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Guessing in MiFID Tests, Financial Literacy and Investors Trading Behavior

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Guessing in MiFID Tests, Financial Literacy and Investors Trading Behavior *

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Abstract

This paper examines the link between investors financial knowledge and trading behavior by analyzing retake patterns in the Markets in Financial Instruments Directive (MiFID) test. We categorize investors who fill in the MiFID test multiple times into two distinct groups based on their scoring trajectories across multiple attempts: "guesser" investors, who exhibit inconsistent performance in the test, with initial scores exceeding subsequent results, and "improver" investors, who demonstrate a progressive improvement in their scores over attempts. We find that "guesser" investors tend to trade more, yet consistently achieving lower returns compared to their "improver" counterparts. These results suggest that a "guessing" attitude to financial assessments may indicate, not only a lack of genuine financial literacy, but possibly overconfidence, which leads to suboptimal investment decisions.

Keywords: Financial literacy, MiFID directive, MiFID test, Guessing, Overconfidence, Investors trading behavior
JEL Codes: D53, D91, G11, G41, G53

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1 Introduction

The relevant role of financial literacy is extensively recognized by many scholars as it matters for the decision-making process, particularly as a mitigating factor against behavioral biases such as overconfidence (see, e.g., Lusardi, 2008; Bottazzi and Lusardi, 2021; Lusardi, 2019; Lusardi and Mitchell, 2023; Inghelbrecht and Tedde, 2024, 2026; Odean, 1998, 1999). To foster the spread of an appropriate financial culture among investors, the European regulator introduced in 2004 the Markets in Financial Instruments Directive (MiFID, Directive 2004/39/EC).[1] According to MiFID, investment firms develop questionnaires to assess investors financial literacy, and several studies (see, e.g., Marinelli and Mazzoli, 2010; Linciano and Soccorso, 2012; Broihanne and Orkut, 2021; Bellofatto et al., 2018; D'Hondt and Roger, 2017) examine the questionnaires effectiveness in gauging whether investors act in line with their actual financial competence. These questionnaires are structured as multiple-choice tests that, alongside the correct responses, include wrong answers and allow respondents to select a "Don't know" response (Bucher-Koenen et al., 2024; Wikman and Wärneryd, 1990; Tourangeau, 2021; Nadeau and Niemi, 1995; Klapper and Lusardi, 2020; Bellofatto et al., 2019, 2017; D'Hondt et al., 2021; Rooij et al., 2011). It is important to note that the directive consents investors to fill in the MiFID test multiple times. In this regard, the information content of the retake patterns in the MiFID tests deserves to be deeply analyzed.

In this research, we examine the link between investors financial knowledge and their trading behavior by investigating retake patterns in the MiFID test. Our contribution to the existing literature is the following. Bertola and Lo Prete (2025) investigate how the retesting in financial literacy surveys can reveal knowledge measurement errors. They use the "Big Three" questions elaborated by Lusardi and Mitchell (2008) to grade households financial competence, referring to two survey waves applied respectively in 2020 and 2021, and compare households who demonstrate consistent accuracy in their knowledge with those who guess their answers. They show how households who reply consistently across the two survey waves suffer less finan-

[1] The updated version (Directive 2014/65/EU) offers a more robust framework of regulation, with the aim to address the more complex market reality, characterized by increasing diversity and complexity in financial instruments. More information about the directive in Appendix A.

cial distress. We start from their idea, but further elaborate it. Firstly, we measure financial literacy not using the "Big Three", but through the replies to the MiFID test, which includes more and more detailed questions. We distinguish investors who randomly guess survey answers and achieve a first score higher than the subsequent from those who consistently improve their score.[2]

Secondly, we do not concentrate on how investors face financial distress, but indeed analyze their trading behavior, focusing on their stock orders, transactions and net return. We find that investors who perform better in their first test than the consecutive trade more and achieve lower net return, implying a lucky guessing in the first test and suggesting that the guessing attitude entails a suboptimal trading behavior. The retake pattern and the guessing attitude may indicate the unwillingness of investors to accept their initial score, as suggested by Inghelbrecht and Tedde (2024, 2026). In their studies, these authors classify those investors who retake the MiFID test multiple times as overconfident about their financial literacy. These investors overestimate their own knowledge respect to the actual knowledge, and base their behavior on this overestimated knowledge (see, e.g., Barber and Odean, 2001; Gervais and Odean, 2001; Barber and Odean, 2013, 2004, 2000; Abreu and Mendes, 2012; Forbes et al., 2015; Barber et al., 2020). This type of overconfidence is known as overestimation (Kruger and Dunning, 1999; Moore and Healy, 2008; Merkle, 2017; Xia et al., 2014; Moore and Schatz, 2017).

Inghelbrecht and Tedde (2024, 2026) claim that overconfident investors refuse the score achieved in the MiFID test at their first attempt and redo the test multiple times, until they reach the score they believe to deserve. Lastly, we exploit this definition and take a further step forward. Our research investigate the trading behavior of these investors, showing that, among investors with multiple attempts at filling in the MiFID test, those who refuse to admit their ignorance and prefer to guess the answer, tend to trade more and to perform worse than those who consistently improve their scores, suggesting that the propensity to guess may be interpreted as a trait of overconfidence.

The remainder of this paper is organized as follows. The next Section describes the data

[2]Details about the sample selection can be found in Section 2.2.

and the sample used for our analysis. Sections 3 and 4 present our main empirical findings, and Section 5 offers several validation tests. Section 6 concludes.

2 Data

2.1 Main Variables

The dataset used for our empirical analysis is already detailed by Inghelbrecht and Tedde (2024, 2026), and has been offered by one large discount brokerage house in Belgium and includes cross-sectional data on 72,847 clients, for a period of time that goes from January 2014 to May 2019. This dataset incorporates different information about investors demographic details, about their trading behavior, and about their level of financial knowledge. The customer data file includes the gender and age of the investor, and information about the account, indicating if the account is single or double.[3] The value of the account and the value of the stock portfolio (i.e., the end-of-day value of investments) are reported in the account file, and the sum of these two variables is used in our regressions as proxy for the investor's wealth.

Data about transactions and orders, placed, executed and non-executed, is reported in the trade file. Consistent with Odean (1999), we select only investors who have executed at least one trade during the sample period. Our analysis focuses on common stocks trading behavior. We use information in this file to evaluate the number of stocks within each portfolio and the portfolio concentration level. Portfolio concentration, measured by the Herfindahl–Hirschman index, is used as proxy for stock portfolio diversification in the our regressions.

To compute the investor's monthly net return over the holding period, as done by Inghelbrecht and Tedde (2024, 2026), we calculate the monthly change in the market value of all stocks in an account, net of transaction costs. Following the modified Dietz method (Dietz, 1966), we take into consideration deposits and withdrawals during the month, and calculate

[3]We investigate only the trading behavior of the primary investor associated with a double account.

the net return as:

$$r_t^{net} = \frac{V_t - V_{t-1} - DW_t}{V_{t-1} + \sum_{i=1}^{n} w_i \times DW_{it}}, \tag{1}$$

where V_t represents the portfolio value at the end of month t, DW_t denotes the net amount of deposits and withdrawals during month t, and the term $\sum_{i=1}^{n} w_i \times DW_{it}$ is the aggregate of each deposit/withdrawal i during month t, each scaled by its respective weight w_i. In this approach, deposits and withdrawals are weighted by the length of time between the deposit/withdrawal and the end of the month.[4] Moreover, to minimize the impact of extreme values, we apply winsorization to net return every month at both 1% and 99% percentiles. Net return is used as proxy for the investor's performance in our regressions.

Finally, information about financial literacy can be found in the questionnaire file, which includes all the answers to the MiFID test. The test used in this study includes 10 multiple choice questions, which are the same across the different attempts, for a maximum score of 18, with 8 questions that account for 2 points each, and 2 questions that account for 1 point each.[5] The 8 questions measure financial knowledge, the last 2 questions investigate the investor's previous trading experience and his attitude in searching for extra financial information. Specifically, question 1030 asks *"Have you already invested in a listed product?"* and assigns 1 point for a positive reply and 0 for a negative answer; whereas question 1031 demands *"Are you looking for additional information if you have questions about a financial product?"*, and attributes 1 point if the investor replies affirmatively.

