Run, Walk, or Buy?
Financial Literacy, Dual-Process Theory, and Investment Behavior°

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April 10, 2013

Abstract

Combining recent empirical findings on the usefulness of financial literacy for investment decisions and literature from psychology, we argue that the behavior of people with a high level of financial literacy might depend on the prevalence of the two thinking styles according to dual-process theories: intuition and cognition. We hypothesize that a high level of financial literacy might be overruled if subjects believe in trusting their hunches. We expect this interaction effect to be most pronounced when people are stressed. We test these hypotheses within an innovative experimental design which makes the participants experience the stock market development and their personal performance. Our results confirm the hypothesized interaction effect. We successfully replicate the findings in a follow-up experiment. Moreover, we show that this behavior has negative consequences on the risk-adjusted performance. We contribute to the existing literature by providing a further step to understand the mechanism of how and when personal characteristics affect behavior.

Keywords: Individual Investors, Investor Behavior, Financial Literacy, Dual-Process Theories, Rational-Experiential Inventory

JEL-Classification Code: G11, D81

° We thank Martin Kocher, Klaus M. Schmidt, Marta Serra-Garcia, Martin Spann, Dieter Frey, Ralf Elsas, Vijay Aseervatham, Johannes Jaspersen, as well as all conference and seminar participants at the 3rd Annual Experimental Finance Conference in Luxembourg, CEAR/MRIC Behavioral Insurance Workshop 2012, Colloquium on Financial Markets 2013, European Retail Investment Conference 2013, and the University of Innsbruck for valuable comments.

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1. Introduction

A famous advice of Warren Buffett states that "investors should remember that excitement and expenses are their enemies. And if they insist on trying to time their participation in equities, they should try to be fearful when others are greedy and greedy only when others are fearful."[1] Still, what we see in financial markets is often the opposite. Many private investors enter and leave the stock market quite (too) late and therefore make the classic mistake of buying high and selling low (see, e.g., Nofsinger 2012). Probably the most famous examples for this behavior are the stock market crashes of 1929 (Black Thursday, October 24, 1929) and 1987 (Black Monday, October 19, 1987). Yet, this behavior has also been observed in the last couple of years, e.g., after the collapse of Lehman Brothers in 2008 or in the European sovereign-debt crisis starting in late 2009. In these days, the press headlined that investors "could not keep their nerve" (New York Times, September 24, 2008[2]) and stated that "barometers of financial stress hit record peaks" (Financial Times, September 18, 2008[3]). While some newspapers gave the advice "Don't panic!" (The Telegraph, November 22, 2011[4]), others emphasized the investors' dilemma to "run, walk or buy" (Financial Times, August 5, 2011[5]). But what makes investors "lose their nerves" and who starts "running"? Dennis and Strickland (2002) find some evidence that, on average, institutional investors sell more than individuals when the stock market has crashed. Glaser and Weber (2009) and Statman, Thorley, and

[1] Letter to shareholders (2004) http://www.berkshirehathaway.com/letters/2004.html (date last accessed: February 13, 2013).

[2] Online available: http://www.nytimes.com/2008/09/24/business/24markets.html (date last accessed: February 13, 2013).

[3] Online available: http://www.ft.com/intl/cms/s/0/8058d308-84d3-11dd-b148-0000779fd18c.html (date last accessed: February 13, 2013).

[4] Online available: http://www.telegraph.co.uk/finance/markets/questor/8904859/Equity-investors-Dont-panic.html (date last accessed: February 13, 2013).

[5] Online available: http://www.ft.com/intl/cms/s/0/28cfa324-bf7b-11e0-90d5-00144feabdc0.html (date last accessed: February 13, 2013).

Vorkink (2006), among others, document that trading activity and volume differ in bullish and bearish market phases. Still, which personal characteristics play a role?

