investors are making poor portfolio decisions.

Statistical significance is estimated in Panel B.. We denote (A) [resp. (B)] the distribution of average weighted returns earned by each individual investor on purchased (resp. sold) stocks over a 3 month period subsequent to the purchase (sale). (C) [resp. (D)] is the distribution of average weighted returns on bought (resp. sold) securities over a 6 month period. Finally, (E) [resp. (F)] refers to the distribution of average weighted returns on purchased (resp. sold) stocks over a 1 year horizon. V is the number of ranks of positive differences. As N = 43 958 is a large sample size, the number of the ranks of positive differences, V, is approximately normal. Results show that the distributions of average weighted returns to bought and sold securities are significantly different, whichever period considered (*T= 3 months, 6 months, 1 year*).

(iii) Calendar time portfolios

Table 4 reports the results. Panel A presents the average monthly calendar time return on the "Buy" portfolio, on the "Sell" Portfolio as well as the difference between the returns. Panel B gives the estimates of Jensen's alpha. t-values are given in parentheses.

The results confirm the ones obtained in the first part of this section. The values reported in Panel A show that for the two portfolio formation periods, the monthly returns to the "Bu /Sell" portfolio are significantly negative. For instance, if we consider a portfolio formation period of 6 months, the "Sell" portfolio outperforms the "Buy" portfolio on average by 0.2%. Investors in the dataset are clearly making poor portfolio choices ; they are trading too much.

Results from Panel B confirm these conclusions. The Jensen's α estimates are all significantly negative. The portfolios held by our investors are underperforming the market, once more highlighting poor portfolio selection

IV. Conclusion

In this paper, we investigate the presence of overconfidence for 43 958 individual investors using a large brokerage account database between 1999 and 2006. Based on three methodologies, our main results show that individual investors are subject to overconfidence and consequently trading too frequently. More precisely, securities or portfolios investors are buying are systematically underperforming those they are selling on follow-up periods. This study confirms that investors are clearly not making profitable trades.

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Tableau 1 Descriptive statistics

This table contains results based on 4 714 702 trades (2 482 190 buy orders and 2 232 512 sell orders) for 43 958 investors over 1999-2006. "Age" (in years) is computed on 01/01/2006, "Activity over 1999-2006" is valued for active accounts. "Trade amount / investor" [resp. Total Nb of trades/investor] is computed over the total amount of euros [Nb of trades] traded by investors over 1999-2006.

Variable	**Mean**	**Std. Deviation**	**25%**	**50%**	**75%**	**99%**
Age	47.90	13.67	37	46	57	83
Nb. Assets/trade	495.50	5284	24	60	200	7700
Trade amount/trade (€)						
Buy	3784.51	9850	1199.78	2013.01	4642.86	24299.19
Sell	4106.44	10757	1241.43	2276.09	5243.12	27290.40
Total Nb. Of trades /investor	107	392	21	43	99	994
Activity over 1999-2006	4.83	2.03	3	5	7	8

Table 2 Average returns and statistical significance

This table contains results based on 4 714 702 trades. Panel A reports average returns (%) to securities bought and sold for 3 follow-up periods: 3 months, 6 months and 1 year. “N” refers to the number of observations and ”Difference” reports the difference between the average returns to securities bought and sold over each horizon. Panel B gives indications about statistical significance of the results reported in Panel A. (A)([resp. (B)] refers to the distribution of average returns earned by each individual investor on purchased (resp. sold) stocks over a 3 month period subsequent to the purchase (sale). (C) [resp. (D)] is the distribution of average returns on bought (resp. sold) securities over a 6 month period. (E) [resp. (F)] refers to the distribution of average returns on purchased (resp. sold) stocks over a 1 year horizon. V is the number of ranks of positive differences.

Panel A : Average returns following purchases and sales (%)				
	N	3 months later	6 months later	1 year later
Purchases	2 482 190	2.085	2.249	2.569
Sales	2 232 512	4.434	5.354	6.697
Difference		-2.349	-3.105	-4.128
Panel B : Wilcoxon Tests				
	A/B	C/D	E/F	
V	239 357 494	242 735 973	233 872 295	
E(V)	482 999 517.5	482 845 689	478 067 292.5	
Variance (V)	707 6667 430 651.25	7073 286 972 442.5	6968 547 889 126.12	
p-Value (Bilateral)	< 0.0001***	< 0.0001***	< 0.0001***	
Alpha	0.05	0.05	0.05	

Table 3 Weighted average returns and statistical significance

This table contains results based on 4 714 702 trades. Panel A reports average weighted returns (%) to securities bought and sold for 3 follow-up periods: 3 months, 6 months and 1 year. “N” refers to the number of observations and ”Difference” reports the difference between the average weighted returns to securities bought and sold over each horizon. Panel B gives indications about statistical significance of the results reported in Panel A. (A)([resp. (B)] refers to the distribution of average weighted returns earned by each individual investor on purchased (resp. sold) stocks over a 3 month period subsequent to the purchase (sale). (C) [resp. (D)] is the distribution of average weighted returns on bought (resp. sold) securities over a 6 month period. (E) [resp. (F)] refers to the distribution of average weighted returns on purchased (resp. sold) stocks over a 1 year horizon. V is the number of ranks of positive differences.

Panel A : Average weighted returns following purchases and sales (%)				
	N	3 months later	6 months later	1 year later
Purchases	2 482 190	0.6106	1.628	2.177
Sales	2 232 512	2.171	3.554	4.638
Difference		-1.555	-1.926	-2.462

Panel B : Wilcoxon Tests			
	A/B	C/D	E/F
V	466 750 742,5	452 521 632,5	525 668 467,5
E(V)	482 999 517,5	482 845 688,5	478 067 292,5
Variance (V)	7076 667 430 553,37	7073 286 972 351,62	6968 547 889 042,37
p-Value (Bilateral)	< 0,0001***	< 0,0001***	< 0,0001***
Alpha	0,05	0,05	0,05

Table 4 Calendar time portfolios

This table contains results based on 4 714 702 trades. Calendar-time portfolios consisting of all purchase (sale) events during a "portfolio formation period" (3 months and 6 months) are constructed and two measures of performance are computed. Panel A reports the average calendar time return on the "Buy" and "Sell" portfolio. "Difference" is the difference between the average returns on the two portfolios. Panel B gives of Jensen's alpha. t-values are given in parentheses.

Panel A : Returns on "Buy" and "Sell" Portfolios		
	Portfolio formation period	
	3 months	6 months
"Buy" portfolio	-0.010	-0.009
"Sell" portfolio	-0.007	-0.008
Difference	-0.003**	-0.002*
	(-2.17)	(-1.553)
Panel B: Jensen's alpha		
	Portfolio formation period	
	3 months	6 months
Jensen's α	-0.260**	-0.135*
	(-2.496)	(-1.68)
β	0.118***	0.092***
	(7.56)	(7.67)

***, **,* - Significant at the 1%, 5% and 10% levels respectively

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