2.2 Sample Selection

Our sample includes 3,222 investors who fill in the MiFID test multiple times. We classify these investors into two groups: 698 "guesser" and 2,524 "improver" investors. We define "guesser" those investors who achieve a first higher than the subsequent. Specifically, for the investors who fill in the test twice, the "guesser" are identified as those with a first score higher than

[4]Deposits have a positive sign and withdrawals a negative sign. The weight w_i is calculated as the fraction of time between the deposit/withdrawal and the end of the month relative to the entire month.

[5]The full questionnaire is reported in Appendix A.

the second (344 investors); for the investors who fill in the test three times, the "guesser" are those who achieve a first score equal or higher than the second and a first score higher than the third (349 investors); for the investors who fill in the test more than three times, the "guesser" are those who reach a first score equal or higher than the second and than the third and higher than the consecutive. On the other hand, the "improver" investors are those who consistently improve their score in the subsequent attempts. This classification suggests that the guessing attitude implies a random and lucky selection of the correct answers in the first test compilation, revealed by the lower score reached in the succeeding attempts. By contrast, the "improver" investors increase their score in the consecutive tests, either by truly improving their knowledge or just by checking for the right answers. In order to classify "guesser" and "improver" investors, we use the scores achieve in the different attempts at filling in the test, as obtained by considering the replies to all the 10 questions.

Table 1 provides descriptive statistics about the main investors characteristics. This table presents demographic and account details in Panel A and Panel B, summary statistics regarding the number of months with trades in Panel C, and information about the stock portfolio diversification in Panel D. Consistent with Barber and Odean (2001), investors are mainly middle-aged male. They keep on their account an amount of around 67 thousands €, if they are "guesser", and around 59 thousands €, if they are "improver" investors, almost totally invested in stocks, which is comparable to previous studies (Barber and Odean, 2000; Inghelbrecht and Tedde, 2024, 2026). Panel C suggests that "guesser" investors tend to be slightly more active in trading than "improver" investors; whereas Panel D indicates that, on average, both "guesser" and "improver" investors hold approximately 5 stocks in their portfolio.

3 Empirical Analysis: Investor's Financial Literacy

Table 2 shows descriptive statistics about investors financial literacy. The "guesser" investors retake the MiFID test on median 3 times, compared with 2 attempts for the "improver" counterpart. The "guessers" achieve an average (median) first score equals to 10.51 (12), compared

with 7.24 (6) for the "improver" investors. However, the second score is much higher for these investors, who get, on average, almost 5 points more than the "guessers", and this difference is highly significant. The last score is still higher for both groups of investors, but "improver" investors obtain a score 3 points higher. This evidence is also confirmed by the level of true financial literacy. To measure investor's true financial literacy, we compute the sum of the correct answers considering only the 8 financial literacy questions, for a maximum score of 16, leaving out the last 2 questions. Moreover, the average (median) investor who guesses, gets it right in 4.70 (5) answers (out of 8 questions) in the first test, in 4.12 (4) in his second attempt, and 5.26 (6) in his last retake. Conversely, an average (median) "improver" investor gives 3.36 (3) correct answers in the first test, 6.33 (7) in the second attempt, and 6.48 (7) in the last. The differences in the number of correct answers are all highly significant. The trend of the number of wrong answers follows, intuitively, an opposite pattern. Regarding the preferences to uncertainty questions, the selection of the "Don't know" responses between first and last attempts shows an average declining trajectory for the "improver" investors, suggesting that these investors consistently check for the correct answer across attempts (Bucher-Koenen et al., 2024). By contrast, the "guesser" investors tend to select a slightly increasing number of "Don't know" replies across consecutive retakes, underscoring their attitude to randomly guess the answers (Bertola and Lo Prete, 2025).

Table 3 presents, in Panel A, statistics about investors previous trading experience and their disposition in checking for financial information. Specifically, question 1030 of the MiFID test asks *"Have you already invested in a listed product?"* and question 1031 states *"Are you looking for additional information if you have questions about financial products?"*. The percentage of "improver" investors who reply affirmatively at both questions in their first test is 28% and 25%, respectively, compared with 60% and 54% for the "guesser" investors (Inghelbrecht and Tedde, 2024). These values take an opposite direction in the second test: on average, 34% and 32% more "improver" give a positive answer to question 1030 and 1031 respectively, and these differences are highly significant. The positive replies keep increasing for both groups of investors in the last attempt at filling in the MiFID test, and the differences between the

two groups, respectively 14% and 15%, are significant at 1% level. Once again, this evidence highlights that the "guesser" investors do not follow a straight trajectory in selecting their answers, indeed they select their options at random. Panel B shows the amount of time (i.e., minutes) investors need to fill in the test. The "guesser" investors spend on average 5 minutes to compile the test the first time. Then they need just 2 minutes to retake it their second attempt, and for the last attempt, they dedicate 3 minutes. Considering that the questions are always the same across the different attempts, this fluctuation in the duration required for the test reiterates that the selection process is arbitrary. On the other hand, an average "improver" investor devotes 4 minutes at each attempt, indicating consistency.[6]

Finally, Table 4 shows the Pearson correlations between the different proxy variables for financial literacy (i.e., the score, the level of literacy, the number of correct answers, the number of wrong answers, all related to the first attempt), the proxy variable for previous trading experience (i.e., the first reply at question Q.1030), and the search for extra information (i.e., the first reply at question Q.1031). Intuitively, we find a strong, positive correlation (i.e., 0.98) between the level of literacy and the number of correct answers, a strong, negative correlation (i.e., -0.92) between literacy and the wrong answers, and a strong, negative correlation (-0.90) between the number of correct and wrong answers. All these correlations are highly significant. Moreover, we can notice a positive and moderate correlation between the score and both question Q.1030 (i.e., 0.70) and question Q.1031 (i.e., 0.64), and these correlations are significant at 5% level. Interestingly, the correlation between these two questions is 0.67, suggesting a positive link between the previous experience in stock market and the need for extra financial information.

4 Empirical Analysis: Investor's Trading Behavior

Once measured the level of investors financial literacy, Table 5 presents the univariate results (mean and median values) about the impact of guessing in the MiFID test on trading behavior. We investigate the number of orders, the number of transactions, the net return and the risk-

[6] Appendix B shows summary statistics for the time interval between consecutive MiFID test retakes.

adjusted return. All these variables are evaluated on a monthly basis, as an average per each investor, across the full sample, and refer to stocks. Net return and risk-adjusted return are expressed in %. Specifically, Panel A shows the mean values for "guesser" and "improver" investors, along with their differences and the test statistic from a two-sample t-test. Panel B provides the median values for both groups, their differences, and the p-value from the Wilcoxon rank sum test. Results in this table indicate that the average "guesser" investor execute more orders and more transaction than the average "improver" investor, but achieve lower returns. Evidence in Panel A suggests that "guesser" investors complete, on average on a monthly basis, 0.54 more orders and 0.31 more transactions than "improver" investors, and these findings are significant at 5% level. Median results are consistent. Moreover, "improver" investors achieve an average net return per month 1.43% higher than their "guesser" counterpart, which implies a remarkable yearly gain of 17.16% for this group of investors. However, this result is only significant at 10% level. Median result confirms this evidence but the difference is not statistically significant. Overall, univariate results suggest that the attitude to guess the answers in the MiFID test may point a specific behavioral trait, attributable to overconfidence (Inghelbrecht and Tedde, 2024, 2026).