Van Rooij, Lusardi, and Alessie (2011a) state that stock market participants typically have a higher level of financial literacy compared to the average population. Grinblatt, Keloharju, and Linnainmaa (2011, 2012) find evidence that, on average, investors with a higher IQ are more likely to invest and succeed in the stock market. So, does intelligence and financial literacy prevent investors from making common investment mistakes? Not necessarily. There is evidence that even investors with presumably high financial literacy do not make use of their knowledge when building their own portfolio and that they are driven by behavioral factors comparable to lay investors (see, e.g., Doran, Peterson, and Wright 2010; Müller and Weber 2010). Besides that, there are several studies in which financial literacy has weak influence or does not show any impact on the quality of investment decisions (see, e.g., Gathergood 2012; von Gaudecker 2011; Bodnaruk and Simonov 2012).

In this study, we focus on the question why some financially literate people deviate from their "normal" investment strategy. Disciplined trading and maintaining the investment strategy can avoid the costly irrational behavior and is therefore often said to be a key to success in financial markets (Locke and Mann, 2005). In particular, we try to disentangle additional personal characteristics that drive the trading impulse of financially literate people in different market conditions. We use an innovative experimental design in order to examine this research question. Based on the idea that the dual-process theories' concept of two thinking styles, intuition and cognition, could be a key to solve this question, we hypothesize that there is an interaction effect between financial literacy and the prevalence of intuitive thinking.

Consistent with our hypotheses, we find that financially literate people are more likely to deviate from their investment strategy if they tend to trust in their hunches. We replicate these findings in a second experiment with different subjects and different stock market developments. Moreover, we document that intuitive behavior indeed lowers the risk-adjusted performance of financially literate individuals.

This paper is related to other studies that analyze determinants of investment behavior such as IQ (Grinblatt, Keloharju, and Linnainmaa 2012), cognitive abilities (Christelis, Jappelli, and Padula 2010), religion (Kumar, Page, and Spalt 2011), and political preferences (Kaustia and Torstila 2011). Some studies examine the impact of personality traits such as the 'Big Five' (Fenton-O'Creevy et al. 2004), sensation seeking (Grinblatt and Keloharju 2009), self-monitoring (Biais et al. 2005), and motivational systems (Mühlfeld, Weitzel, and van Witteloostuijn 2013) on trading behavior of individual investors. With the notable exception of Kempf, Merkle, and Niessen-Ruenzi (2013) who link affective attitudes with stock market expectations, we are one of the first that link dual-process theories with capital market decisions. This is quite surprising since dual-process theories are one of the most important and validated theories from psychology (see, e.g., Evans 2003). Furthermore, this study is the first that tries to shed light on the mixed evidence of financial literacy as a predictor for "good" investment behavior.

The remainder of this paper proceeds as follows: In Section 2, we provide a literature review and formulate our hypotheses. Section 3 describes the experimental design, the data, and the participants. In Section 4, we present the results and several robustness checks. In Section 5 and 6, we describe two follow-up experiments and illustrate the findings. Section 7 provides a discussion of our findings and concludes.

2. Literature Review and Hypotheses

Financial Literacy and Investment Behavior

In the last couple of years, financial literacy received special attention from research and politics in both the U.S. and in Europe (see, e.g., Lusardi and Mitchell 2007, 2008, 2011; Lusardi, Mitchell, and Curto 2010). This can be particularly ascribed to the increased necessity to save for retirement and the increased complexity of financial products and services making it more important but also more difficult to make informed investment decisions. There are several studies which examine the question whether individuals are well-prepared for this task. These studies generally indicate that financial illiteracy is widespread and that many individuals lack knowledge of even the most basic economic principles (Lusardi and Mitchell 2007, 2008; Hilgert, Hogarth, and Beverly 2003). The link between financial literacy and ("good") investment behavior is less clear. Van Rooij, Lusardi, and Alessie (2011a) show that individuals with lower financial literacy are much less likely to invest in stocks. Guiso and Jappelli (2008) find in the individual's financial literacy a good indicator for the diversification of his/her portfolio. Using investor's wealth and profession as a proxy for financial literacy, Dhar and Zhu (2006) find empirical evidence that more literate investors are less prone to the disposition effect. The results of Müller and Weber (2010) indicate that financial literacy is positively related to investments in low-cost funds. Nevertheless, they report that even the most sophisticated investors select actively managed funds instead of less expensive ETFs (exchange traded funds) or index fund alternatives. Even finance professors with presumably high financial literacy do not implement their knowledge when building their own portfolio. For example, Doran, Peterson, and Wright (2010) find that the professors' perception regarding market efficiency and the consequential optimal investment strategy are unrelated to their

actual, realized behavior. The authors argue that the professors' investment decisions are, despite their high financial literacy, driven by behavioral factors comparable to amateur investors. Hibbert, Lawrence, and Prakash (2012) document that a significant number of finance professors do not participate in the stock market at all.[6] Moreover, several studies document only a weak, if any, impact of financial literacy on the quality of investment decisions (see, e.g., Gathergood 2012; von Gaudecker 2011, Bodnaruk and Simonov 2012).

To sum up, the existing literature and the anecdotal evidence mentioned in the Introduction are somehow puzzling: A high degree of financial literacy in general leads to "better" decisions, but obviously not for all subjects and not in all situations. In this paper, we want to analyze whether dual-process theories from psychology can help to come a step closer to a possible solution of this puzzle.

Dual-Process Theories

Dual-process theories (for a review see, e.g., Evans 2008) embrace the idea that decisions can be driven by both intuitive and cognitive processes. Although dual-process theories come in many different forms, they all agree on distinguishing two main processing mechanisms. One of the processes can be characterized as fast, non-conscious, and tied to intuition (System 1), and the other as slow, controlled, and conscious (System 2) (see, e.g., Stanovich and West 2000). System 2 is responsible for analytical and rational thinking (Stanovich and West 2000) which is needed to consistently implement a financially literate investment strategy. Goel and Dolan (2003) and Sanfey et al. (2006) provide neuropsychological evidence for dual processes.

[6] For the "non-participation" puzzle see also, e.g., Haliassos and Bertaut (1995) and Campbell (2006).

Dual-process theories have been studied and applied to many different fields, e.g., reasoning and social cognition (Evans 2008). When linking dual-process theories to decision-making, it has been shown that heuristics and biases, such as framing (Tversky and Kahneman 1981) and representativeness (De Bondt and Thaler 1985; Kahneman and Tversky 1972), are associated with System 1 (Shiloh, Salton, and Sharabi 2002; Kahneman and Frederick 2002, 2005; Mahoney et al. 2011; Alós-Ferrer and Hügelschäfer 2012). System 2 is responsible for the intervention and improvement of the decision. Still, there is also evidence for the superiority of unconscious decision-making. For example, Klein (1999) states that experts under time pressure rapidly retrieve a scheme that provides a solution. Reyna (2004) argues that experts, in contrast to novices, do not need to rely on explicit analytic reasoning. Dijksterhuis et al. (2006) claim that unconscious decisions are better than conscious ones. Gigerenzer and Gaissmaier (2011) and Gigerenzer (2007) indicate that heuristics, less computation, and less time can improve accuracy.

Crusius, van Horen, and Mussweiler (2012) underline the importance and explanatory power of a process-focused perspective when analyzing economic behavior in various contexts. Lovric, Kaymak, and Spronk (2008) present a descriptive model of individual investor behavior in which decisions are driven by dual systems. Nevertheless, in economics and finance, there are only few studies which integrate the idea of dual-process theories into their research. One exception is Godek and Murray (2008) who analyze the role of rational and experiential processing modes on the willingness to pay for advice. Moreover, Thaler and Shefrin (1981) incorporate the idea of two conflicting processes into their model about intertemporal choice. Gennaioli and Shleifer (2010) present a model of intuitive inference. Kempf, Merkle, and Niessen-Ruenzi (2013) build a link between affective attitudes and stock market expectations.

To the best of our knowledge, we are the first to link dual-process theories with investment decisions.