Moreover, for our empirical analysis, we estimate the following models:

$$Y_i = \alpha + \beta Guessing_i + \epsilon_i \tag{2}$$

and

$$Y_i = \alpha + \beta Guessing_i + \gamma Guessing_i \times \#WrongAnswers_i + \delta Z_i + \epsilon_i, \tag{3}$$

where the dependent variable Y_i represents, respectively, the number of orders, number of transactions, and net return.[7] To examine the effect of the guessing attitude, the variable $Guessing_i$ is used. This variable is a dummy which is equal to one if the investor achieves a first score is equal or higher than the subsequent; and zero otherwise. The variable $Guessing_i \times \#WrongAnswers_i$ captures the interaction effect between being a "guesser" investor and the

[7]We do not investigate the "guessing" effect on the risk-adjusted return because results in Table 5 present no statistically significant differences between the two groups of investors.

number of wrong answers selected in the first test. The vector Z_i is the vector of control variables, which includes the number of attempts at filling in the MiFID test, the reply to question 1030 of the test (i.e., *"Have you already invested in a listed product?"*), and the reply to question 1031 of the test (i.e., *"Are you looking for additional information if you have questions about financial products?"*), both in the first test, the number of wrong answers at the first attempt, the gender of the investor and the age, the wealth, and the portfolio concentration. The replies to questions 1030 and 1031 are captured by two dummy variables, which equal one if the investor answers positively; zero if the replies are negative. We use another dummy for the gender, which takes value of one if the investor is male. To evaluate the investor's wealth, we take the sum of portfolio and account value, and express this value in logs.

Table 6 reports the OLS regression results. Panel A presents the baseline model, Panel B presents the specification with control variables. Evidence in this table confirms the univariate results. The coefficients of the "guessing" dummy variable indicate that the average "guesser" investor execute each month 0.56 orders and 0.32 transactions more than the average "improver" investor, and achieves each month a net return 1.45% lower. Based on the estimated coefficients, it can be inferred that a guessing attitude implies on average 6.72 (3.84) more orders (transactions) per year, and a loss in performance of 17.4%. These results are significant at 5% (the number of orders and transactions) and 10% (the net return) level. Findings in Panel B are consistent, even if lower in magnitude. Specifically, the coefficients of the "guessing" dummies indicate that, on average, "guesser" investors trade more, completing each month 0.23 more orders and 0.18 more transactions, and perform poorly, gaining a net return 1.28% lower. Results are significant at 5% level. The number of attempts at filling in the MiFID test does not present significant effect on the dependent variables, whereas the positive reply to question 1030 and 1031 entails the execution of 0.14 and 0.37 more orders (finding significant at 5% level) and 0.03 and 0.06 more transactions (finding significant at 10% level) per month, suggesting that both the previous trading experience and the search for extra information are correlated with a more active trading activity. Intuitively, the number of wrong answers means less orders and transactions (findings significant at 10% level), and lower net return. Interest-

ingly, the coefficients of the interaction terms present a positive sign for the number of orders and transactions, underscoring that the "guesser" investors tend to trade more even if the number of their wrong answers rises. On average, "guesser" investors make each month an additional, highly significant, 0.04 extra order and an additional 0.03 extra transaction. This evidence suggests that these investors can be identify as overconfident. Moreover, their net return suffers an additional monthly decrement equal to 0.41% as they select the wrong replies, and also this result is highly significant. In line with the existing literature, the trading activity of male investors is associated with lower performance and higher trades, whereas age and wealth have a positive, even weak, effect (Barber and Odean, 2001; Inghelbrecht and Tedde, 2024). Portfolio concentration, as suggested by Von Gaudecker (2015), has a negative, highly significant, impact on both trading activity and performance.

5 Alternative Identification Strategies

In order to check the validity of our results, we perform several robustness tests with alternative model specifications. Firstly, we create an alternative proxy variable to capture the "guessing" attitude. Specifically, we evaluate the true level of financial literacy by including only the 8 knowledge questions, for a maximum score of 16, and build a dummy variable that equals one if the level of financial literacy in the first test is equal or higher than those in the consecutive attempts. We estimate the following model:

$$Y_i = \alpha + \beta Guessing(Literacy)_i + \delta Z_i + \epsilon_i, \tag{4}$$

where the dependent variable represents, respectively, the investor's number of orders, number of transactions, and the stock net return, on a monthly basis. The $Guessing(Literacy)_i$ variable captures the "guessing" attitude, and the vector Z_i of control variables includes the number of attempts in compiling the MiFID test, one dummy variable for the question 1030 and one for question 1031, another dummy for gender, the age and wealth of investor, and his portfolio concentration. The two dummy variables for question 1030 and 1031 take value of one for a

positive reply, and zero otherwise; the dummy for gender equals one if the investor is male; the wealth is evaluated as the sum of portfolio and account value, and is expressed in logs. We do not include neither the number of correct nor wrong answers because both variables are highly correlated with the level of financial literacy (see Table 4).

Table 7 reports the OLS regression results for this model specification. Results in this Table contrast with our main findings. Panel A suggests that, when considering the true level of financial literacy, the "guessing" attitude does not imply more active trading and lower performance. Conversely, on average, the investor executes each month 0.23 less orders and achieves a net return 1.04% higher if he is "guesser". The positive coefficient of the number of transactions, in line with our main evidence, indicates that, each month, the average investor perform 0.19 more transactions if he follows a "guessing" attitude. However, all these results are not statistically significant. Panel B confirms these findings, even if their effect is lower in magnitude and still not significant. This evidence underscores what follows: when considering the total score achievable in the MiFID test (i.e., the score obtained adding the points of the 8 knowledge questions to the point of question 1030 and question 1031), a "guessing" attitude reveals a specific behavioral trait, characterized by excessive trading and lower return, recognizable with overconfidence. By contrast, if measuring the true level of financial literacy (i.e., the score obtained considering only the 8 knowledge questions), the same "guessing" attitude is not more consistent with overconfidence. This suggests the following plausible conclusion: the main driver of the "guessing" attitude is not the lack of true financial literacy *per se*, but indeed is the way investors reply to the last two behavioral questions, which reveal previous trading experience and the search for extra information.

As additional robustness tests, we substitute the level of financial literacy with two alternative proxy variables: the number of wrong answers and the number of correct answers. The investor is classified as "guesser" if he gets in his first test a number of wrong answers equal or lower than those in his consecutive attempts. On the other hand, we consider an investor as "guesser" if he selects a number of correct answers in the first test equal or higher than those in the subsequent. Appendix C, in Table C.2 and Table C.3, presents regression results for

these two alternative model specifications. As results shown in Table 7, our findings contrast with our main evidence, possibly suggesting that the "guessing" attitude is not merely driven by the true level of financial literacy, but instead by more behavioral characteristics.

To capture the effect of these behavioral characteristics, we build other two alternative "guessing" proxy variables. The first one considers replies to question 1030. This question demands *"Have you already invested in a listed product?"*, and our proxy is a dummy variable that takes the value of one if the investor answers affirmatively in the first test and negatively in the second one, suggesting a random guess. We estimate the following model:

$$\begin{aligned} Y_i = \alpha + \beta Guessing(Q.1030PositiveNegative)_i + \\ +\gamma Guessing(Q.1030PositiveNegative)_i \times \#WrongAnswers + \delta Z_i + \epsilon_i, \end{aligned} \tag{5}$$

where the dependent variable represents the investor's trading behavior, as already discussed (see Section 4), and the "guessing" variable $Guessing(Q.1030PositiveNegative)_i$, as said, is a dummy that takes the value of one if the investor gives a positive answer to question 1030 in the first test and a negative one in his second attempt, suggesting a "guessing" attitude in selecting the answers. The vector of control variables includes the same regressors as already discussed in Section 4 and an interaction term, $Guessing(Q.1030PositiveNegative)_i \times \#WrongAnswers$ that captures, for the "guesser" investors, the additional effect given by the wrong answers. Table 8 presents OLS regression results. Panel A shows that the coefficients of the proxy variables for "guessing" are positive for both the number of orders and transactions, suggesting a positive correlation between trading activity and the "guessing" attitude. This implies that an average investor executes, on a monthly basis, 0.21 orders and 0.19 transactions more if he, in his first attempt, declares to have previous trading experience, but denies it in his second test retake. These results are significant at 5% level. Moreover, the "guessing" attitude entails a monthly loss in the net return equal to 1.84%, and this finding is highly significant. Panel B corroborates these findings, which are also stronger in magnitude. Specifically, an average investor performs each month 0.28 orders and 0.73 transactions more if he tends to guess his replies to question 1030, firstly selecting "yes" and then opting for "no", achieving a net return

2.04 lower. All these findings are highly significant. The economic significance of this is even more pronounced if we consider that, in a year, the "guessing" attitude implies almost 9 extra transactions and a loss in the net return equal to 24.48%. The coefficients of the interaction terms indicate, for the "guesser" investors, an additional positive impact for each wrong answers on the trading activity and an additional negative impact on the net return, confirming our main findings (see Section 4).[8]