Hypotheses

It is often assumed that both systems can be active concurrently and compete for control (e.g., Gilbert 1989, 1991; Epstein 1994; Hammond 1996; Sloman 1996). While System 1 quickly suggests an intuitive answer, System 2 monitors and intervenes (Kahneman and Frederick 2002). If System 2 is not strong enough to "convince" System 1, then the actual financial knowledge to realize a rational or "reasonable" investment strategy might be overruled and might not have any effect. In real life, investors usually do not agree about the definition of a "reasonable" investment strategy. There is a lot of evidence that investors base their investment decisions on the past performance (see, e.g., Sirri and Tufano 1998, Choi, Laibson and Madrian 2010, and De Bondt 1998). In particular, while some investors believe in trend continuation (momentum strategy[7]), others believe in trend reversal (contrarian strategy[8]). As stated by Locke and Mann (2005), investors should try to be disciplined and maintain their investment strategy. Taking these concepts into account, we hypothesize that financially literate investors are more likely to deviate from their investment strategy if they rely on their intuition. In other words, we argue that a strong System 1 decreases the probability that investors keep up their investment strategy. This argumentation is in line with De Bondt (1998, p. 837) who states that many investors lack discipline and trade on impulse and that they should "avoid beating themselves".

[7] Grinblatt, Titman, and Wermers (1995) find that the majority of the analyzed mutual funds were momentum traders. Jegadeesh and Titman (1993) and Chan, Hameed, and Tong (2000), among others, examine the profitability of momentum strategies. Luo (2013) analytically shows that representativeness heuristic traders, i.e. momentum traders, are not driven out of a competitive market if noise traders are present.

[8] For example, Choe, Kho, and Stulz (1999) show that individual investors in Korea conducted a contrarian strategy. De Bondt and Thaler (1985), among others, analyze the performance of reversal strategies.

H1: Financially literate people are more likely to deviate from their investment strategy if they rely on their intuition.

The second hypothesis deals with decision making under stress. From a psychological point of view, it has been shown that stressed subjects do not analyze situations in-depth (Dörner and Pfeifer 1993), tend to focus on the most central information only (Easterbrook 1959), and adopt mental short-cuts (Wyer and Srull 1994). The findings of Bless et al. (1996) indicate a lower reliance on knowledge structures when people are in a sad mood. Sweeny (2008) argues that negative events or experiences can make the processes of responding quicker and more automatic. Therefore, we argue that System 1 has a stronger influence if people are stressed. This makes it more likely that System 2 is not strong enough to overrule the intuitive reaction of System 1. Consequently, the decisions will be based less on analytical thinking and on (financial) literacy, respectively.

H2: H1 is more pronounced when people are stressed.

We test these hypotheses using an innovative experimental design described in the next section.

3. Experimental Design, Participants, and Descriptives

Experimental Task

Participants were confronted with a typical investment decision (see, e.g., Kaufmann, Weber, and Haisley 2013). They had the opportunity to invest their money into a risky asset (i.e., into the stock market) and/or a risk-free asset with a safe return of 3.0% p.a..[9] After having seen the historical stock market performance of one year (i.e., 250 trading days: t=250), participants

[9] In our setting, it is not possible to hold cash.

were asked to allocate their initial amount of money (1000 *Experimental Dollars*) between the risky and the risk-free asset. After that, subjects experienced day by day[10] (both graphically and numerically) the development of the stock market and their resulting portfolio value over the next year (again, 250 trading days).[11] Throughout the experiment, while the path developed, subjects had the opportunity to "stop the time" and to adjust their allocation. In fact, they could sell and buy assets at the current market price whenever and as often as they wanted to.[12] There are no transaction costs.[13] In our setting, participants are assumed to be price takers and thus have no impact on the market price.

Each participant passed ten rounds of this setting. In the first five rounds, stock price development was based on a randomly chosen 500 trading days period of the historical development of the DAX[14] between January 1988 (introduction of the DAX) and March 2012.[15] In this period, the DAX experienced a yearly return of 8.0% with a volatility of 23.2% p.a.. Participants were informed about the data generating process (i.e., expected return, volatility, and randomly chosen 500 trading days periods of the DAX between 01/1988 and 03/2012), but not about the exact time period of the underlying data in each round.[16]

In order to overcome the potential issue that subjects might be able to (or rather think that they are able to) recognize the stock price development, the second five rounds were based on a geometric Brownian motion (cf. Wiersema 2008, p. 5). The two input parameters, expected

[10] The graphical development of the chart took about one minute (approximately 4 time steps per second).

[11] A screenshot is provided in Appendix C. We also varied the position of the stock market account and the risk-free account on the screen. For half of the participants, the stock market account was on the left hand side of the display, for the other half, it was on the right hand side. As robustness check, we recalculate the analyses for these two different screen designs.

[12] The stock is assumed to be perfectly divisible, i.e., there are no restrictions concerning the amount of money which is (de-)invested into (out of) the stock. Short-selling is not allowed.

[13] In Experiment II (see Section 6), transaction costs are included.

[14] The DAX is a blue chip stock market index consisting of the 30 major German companies.

[15] Stock market data were taken from Datastream.

[16] See Appendix D for the exact wording.

return and volatility, were set to the same values as in the DAX setting. Again, participants were informed that the stock price development was random and based on these parameters. In order to control for possible order effects, half of the participants were first assigned the DAX charts and afterwards the artificial charts, and vice versa. Furthermore, the stock price developments were randomized within the DAX and Brownian motion setting. The stock price was normalized to 100 *Experimental Dollars* at the start of each run (t=0).

Following Glaser et al. (2007), the upper and lower bounds of the graphs' vertical axis were set according to Lawrence and O'Connor (1992), i.e., depending on the minimum and maximum of the respective stock price development. The bounds were set in such a way that the data's amplitude, defined by the minimum and maximum, fills three eighth of the vertical axis of the graph.[17] This procedure lowers the risk that the bounds of the diagram serve as "natural boundaries" for the future development of the stock price. For example, if the stock price between t=0 and t=500 ranges in the interval (80, 140), then the bounds of the vertical axes are 30 and 190.

This experimental design seems appropriate to address the research questions mentioned above. The way of experiencing the portfolio performance is innovative and enables an in-depth analysis of the behavior in up- and downswing markets. Furthermore, it offers a lot of freedom how to decide. In particular, it allows investing according to the two-fund separation theorem making the investment decision quite realistic.

[17] This procedure implies that, in general, the upper bound is calculated as follows: $maximum + (maximum - minimum) * \frac{5}{6}$. The lower bound is calculated analogously: $\max[0, minimum - (maximum - minimum) * \frac{5}{6}]$.

Measuring Reliance on Intuition

Following Kahneman (2011, p. 48), we assume that the predominance of one of the two systems suggested by the Dual-Process Theories is quite a stable characteristic of an individual. Participants' prevalence of System 1 and System 2 thinking styles is measured by the Rational-Experiential Inventory (REI) of Epstein et al. (1996) consisting of two subscales, Need for Cognition (System 2) and Faith in Intuition (System 1). The REI is a 29-point self-report questionnaire[18], based on the Cognitive Experiential Self Theory (CEST).[19] Pacini and Epstein (1999), among others, describe the development and validity of the scale. Participants are asked to evaluate each item and indicate how true each statement is about oneself on a 7-point Likert scale ranging from 1 (completely false) to 7 (completely true). As the participants in our experiment were all German native speakers, we used the German version provided by Keller, Bohner, and Erb (2000). A high value in the Need for Cognition scale indicates a high ability, reliance, and enjoyment of thinking in an analytical, logical manner. A high value in the Faith in Intuition scale refers to a high level of ability and reliance on one's intuitive impressions and feelings (Pacini and Epstein 1999, p. 974).

In accordance with previous studies (e.g., Pacini and Epstein 1999; Keller, Bohner, and Erb 2000), we found the experiential and rational scales of the REI to be uncorrelated (pairwise correlation: 0.01, p-value: 0.91). Thus, scoring high on rationality does not necessarily result in a low score on experiential thinking, and vice versa. In the experiment, Cronbach's Alpha (see Cronbach 1951) is 0.84 for the Faith in Intuition scale and 0.85 for the Need for Cognition scale, denoting a high internal consistency.

[18] See Appendix K for the REI questionnaire.

[19] There are several versions of the REI with different numbers of items. Epstein et al. (1996) report 31 items, while the German version from Keller, Bohner, and Erb (2000) has 29 items.