The other alternative "guessing" proxy variable is again a dummy variable that equals one if the investor's answer to question 1031, *"Are you looking for additional information if you have questions about financial products?"*, is positive in the first test and negative in the second attempt. Also this proxy has the aim of capturing a "guessing" attitude. The model estimated is the following:

$$\begin{aligned} Y_i = \alpha + \beta Guessing(Q.1031 PositiveNegative)_i + \\ + \gamma Guessing(Q.1031 PositiveNegative)_i \times \#WrongAnswers + \delta Z_i + \epsilon_i. \end{aligned} \tag{6}$$

The variables are the same, as previously discussed, and Table 9 shows the OLS regression results. The "guessing" attitude involves 0.40 more orders and 0.35 more transactions per month, provoking a decline in the monthly net return of 2.42%. These findings are significant at 5% level. Results reported in Panel B indicate that, in one year, an average investor execute 11.40 more orders and 8.64 more transactions, suffering a reduction of 34.44% in the net return, if he is a "guesser", and these results are highly significant.[9] Overall, evidence reported in Table 8 and Table 9 corroborates our main findings, suggesting that the "guessing" attitude implies a more active trading activity accompanied by lower returns, possibly indicating overconfidence. Moreover, the inconsistency in answers to question 1030 and question 1031 underscores an important point: the behavioral aspect is more relevant in driving the investors trading activity than the true level of financial literacy. Specifically, our results highlight that the "guessing"

[8]The Pearson correlation between the variable $Guessing(Q.1030 PositiveNegative)_i$ and the variable $Q.1030_i$ is 0.57.

[9]The Pearson correlation between the variable $Guessing(Q.1031 PositiveNegative)_i$ and the variable $Q.1031_i$ is 0.63.

attitude in behavioral questions (i.e., question 1030 and question 1031), exemplified by the random selection of replies to those questions, brings to highly significant results; whereas the "guessing" attitude in knowledge questions determines not significant findings.

Finally, to further validate this evidence, we identify the "guessing" attitude with two other alternative dummy variables. The first one takes the value of one if the investor is not consistent in his replies to question 1030 across all attempts, and the second one equals one if the investor is inconsistent giving answers to question 1031; conversely, the two proxies have a value of zero if the investor shows consistency in all his replies. Regression results are reported in Appendix C, Table C.4 and Table C.5, and corroborate our main findings.[10]

6 Concluding Comments

This paper investigates the information content of MiFID test retake patterns and provides a novel lens through which to observe investor's knowledge (or lack of knowledge) and its impact on trading behavior, suggesting that how an investor reaches a given score on a MiFID test is as critical as the score itself. By distinguishing between "improver" investors (i.e., those who demonstrate a progressive score improvement) and "guesser" investors (i.e., those whose declining trajectories suggest an initial reliance on luck), we uncover significant disparities in investors trading behavior.

Our empirical analysis leads to three key conclusions. Firstly, a declining score across multiple attempts may be seen as an indicator of lower "true" financial literacy (Bertola and Lo Prete, 2025). While "guesser" investors may eventually reach a high score, their inability to sustain or improve upon their initial score suggests that their baseline knowledge is fragile.

Secondly, consistent with the framework of Odean (1998) and Inghelbrecht and Tedde (2024, 2026), we find that the "guessing" attitude may indicate a behavioral manifestation of overconfidence. These investors, who randomly select their answers, tend to trade more and, ultimately,

[10]We conduct other robustness tests. Appendix D presents univariate and regression results for the subsample of investors who fill in the MiFID test two times. Appendix E reports univariate and regression results classifying as "consistent" those investors who maintain the same score across multiple attempts. Appendix F shows univariate and regression results adding in the sample those investors who fill in the MiFID test only once (Inghelbrecht and Tedde, 2024). These additional analyses confirm our main findings.

perform worse. Conversely, "improver" investors, who actively refine their knowledge through the testing process, exhibit more disciplined trading patterns and achieve superior financial performance. This suggests that the process of "improving the score" may actually mirror a broader, more cautious approach to market participation.

Thirdly, the "guessing" attitude seems to be driven less by a lack of technical knowledge and more by inconsistent responses regarding previous trading experience (Q.1030) and search for information (Q.1031). This reinforces our main findings and suggests that the "guessing" attitude can be seen as a proxy for overconfidence, rather than just a lack of financial literacy.

Moreover, our findings have direct policy implications. MiFID focuses heavily on the final score achieved by an investor. However, our research suggests that the pathway to that score is equally, if not more, informative. Regulatory frameworks could be enhanced by requiring firms to monitor retake patterns; a "guessing" attitude could trigger additional educational requirements or more stringent suitability warnings, protecting investors from the pitfalls of their own overconfidence. Future research should investigate if these "guessing" traits are persistent across different asset classes or using alternative knowledge questionnaires.

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Table 1: Descriptive statistics on investors main characteristics

This table reports descriptive statistics on investors' demographic characteristics (Panel A), details about their account (Panel B), the number of months with active trading (Panel C), and their stock portfolio diversification (Panel D). These statistics are reported for 698 "guesser" investors, and for 2,524 "improver" investors, as explained in Section 2.2. The summary statistics in Panel B and in Panel D are calculated based upon the average across time for each investor, on a monthly basis.

	"Guesser" Investors			"Improver" Investors		
	Mean	Median	Stdev	Mean	Median	Stdev
Panel A: Demographic information						
Gender	84%			86%		
Age	62.27	63	15.23	60.88	61	15.49
Panel B: Account details						
Account value (in thousand €)	67	23	176	59	14	227
Portfolio value (in thousand €)	57	18	169	51	11	204
Panel C: Trading months						
# months orders	18.27	13	16.51	16.35	11	15.63
# months transactions	16.63	11	15.59	15.07	10	14.71
Panel D: Portfolio diversification						
# stocks	5	4	7.83	5	3	8.96
Portfolio concentration	0.39	0.33	0.28	0.41	0.35	0.26

Table 2: Descriptive statistics on investors financial literacy

This table reports descriptive statistics on investors' financial literacy. These statistics are reported for 698 "guesser" investors, and for 2,524 "improver" investors, as explained in Section 2.2. Summary statistics are presented for the number of attempts at filling in the MiFID test, the MiFID test score at the first, at the second and at the last attempt, the level of literacy at the first, at the second and at the last attempt, the number of correct answers at the first, at the second and at the last attempt, the number of "Don't know" replies during the first, the second, and the last attempt at filling in the test, and the number of wrong answers given at the first, the second, and the last attempt at filling in the MiFID test. Mean differences and related t-test are also reported.

	"Guesser" Investors			"Improver" Investors			Differences	
	Mean	Median	Stdev	Mean	Median	Stdev	Diff Mean	t-stat
Panel A: Financial literacy								
# attempts	2.92	3	1.77	2.09	2	0.32	-0.83	-3.56
Score first attempt	10.51	12	5.75	7.24	6	4.98	-3.25	-3.61
Score second attempt	9.40	8	6.55	14.38	16	3.74	4.98	2.79
Score last attempt	11.61	14	6.33	14.78	16	3.52	3.17	2.89
Literacy first attempt	9.40	10	5.06	6.72	6	4.46	-2.68	2.73
Literacy second attempt	8.24	8	5.74	12.66	14	3.48	4.41	3.35
Literacy last attempt	10.52	12	5.63	12.96	14	3.36	2.43	3.83
# correct answers first attempt	4.70	5	2.52	3.36	3	2.23	-1.34	-2.73
# correct answers second attempt	4.12	4	2.87	6.33	7	1.74	2.21	2.72
# correct answers last attempt	5.26	6	2.81	6.48	7	1.68	1.22	2.58
# wrong answers first attempt	2.87	2	2.32	4.17	5	2.20	1.28	2.84
# wrong answers second attempt	3.33	2	2.81	1.26	1	1.38	-2.07	3.73
# wrong answers last attempt	2.11	1	2.45	1.13	1	1.28	-0.98	3.07
"Don't know" first attempt	0.42	0	0.95	0.47	0	1.03	0.05	1.34
"Don't know" second attempt	0.72	0	1.98	0.40	0	1.04	-0.32	1.72
"Don't know" last attempt	0.75	0	2.01	0.39	0	1.01	-0.35	1.98

Table 3: Descriptive statistics on investors' previous trading experience and extra information

This table reports descriptive statistics on investors' previous trading experience and their search for extra information (Panel A), and the amount of minutes they need to fill in the test (Panel B). These statistics are reported for 698 "guesser" investors, and for 2,524 "improver" investors, as explained in Section 2.2. Panel A reports details about the percentage of investors that answer 'yes' to questions Q.1030 ("Have you already invested in a listed product?") and to question Q.1031 ("Are you looking for additional information if you have questions about financial products?") of the MiFID test, in the first, second, and last attempt. Panel B shows descriptive statistics for the amount of minutes needed to fill in the MiFID test at the first, second, and last attempt. Mean differences and related t-test are also reported.