Financial Literacy and Control Variables

Over the last decade, a broad range of financial literacy measures has been used and discussed in research (for a review, see, Huston 2010; Knoll and Houts 2012). Following van Rooij, Lusardi, and Alessie (2011a, 2011b), we measure financial literacy using a 15 item questionnaire comprising five basic and ten advanced questions.[20]

Since investment decisions, in particular the stock quota when asked about the initial allocation, should depend on the individual's risk preferences, we ask for the willingness to take financial risk (Dorn and Huberman 2005, 2010; Dohmen et al. 2011) assessed on a scale from 0 to 10 (*Willingness to Take Risk*). These kinds of simple questions have been shown to have the most explanatory power for financial risk taking (Kapteyn and Teppa 2011; Dorn and Huberman 2010).[21] As a robustness check, we also controlled for risk aversion (*Risk Aversion*) evaluated in the style of Holt and Laury (2002).[22] The behavior could also be influenced by interest in and experience with capital markets. We therefore ask for a self-assessment of those factors on a scale from 1 (not interested/no experience at all) to 7 (very interested/a lot of experience) (*Interest / Experience in Financial Markets*) and ask whether participants are invested in stocks (or stock funds), bonds, and options (or other derivatives), respectively (*Stock Market Investments*). Finally, some demographics (age, gender, education, and field of study) were collected. Appendix A provides a full description and coding of all variables used.

[20] We excluded question number 13 of van Rooij, Lusardi, and Alessie (2011a, p. 454) since we are not convinced that the correct answer is unambiguously defined. See Appendix L for the questionnaire applied.

[21] Charness, Gneezy, and Imas (2013) provide a review of merits and weaknesses of different mechanisms for risk elicitation.

[22] We used the number of questions before switching to the risky alternative as the measure for risk aversion since we did not want to assume CRRA or use arbitrary points in the intervals provided by Holt and Laury (2002). See Appendix M for details of the risk aversion assessment.

Data Collection

Data collection took place at the computer laboratory MELESSA[23] at Ludwig-Maximilians-Universität (LMU) Munich. Participants were invited using the recruiting software of MELESSA "Online Recruitment System for Economic Experiments" (Greiner 2004). The 119 participants (50% female) were randomly assigned to different cubicles in order to control for several effects, e.g., ordering of DAX data vs. artificially generated data. Table I provides an overview of the participants' characteristics. The mean age was 22 with a range from 18 to 32 years. 26% reported being invested in stocks or stock funds, 17% into bonds, and 8% into options. The degree of financial literacy, measured by 15 questions taken from van Rooij, Lusardi, and Alessie (2011a, 2011b), ranged from 5 to 15 correct answers with a mean of about 11.5 (median: 12, standard deviation: 2.49).[24] Subjects above the median were classified as being highly financially literate. Most of the participants were studying business/management (42%), followed by economics (29%). The majority of subjects were somehow interested in financial markets (mean: 4.23; median: 5) but did not have much experience (mean: 2.58; median: 2). The average willingness to take financial risk (assessed on a scale from 0 to 10) was 4.97 (median: 5). The two subscales of the Rational Experiential Inventory of Epstein et al. (1996) showed values between 1.86 and 5.93 (mean: 4.22; median: 4.29; standard deviation: 0.81) for the Need for Cognition index, and between 1.67 and 6.20 for the Faith in Intuition index (mean: 4.12; median: 4.13; standard deviation: 0.83). Again, we used the median as the cut-off point

[23] Munich Experimental Laboratory of Economic and Social Sciences (MELESSA). For further information, see http://www.melessa.lmu.de/eng/index.html.

[24] The Cronbach alpha is 0.70 denoting an acceptable reliability.

between high and low Need for Cognition and Faith in Intuition, respectively. With regard to our hypotheses, we focus in the following on the "Faith in Intuition" subscale.[25]

[Table I about here]

Subjects were incentivized as follows: The final portfolio value of one of the ten rounds was randomly chosen and converted into Euro by a factor of 0.005. We decided not to incentivize all ten rounds in order to prevent intertemporal diversification issues. As suggested in the literature, one of the lottery decisions faced in the risk aversion assessment (Holt and Laury 2002) was randomly chosen, played, and converted into Euro (see Appendix M). The information about the amount of payment was provided to the participants after having finished all tasks, i.e., also after answering the Rational-Experiential Inventory and financial literacy questions. The average final portfolio value among the 1,190 participant-runs is 1,000.21 (median: 1,011.06) with a standard deviation of 137.46. Together with a show-up fee (4 Euro) and the payoff from the lottery, this results in an average payment of about 10 Euro (10.46 Euro). The experiment took about 45 minutes. Appendix B summarizes the setup and chronology of the experiment.