	"Guesser" Investors			"Improver" Investors			Differences	
	Mean	Median	Stdev	Mean	Median	Stdev	Diff Mean	*t*-stat
Panel A: Previous trading experience and extra information								
Answer Q.1030 first attempt (in %)	60%			28%			-32%	-4.45
Answer Q.1030 second attempt (in %)	56%			90%			34%	4.43
Answer Q.1030 last attempt (in %)	79%			93%			14%	3.21
Answer Q.1031 first attempt (in%)	54%			25%			-25%	-3.11
Answer Q.1031 second attempt (in%)	53%			85%			32%	2.71
Answer Q.1031 last attempt (in%)	74%			89%			15%	3.22
Panel B: Minutes filling in the MiFID test								
# minutes first attempt	5	4	4.74	4	2	4.45		
# minutes second attempt	2	1	3.07	4	3	3.72		
# minutes last attempt	3	2	2.91	4	3	3.61		

Table 4: Financial literacy and correlation

This table reports the Pearson correlations among different variables that capture financial literacy. The sample consist of 3,222 investors. Correlations are reported for the score, evaluated considering the all 10 questions, and achieved in the first MiFID test, the level of literacy in the first test, evaluated considering only the 8 knowledge questions, the number of correct and wrong answers in the first test, and the first replies to question 1030 and question 1031. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively.

	Score	Literacy	# correct answers	# wrong answers	Answer Q.1030	Answer Q.1031
Panel A: Correlation						
Score	1.00					
Literacy	0.06	1.00				
# correct answers	0.06	0.98***	1.00			
# wrong answers	-0.05	-0.92***	-0.90***	1.00		
Q.1030	0.70**	-0.04	0.04	0.02	1.00	
Q.1031	0.64**	-0.05	0.04	0.04	0.67**	1.00

Table 5: Investors trading behavior: univariate results

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 698 "guesser" investors, and for 2,524 "improver" investors, as explained in Section 2.2. Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Guesser" Investors	"Improver" Investors	Diff	t-stat
# orders	2.03	1.49	-0.54	-2.45
# transactions	1.23	0.92	-0.31	-2.52
Net return (in %)	1.58%	3.01%	1.43%	1.84
Risk-adjusted return (in %)	0.19%	0.26%	0.07%	0.51
	Panel B: Median			
	"Guesser" Investors	"Improver" Investors	Diff	p-value
# orders	0.61	0.47	-0.12	0.00
# transactions	0.38	0.32	-0.06	0.03
Net return (in %)	0.30%	0.39%	0.09%	0.16
Risk-adjusted return (in %)	0.11%	0.24%	0.13%	0.36

Table 6: Guessing and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of our "guessing" variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages for each investor. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor achieves a first score equal or higher than the subsequent; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes control variables, as described in Section 4: the number of attempts at filling in the MiFID test, the first reply to question 1030 (i.e., "Have you already invested in a listed product?"), the first reply to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?"), the number of wrong answers in the first test, the interaction term $Guessing \times \#WrongAnswers$, the gender of investor, the age, the investor's wealth, and portfolio concentration. The proxy for wealth is expressed in logs. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.49***	0.92***	2.98***
	(0.06)	(0.03)	(0.65)
Guessing (dummy)	0.56**	0.32**	-1.45*
	(0.22)	(0.14)	(0.78)
R^2	0.0035	0.0031	0.0004
Panel B: Model with Control Variables			
Intercept	0.18	0.04	6.39***
	(0.34)	(0.19)	(2.23)
Guessing (dummy)	0.23**	0.18**	-1.28**
	(0.11)	(0.08)	(0.53)
# attempts	0.06	0.02	-0.36
	(0.07)	(0.03)	(0.39)
Q.1030 (dummy)	0.14**	0.03*	0.13
	(0.04)	(0.02)	(0.11)
Q.1031 (dummy)	0.37**	0.06*	0.49
	(0.11)	(0.04)	(0.52)
# wrong answers	-0.05*	-0.03*	-0.01
	(0.03)	(0.01)	(0.02)
Guessing (dummy) × # wrong answers	0.04***	0.03**	-0.41***
	(0.01)	(0.01)	(0.12)
Gender	0.28*	0.32***	-1.08*
	(0.18)	(0.08)	(0.62)
Age	0.02***	0.02***	0.05***
	(0.00)	(0.00)	(0.01)
Wealth	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Portfolio concentration	-1.45***	-0.97***	-2.36*
	(0.20)	(0.12)	(1.22)
R^2	0.0365	0.0404	0.0032

Table 7: Financial literacy and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative "guessing" variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages for each investor. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor's level of financial literacy in his first attempt is equal or higher than those in the subsequent attempts; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes control variables, as described in Section 5: the number of attempts at filling in the MiFID test, the first reply to question 1030 (i.e., "Have you already invested in a listed product?"), the first reply to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?"), the gender of investor, the age, the investor's wealth, and portfolio concentration. The proxy for wealth is expressed in logs. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.75***	1.04***	2.42***
	(0.41)	(0.36)	(0.82)
Guessing (dummy for financial literacy)	-0.23	0.19	1.04
	(0.07)	(0.05)	(0.91)
R^2	0.0019	0.0028	0.0006
Panel B: Model with Control Variables			
Intercept	0.17	0.03	2.11***
	(0.22)	(0.05)	(0.54)
Guessing (dummy for financial literacy)	-0.07	0.13	0.35
	(0.09)	(0.15)	(0.89)
# attempts	0.32	0.12	-0.40
	(0.30)	(0.09)	(0.37)
Q.1030 (dummy)	0.45***	0.19*	1.10**
	(0.07)	(0.10)	(0.45)
Q.1031 (dummy)	0.49**	0.20*	0.88*
	(0.22)	(0.12)	(0.51)
Gender	0.30*	0.08**	-0.14**
	(0.19)	(0.04)	(0.07)
Age	0.03***	0.02***	0.01***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01	0.01**
	(0.01)	(0.01)	(0.00)
Portfolio concentration	-2.51***	-1.58***	-2.82***
	(0.29)	(0.31)	(0.47)
R^2	0.0219	0.0274	0.0037

Table 8: Previous trading experience and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative "guessing" variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages for each investor. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor reply positively to question 1030 (i.e., "Have you already invested in a listed product?") in his first attempt and negatively in his second attempt; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes control variables, as described in Section 5: the first reply to question 1030 (i.e., "Have you already invested in a listed product?"), the first reply to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?"), the number of wrong answers in the first test, the interaction term $Q.1030PositiveNegative \times \#WrongAnswers$, the number of attempts at filling in the MiFID test, the gender of investor, the age, the investor's wealth, and portfolio concentration. The proxy for wealth is expressed in logs. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.18***	0.76***	1.31***
	(0.25)	(0.20)	(0.32)
Q.1030 positive-negative (dummy)	0.21**	0.19**	-1.84***
	(0.10)	(0.08)	(0.58)
R^2	0.0012	0.0012	0.0007
Panel B: Model with Control Variables			
Intercept	0.22	0.04	2.89***
	(0.21)	(0.04)	(0.47)
Q.1030 positive-negative (dummy)	0.28***	0.73***	-2.04***
	(0.06)	(0.19)	(0.47)
Q.1030 (dummy)	0.45***	0.20**	1.14***
	(0.11)	(0.10)	(0.51)
Q.1031 (dummy)	0.33***	0.13**	0.46*
	(0.10)	(0.06)	(0.25)
# wrong answers	-0.02*	-0.01*	-0.08
	(0.01)	(0.00)	(0.09)
Q.1030 positive-negative (dummy) × # wrong answers	0.08**	0.07*	-0.34**
	(0.04)	(0.04)	(0.15)
# attempts	0.37	0.15	-0.25
	(0.39)	(0.14)	(0.31)
Gender	0.31*	0.08*	-0.52*
	(0.16)	(0.05)	(0.31)
Age	0.03***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01	0.01*
	(0.01)	(0.01)	(0.00)
Portfolio concentration	-2.50***	-1.58***	-2.83***
	(0.29)	(0.21)	(0.46)
R^2	0.0223	0.0275	0.0035

Table 9: Extra information and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative "guessing" variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages for each investor. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor reply positively to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?") in his first attempt and negatively in his second attempt; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes control variables, as described in Section 5: the first reply to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?"), the first reply to question 1030 (i.e., "Have you already invested in a listed product?"), the number of wrong answers in the first test, the interaction term $Q.1031PositiveNegative \times \#WrongAnswers$, the number of attempts at filling in the MiFID test, the gender of investor, the age, the investor's wealth, and portfolio concentration. The proxy for wealth is expressed in logs. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.44***	0.89***	1.38***
	(0.32)	(0.27)	(0.39)
Q.1031 positive-negative (dummy)	0.40**	0.35**	-2.42**
	(0.25)	(0.18)	(0.97)
R^2	0.0053	0.0018	0.0013
Panel B: Model with Control Variables			
Intercept	0.13	0.05	2.31***
	(0.14)	(0.07)	(0.44)
Q.1031 positive-negative (dummy)	0.95***	0.72***	-2.87***
	(0.11)	(0.19)	(0.99)
Q.1031 (dummy)	0.49***	0.20**	0.89**
	(0.09)	(0.10)	(0.44)
Q.1030 (dummy)	0.46***	0.21**	1.16**
	(0.10)	(0.10)	(0.51)
# wrong answers	-0.02*	-0.01	-0.08**
	(0.01)	(0.01)	(0.04)
Q.1031 positive-negative (dummy) × # wrong answers	0.17**	0.02*	-0.22*
	(0.08)	(0.01)	(0.12)
# attempts	0.28	0.10	-0.54*
	(0.29)	(0.11)	(0.28)
Gender	0.29*	0.08*	-0.65*
	(0.16)	(0.05)	(0.38)
Age	0.03***	0.03***	0.02***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01	0.01*
	(0.01)	(0.01)	(0.00)
Portfolio concentration	-2.50***	-1.59***	-2.88***
	(0.33)	(0.22)	(0.57)
R^2	0.0220	0.0278	0.0041

Appendices

Appendix A portrays the full version of the questionnaire related to MiFID I. The questionnaire is used by the brokerage firm that offered data for the empirical analysis. Appendix B reports descriptive statistics for the time interval between consecutive test retakes. Appendix D presents univariate and regression results for the subsample of investors who fill in the MiFID test only twice. Appendix E shows univariate and regression results classifying as "consistent" those investors who maintain the same score across multiple attempts. Appendix F portrays univariate and regression results adding in the sample those investors who fill in the MiFID test only once (Inghelbrecht and Tedde, 2024, 2026).

A MiFID Questionnaire

This appendix reports the full questionnaire for non-complex financial instruments (appropriateness questionnaire) related to MiFID I. The MiFID I is the Directive 2004/39/EC of the European Parliament and of the Council of 21 April 2004. Its updated version (MiFID II) is the Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014, on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU.[11] The empirical analysis is based on data related to this questionnaire. According to the MiFID, every broker and financial institution has the discretionary power in designing the questionnaire. The aim of the two directives is to assess investors' financial literacy. Financial literacy represents a key concept used by MiFID to improve the investors protection through the suitability and appropriateness ("Know Your Customer") principles. The principle of "Know Your Customer" applies to all market intermediaries and all financial instruments covered by MiFID, and distinguishes among the execution of orders, provision of financial advice, and supply of portfolio management services. Rules based on the suitability assessment are binding since retail investors request financial advice and/or portfolio management services. By contrast, when retail investors ask for the "order execution only", they are fully in charge of their trades, and the appropriateness assessment is to ensure that investors have the necessary knowledge to understand the risks involved in (complex) financial instruments before investing. The result of the appropriateness assessment is not binding. Moreover, it is common practice that financial institutions require the appropriateness assessment also for the "order execution only" of non complex financial products with random returns (i.e., stocks), referring to the precautionary principle (D'Hondt et al., 2021; Inghelbrecht and Tedde, 2024).

The structure of the MiFID I questionnaire for non-complex instruments used by our brokerage firm is shown in Figure A.1.

[11] The corresponding US securities regulation encompasses the 1934 Securities Exchange Act, the FINRA rules (Financial Industry Regulatory Authority of 2007) and the Reg NMS (Regulation of the National Market System of 2005).

Figure A.1: MiFID Questionnaire

1022:
Due to the subprime crisis of 2008, there was a bear market. What did that mean?
- That stock prices rose on average
- That the share prices fall on average
- That the exchange rates remained on average the same
- I don't know

1023:
The most important stock indicator of the Belgian stock market, the BEL 20 index, is discussed daily in the media.
The BEL 20 is an index that shows the average price development of 20 shares, which:
- have the largest market capitalization
- the most traded orders
- the most worthy
- I don't know

1024:
You want to place a buy order. You can choose between giving a limit order and a market order.
Which of the following statements is correct?
- Statement 1: A limit order is always guaranteed to be executed
- Statement 2: With a limit order, you know the maximum amount to be paid in advance
- I don't know

1025:
In the order screen you will see different rates.
You can see, among other things, the last price, the ask price and bid price and the closing price.
What is the bid rate?
- The price of the best buyer. You can basically sell your securities at this price
- The price you (maximum) bid to buy certain securities
- The guaranteed price offered if there are no other interested parties
- I don't know

1026:
Various investment products can be traded on the stock exchange.
For example, there are stocks and bonds.
If we rank the different investment products of a Belgian listed company one after the other, starting with the product with the lowest risk and ending with the product with the highest risk, which order is generally correct?
- Stocks, Savings in a Savings Account, Bonds
- Bonds, Stocks, Saving in a Savings Account
- Saving on a savings account, bonds, stocks
- I don't know

1027:
What is a spread?
- The difference between the bid and ask price
- The time it takes to ship an order
- A form of portfolio diversification
- I don't know

1028:
The ECB decides to raise interest rates. You have bonds in your portfolio.
What is happening?
- An interest rate change is often short-lived, so the price will recover on its own
- I make a profit because of the interest rate hike, because the bonds are worth more
- The interest rate hike will cause the price of my bonds to fall
- I don't know

1029:
If the EUR/USD rate goes down, then:
- Decreases the value of the euro against the dollar
- The value of the dollar falls against the euro
- The value of the euro falls against the dollar and the value of the dollar falls against the euro
- I don't know

1030:
Have you already invested in a listed product?
- Yes
- No

1031:
Are you looking for additional information if you have questions about a financial product?
- Yes
- No

B Time Interval between Attempts

Table B.1: Descriptive statistics on time intervals between consecutive attempts

This table reports summary statistics for the time intervals between consecutive attempts at completing the MiFID test. These statistics are reported for 698 "guesser" investors, and for 2,524 "improver" investors, as explained in Section 2.2. The first column shows the number of investors who wait maximum 1 day between one attempt and the other; the second column shows the number of investors who wait maximum 7 days; the third column shows the number of investors who wait maximum 10 days; the last column shows the number of investors who wait maximum 14 days.