4. Results

Basic Characteristics of Trading Behavior

In order to gain some insights into the participants' behavior during this experiment, some stylized facts are presented in the following. When asked for their initial allocation of the 1,000 Experimental Dollars provided, subjects invested on average 451.47 Experimental Dollars (median: 450.00) into the stock market (i.e. 548.53 (median: 550.00) into the risk-free asset)

[25] Note that we checked whether the second subscale "Need for Cognition" influences our results. This is not the case.

with a standard deviation of 353.77. We find that the initial allocation is mainly driven by the individual's risk attitude and the observed past performance of the stock market (see Appendix E).[26] This is in line with standard economic theories[27] and with previous empirical and experimental findings (e.g., Glaser and Weber 2009; Nosić and Weber 2010), respectively. As we are able to replicate some common findings, this points to the validity of our experimental design.

The average stock quota within a run is 42.45% (median: 38.77%; standard deviation: 28.49%). Subjects traded between 0 and 25 times per run, with a mean of 3.39 (median: 2) and a standard deviation of 3.74.[28] The average (median) trading volume is 528.03 Experimental Dollars (500.00) when investing into the stock market and 517.27 (431.60) when leaving the stock market. The average (median) turnover[29] is 0.52 (0.47) when buying stocks and 0.50 (0.43) when selling stocks. Analyzing flows into and out of the stock market shows that participants bought stocks when the market recently has performed well and sell stocks when the stock price has dropped (see Appendix F and Appendix G). This pattern is in line with findings from Nofsinger (2012) who analyzes equity mutual fund flows in the U.S. between 1989 and 2011. Summary statistics of the participants' investment behavior are provided in Table II.

[Table II about here]

[26] We applied a Tobit regression with the initial allocation as dependent variable and an OLS regression with both the initial allocation and the natural logarithm of initial allocation as dependent variable. The results are robust.

[27] One might also argue that expected utility maximizers put all their money into the risky asset since too little is at stake and they do perfect asset integration which as a consequence leads to risk neutrality. However, as we have seen, subjects do allocate according to their risk aversion. Whether this is done due to partial asset integration (see Andersen et al. 2012) or due to mental accounting does not affect the interpretation of our results.

[28] Every shift from the stock market to the risk-free asset (and vice versa) is defined as a "trade".

[29] Turnover of subject i at time t is defined as $turnover_{i,t} = \frac{trading\ volume_{i,t}}{portfolio\ value_{i,t}}$.

Our hypothesis requires the assignment of an investment strategy to the participants. We analyze the connection between the initial allocation and the observed past performance of the stock market in order to learn about the participants' general believes about future returns. The average (median) correlation between the past performance and the initial allocation of 0.17 (0.22) indicates that more participants believe in trend continuation than in trend reversal. However, the correlation coefficient varies between -0.80 and 0.97 and is negatively skewed; the standard deviation is 0.42. This broad range suggests that there is a great heterogeneity within the participants concerning their investment strategy. We classify the participants according these revealed preferences into three investment strategy categories: Participants with a correlation below or equal (above) -0.15 (0.15) are classified as contrarian (momentum) traders. None of these strategies is assigned to subjects with a coefficient between -0.15 and 0.15. According this classification, 56.30% of the participants are considered to be momentum traders and 23.53% are considered to be contrarian traders.[30] Note that the correlation coefficient is significantly ($p<0.01$) greater for the participants that tend to rely on their intuition (correlation coefficient: 0.20 vs. 0.14). Moreover, the Faith in Intuition score is significantly greater for momentum traders ($p=0.05$). Momentum trading is often explained by the representativeness heuristic (see, e.g., Luo 2013; DeBondt and Thaler 1985; Barberis, Shleifer, and Vishny 1998). As a consequence, our findings expand the findings of Alós-Ferrer and Hügelschäfer (2012) who find a positive relationship between Faith in Intuition and an increased use of the representativeness heuristic.