	Max 1 day	Max 7 days	Max 10 days	Max 14 days
"Guesser" investors with 2 or more attempts (698 investors):				
Attempt 2	401 (57.44%)	453 (64.89%)	462 (66.19%)	491 (70.34%)
Last attempt	197 (28.22%)	238 (34.09%)	245 (35%)	266 (38.11%)
"Improver" investors with 2 or more attempts (2,524 investors):				
Attempt 2	1,595 (63.19%)	1,878 (74.40%)	1,922 (76.15%)	1,967 (77.93%)
Last attempt	156 (6.18%)	569 (22.54%)	1,099 (43.54%)	1,964 (77.81%)

C Regression Results for Alternative Model Specifications

Table C.2: Wrong answers and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages for each investor. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor select a number of wrong answers in the first attempt equal or lower than the consecutive attempts; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 5.Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.75***	1.04***	3.04***
	(0.41)	(0.36)	(0.82)
Guessing (# wrong answers)	-0.25	0.16	1.06
	(0.22)	(0.15)	(0.93)
R^2	0.0015	0.0035	0.0002
Panel B: Model with Control Variables			
Intercept	-0.28	-0.21	2.89***
	(0.31)	(0.26)	(0.54)
Guessing (# wrong answers)	-0.35	0.21	0.33
	(0.41)	(0.19)	(0.27)
# attempts	0.06	0.08	-0.27**
	(0.06)	(0.07)	(0.10)
Q.1030 (dummy)	0.51***	0.13**	0.65*
	(0.09)	(0.06)	(0.40)
Q.1031 (dummy)	0.56***	0.16**	0.28**
	(0.15)	(0.07)	(0.12)
Gender	0.25*	0.07***	-0.11**
	(0.19)	(0.02)	(0.05)
Age	0.03***	0.02***	0.01***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Portfolio concentration	-2.24***	-1.33***	-2.58***
	(0.31)	(0.26)	(0.64)
R^2	0.0222	0.0383	0.0034

Table C.3: Correct answers and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor select a number of correct answers in the first attempt equal or higher than the consecutive attempts; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 5. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.81***	1.03***	1.79***
	(0.26)	(0.30)	(0.45)
Guessing (# correct answers)	-0.09	0.17	1.27
	(0.14)	(0.16)	(0.84)
R^2	0.0004	0.0038	0.0004
Panel B: Model with Control Variables			
Intercept	0.11	0.23	0.92
	(0.17)	(0.25)	(0.95)
Guessing (# correct answers)	-0.04	0.03	0.15
	(0.04)	(0.03)	(0.17)
# attempts	0.07	0.19	-0.15**
	(0.08)	(0.17)	(0.07)
Q.1030 (dummy)	0.38***	0.09***	0.32*
	(0.08)	(0.03)	(0.17)
Q.1031 (dummy)	0.56**	0.16*	0.30**
	(0.22)	(0.09)	(0.15)
Gender	0.16**	0.07**	-0.13**
	(0.07)	(0.03)	(0.06)
Age	0.03***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Portfolio concentration	-2.23***	-1.33***	-2.54***
	(0.45)	(0.38)	(0.51)
R^2	0.0219	0.0376	0.0036

Table C.4: Question 1030 and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor does not show consistency in his replies to question 1030 (i.e., "Have you already invested in a listed product?"); zero if his answers to this question are consistent across attempts. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 5. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.52***	0.91***	1.87***
	(0.14)	(0.29)	(0.22)
Guessing (Q.1030 not consistent)	0.19**	0.17**	-1.98***
	(0.07)	(0.06)	(0.25)
R^2	0.0013	0.0019	0.0015
Panel B: Model with Control Variables			
Intercept	0.15	0.19	2.93***
	(0.23)	(0.18)	(0.61)
Guessing (Q.1030 not consistent)	0.28***	0.65***	-2.45***
	(0.07)	(0.11)	(0.37)
Q.1031 dummy	0.49***	0.26***	1.13**
	(0.09)	(0.07)	(0.52)
# wrong answers	-0.02*	-0.01*	-0.11**
	(0.01)	(0.00)	(0.05)
Guessing × # wrong answers	0.06**	0.04*	-0.46**
	(0.03)	(0.02)	(0.22)
# attempts	0.37	0.12	-0.31
	(0.46)	(0.16)	(0.036)
Gender	0.29*	0.04**	-0.47*
	(0.15)	(0.02)	(0.25)
Age	0.03***	0.02***	0.03***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.01*	0.01*
	(0.01)	(0.00)	(0.00)
Portfolio concentration	-1.92***	-0.97***	-2.48***
	(0.51)	(0.30)	(0.59)
R^2	0.0355	0.0396	0.0042

Table C.5: Question 1031 and investors trading behavior: OLS regression results

This table reports the OLS regression results about the effect of an alternative guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 3,222 investors. The "guessing" variable is a dummy, which is equal to one if the investor does not show consistency in his replies to question 1031 (i.e., "Are you looking for additional information if you have questions about financial products?"); zero if his answers to this question are consistent across attempts. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 5. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.48***	0.88***	1.95***
	(0.12)	(0.25)	(0.24)
Guessing (Q.1031 not consistent)	0.22***	0.19**	-1.85***
	(0.06)	(0.08)	(0.31)
R^2	0.0018	0.0022	0.0019
Panel B: Model with Control Variables			
Intercept	0.18	0.22	2.34***
	(0.25)	(0.20)	(0.58)
Guessing (Q.1031 not consistent)	0.31***	0.62***	-2.31***
	(0.08)	(0.12)	(0.42)
Q.1030 dummy	0.45***	0.28***	1.05**
	(0.10)	(0.08)	(0.48)
# wrong answers	-0.03**	-0.02*	-0.09*
	(0.01)	(0.01)	(0.05)
Guessing × # wrong answers	0.08**	0.05**	-0.42**
	(0.04)	(0.02)	(0.20)
# attempts	0.32	0.15	-0.28
	(0.41)	(0.18)	(0.32)
Gender	0.25*	0.05**	-0.42*
	(0.14)	(0.02)	(0.22)
Age	0.02***	0.02***	0.04***
	(0.00)	(0.00)	(0.00)
Wealth	0.01	0.02*	0.01*
	(0.01)	(0.01)	(0.00)
Portfolio concentration	-1.85***	-1.02***	-2.56***
	(0.48)	(0.28)	(0.52)
R^2	0.0382	0.0415	0.0069

D Investors with Two Attempts

D.1 Univariate Results

Table D.6: Investors trading behavior: univariate results for investors with two attempts

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 344 "guesser" investors, and for 2,326 "improver" investors. Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Guesser" Investors	"Improver" Investors	Diff	t-stat
# orders	1.85	1.47	-0.38	-1.87
# transactions	1.13	0.90	-0.22	-1.91
Net return (in %)	1.61%	2.74%	1.13%	1.44
Risk-adjusted return (in %)	0.14%	0.23%	0.09%	0.82
	Panel B: Median			
	"Guesser" Investors	"Improver" Investors	Diff	p-value
# orders	0.64	0.46	-0.18	0.01
# transactions	0.42	0.32	-0.10	0.02
Net return (in %)	0.21%	0.38%	0.17%	0.04
Risk-adjusted return (in %)	0.01%	0.02%	0.01%	0.09

D.2 Regression Results

Table D.7: Guessing and investors trading behavior: OLS regression results for investors with two attempts

This table reports the OLS regression results about the effect of our guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 2,670 investors. The "guessing" variable is a dummy, which is equal to one of the investor achieve a first score higher than the second; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 4.Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.47***	0.90***	2.74***
	(0.11)	(0.09)	(0.43)
Guessing (dummy)	0.38*	0.22*	-1.13
	(0.20)	(0.11)	(0.77)
R^2	0.0015	0.0016	0.0002
Panel B: Model with Control Variables			
Intercept	0.16	-0.03	7.55***
	(0.23)	(0.09)	(2.09)
Guessing (dummy)	0.23**	0.13**	-0.69*
	(0.11)	(0.05)	(0.33)
Q.1030 (dummy)	0.13***	0.11**	0.05
	(0.4)	(0.05)	(0.08)
Q.1031 (dummy)	0.51***	0.12*	0.67
	(0.09)	(0.07)	(0.74)
# wrong answers	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.01)
Guessing (dummy) × # wrong answers	0.07***	0.05**	-0.19***
	(0.02)	(0.02)	(0.06)
Gender	0.39**	0.36***	-0.80*
	(0.15)	(0.07)	(0.44)
Age	0.02***	0.01***	0.07***
	(0.00)	(0.00)	(0.02)
Wealth	0.01	0.01*	0.01
	(0.01)	(0.00)	(0.01)
Portfolio concentration	-1.51***	-1.03***	-2.08*
	(0.34)	(0.27)	(1.40)
R^2	0.0419	0.0611	0.0031

E Consistent Investors

E.1 Univariate Results

Table E.8: Investors trading behavior: univariate results for guesser and consistent investors

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 24 "consistent" investors (investors who fill in the MiFID test multiple times and always achieve the same score), and for 698 "guesser" investors. Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Guesser" Investors	"Consistent" Investors	Diff	t-stat
# orders	2.03	2.01	-0.02	-0.06
# transactions	1.23	1.18	-0.05	-0.28
Net return (in %)	1.58%	2.13%	0.54%	0.60
Risk-adjusted return (in %)	0.19%	0.17%	-0.02%	-0.11
	Panel B: Median			
	"Guesser" Investors	"Consistent" Investors	Diff	p-value
# orders	0.61	0.71	0.10	0.42
# transactions	0.38	0.47	0.09	0.39
Net return (in %)	0.30%	0.34%	0.04%	0.19
Risk-adjusted return (in %)	0.01%	0.01%	0.00%	0.19

Table E.9: Investors trading behavior: univariate results for improver and consistent investors

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 24 "consistent" investors (investors who fill in the MiFID test multiple times and always achieve the same score), and for 2,524 "improver" investors. Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Improver" Investors	"Consistent" Investors	Diff	t-stat
# orders	1.49	2.01	0.52	1.99
# transactions	0.92	1.18	0.26	1.87
Net return (in %)	3.01%	2.13%	-0.88%	-1.83
Risk-adjusted return (in %)	0.24%	0.17%	-0.07%	-0.48
	Panel B: Median			
	"Improver" Investors	"Consistent" Investors	Diff	p-value
# orders	0.47	0.71	0.23	0.01
# transactions	0.32	0.47	0.15	0.02
Net return (in %)	0.39%	0.34%	-0.05%	0.41
Risk-adjusted return (in %)	0.01%	0.01%	0.00%	0.48

E.2 Regression Results

Table E.10: Guessing and investors trading behavior: OLS regression results considering consistent investors

This table reports the OLS regression results about the effect of our guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 3,246 investors. The "guessing" variable is a dummy, which is equal to one of the investor achieve a first score higher than the subsequent; zero otherwise. The "consistency" variable is a dummy that equals one if the investor maintains the same score across all attempts; zero otherwise. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 4. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.49***	0.93***	3.01***
	(0.12)	(0.11)	(0.45)
Guessing (dummy)	0.55**	0.32**	-1.43*
	(0.20)	(0.14)	(0.74)
R^2	0.0035	0.0031	0.0004
Panel B: Model with Control Variables			
Intercept	-0.01	-0.11	6.99***
	(0.06)	(0.13)	(2.17)
Guessing (dummy)	0.23**	0.18**	-1.46**
	(0.10)	(0.08)	(0.61)
Consistency (dummy)	0.29**	0.14*	-0.72*
	(0.14)	(0.08)	(0.56)
# attempts	0.05	0.02	-0.24
	(0.06)	(0.02)	(0.27)
Q.1030 (dummy)	0.25***	0.09**	0.13*
	(0.08)	(0.04)	(0.07)
Q.1031 (dummy)	0.38***	0.06	0.51
	(0.08)	(0.07)	(0.63)
# wrong answers	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
Guessing (dummy) × # wrong answers	0.05**	0.03**	-0.11
	(0.02)	(0.01)	(0.13)
Gender	0.27*	0.32***	-1.04*
	(0.14)	(0.08)	(0.71)
Age	0.02***	0.01***	0.08***
	(0.00)	(0.00)	(0.01)
Wealth	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Portfolio concentration	-1.45***	-0.97***	-2.31**
	(0.19)	(0.21)	(1.02)
R^2	0.0356	0.0393	0.0034

F Investors with One Attempt

F.1 Univariate Results

Table F.11: Investors trading behavior: univariate results for guesser and rational investors

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 698 "guesser" investors, and for 29,136 "rational" investors (investors who fill in the MiFID test only once). Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Guesser" Investors	"Rational" Investors	Diff	t-stat
# orders	2.03	1.30	-0.72	-3.41
# transactions	1.23	0.81	-0.42	-3.06
Net return (in %)	1.58%	2.49%	0.91%	2.17
Risk-adjusted return (in %)	0.19%	0.22%	0.03%	0.36
	Panel B: Median			
	"Guesser" Investors	"Rational" Investors	Diff	p-value
# orders	0.61	0.35	-0.25	0.00
# transactions	0.38	0.25	-0.13	0.00
Net return (in %)	0.30%	0.32%	0.02%	0.24
Risk-adjusted return (in %)	0.11%	0.21%	0.10%	0.45

Table F.12: Investors trading behavior: univariate results for improver and rational investors

This table reports the mean and median values for the investor's trading behavior (i.e., the number of orders, the number of transactions, the net return and the risk-adjusted return (both expressed in %)). Results are presented for 29,136 "rational" investors (investors who fill in the MiFID test only once), and for 2,524 "improver" investors. Panel A contains means, differences, and t-test; Panel B displays medians, differences, and p-value from Wilcoxon rank sum test.

	Panel A: Mean			
	"Improver" Investors	"Rational" Investors	Diff	t-stat
# orders	1.49	1.30	-0.19	-2.49
# transactions	0.92	0.81	-0.11	-2.53
Net return (in %)	3.01%	2.49%	-0.52%	-0.75
Risk-adjusted return (in %)	0.26%	0.22%	-0.04%	-0.39
	Panel B Median			
	"Improver" Investors	"Rational" Investors	Diff	p-value
# orders	0.47	0.35	-0.12	0.00
# transactions	0.32	0.25	-0.07	0.00
Net return (in %)	0.39%	0.32%	-0.07%	0.43
Risk-adjusted return (in %)	0.24%	0.21%	-0.03%	0.62

F.2 Regression Results

Table F.13: Guessing and investors trading behavior: OLS regression results considering rational investors

This table reports the OLS regression results about the effect of our guessing dummy variable on the investor's trading behavior (i.e., the number of orders, the number of transactions, and the net return (expressed in %)). These variables are measured as monthly averages. The samples consist of 32,358 investors. The "guessing" variable is a dummy, which is equal to one of the investor achieve a first score equal or higher than the subsequent; zero otherwise. The "improving" variable is a dummy that equals one if the investors consistently increases his score in attempts. The specification in Panel A does not include control variables; the specification in Panel B includes the control variables discussed in Section 4. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. Standard errors are reported between brackets.

	# orders	# transactions	Net Return
Panel A: Baseline Model			
Intercept	1.32***	0.83***	2.53***
	(0.29)	(0.21)	(0.73)
Guessing (dummy)	0.72***	0.42***	-0.97**
	(0.19)	(0.11)	(0.41)
R^2	0.0021	0.0038	0.0002
Panel B: Model with Control Variables			
Intercept	-0.04	-0.07	2.72***
	(0.06)	(0.11)	(0.65)
Guessing (dummy)	0.46***	0.29***	-0.93**
	(0.12)	(0.09)	(0.41)
Improving (dummy)	0.16**	0.10**	0.64
	(0.08)	(0.05)	(0.71)
# attempts	0.05	0.02	-0.29
	(0.06)	(0.03)	(0.31)
Q.1030 (dummy)	0.23***	0.11***	0.51**
	(0.05)	(0.03)	(0.25)
Q.1031 (dummy)	0.16***	0.07**	0.73**
	(0.04)	(0.03)	(0.32)
# wrong answers	-0.04*	-0.02**	0.08
	(0.02)	(0.01)	(0.09)
Guessing (dummy) × # wrong answers	0.02*	0.01**	-0.16
	(0.01)	(0.00)	(0.21)
Gender	0.06*	0.12***	-0.15*
	(0.04)	(0.04)	(0.09)
Age	0.02***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
Wealth	0.01***	0.01*	0.01
	(0.00)	(0.00)	(0.01)
Portfolio concentration	-1.60***	-1.05***	-2.23***
	(0.23)	(0.17)	(0.51)
R^2	0.0155	0.0208	0.0007