[30] Because of the skewed distribution of the correlation coefficients, a classification into equally sized groups does not make sense in this case. In Experiment II, however, the distribution is less skewed and allows for this kind of classification. The results are robust.

The hypotheses deal with the deviation from the personal investment strategy. We define a deviation from a momentum strategy as a stock purchase (sale) after the stock market has dropped (risen). Analogously, a reversal trader deviates from his/her strategy if he/she buys (sells) stocks after the stock price has risen (declined).

A panel probit regression (reported in Appendix F) in the style of Grinblatt and Keloharju (2001), including four non-overlapping intervals of the past stock market return (t to t-5[31], t-5 to t-10, t-10 to t-15, and t-15 to t-20), reveals that the most relevant period for the trading impulse is the shortest (t to t-5): the lower the past return, the higher the propensity to trade ($p<0.01$). We find no significant impact of the mid- and long-term past performance of the stock market. Therefore, the trading decisions are compared to the short-term past performance (t to t-5). Afterwards, the number of trades that deviate from the investment strategy is counted.

The share of deviating trades, i.e. the proportion of trades that deviate from the investment strategy compared to the total number of trades, within a run varies between 0% and 100% with an average (median) value of 28.86% (10.00%). The standard deviation is 0.36. Tobit regression analyses with a lower (upper) limit of zero (one) reveal the determinants of this share (see Table III). The results suggest that the share of deviating trades decreases with a high level of financial literacy and a low level of Faith in Intuition. The interaction term[32] is significantly negative ($p<0.05$, see Column 2) which is in line with Hypothesis 1.

[31] A shorter period (e.g., t to t-1) does not make much sense since real time for less than 5 time steps is less than one second. It seems unlikely that participants' reaction time is that short.

[32] Note that the reversed scale of Faith in Intuition is interacted with financial literacy in order to make the results interpretable concerning the hypotheses. The variables included in the interaction terms are normalized by setting the observed minimum to zero and the observed maximum to one. We also applied a different way of normalization which sets the theoretically achievable minimum (maximum) to zero (one). The results are robust.

[Table III about here]

We relax the interaction effects' assumption of linearity and classify each participant into one of four groups according to his/her level of financial literacy and of the Faith in Intuition scale using the median as a cut-off point.[33] This approach might furthermore be advantageous since it is more robust against possible measurement errors in both the financial literacy and the System 1 proxies. The results which are reported in Column 4 underline the effect that financially literate people act differently depending on the prevalence of their intuitive thinking style. More precisely, financially literate investors with a prevalent System 1 have a significantly higher share of trades that deviate from their investment strategy compared to less intuitive investors with the same (high) level of financial literacy (39% vs. 22%). A simple t-test confirms this observation. The difference between these two groups is highly significant ($p<0.01$). While financial literacy alone has no impact on the probability to deviate from the personal investment strategy, Faith in Intuition does: Participants that are classified as being highly intuitive (high Faith in Intuition) deviate significantly more often from their actually intended investment strategy (see Column 3).

We control within all these regression models for standard demographic variables (age, gender, education), the relationship to economics and finance related topics (field of study, stock market investments, interest and experience in financial markets), and the willingness to take financial risk. None of these control variables shows a persistent influence. The subject's total number of trades per run decreases the share of deviating trades. Additionally, we try to

[33] The group variables take the value of one if fulfilled, zero otherwise. The group variables "High Financial Literacy and Low Faith in Intuition" is omitted (see Table III).

capture run-specific characteristics by including dummies for each run. Robust and participant clustered standard error estimates are applied.

Robustness Checks

In order to check for robustness of the results, we redo the analyses applying an OLS regression. Again, we apply robust and participant clustered standard error estimates. The results (see Columns 5 and 6) remain stable and highly significant when applying this alternative econometric methodology. The results also do not change qualitatively when taking the absolute number of deviating trades as dependent variable and controlling for the total number of trades (not reported).

Furthermore, the results are robust when substituting the willingness to take financial risk with Holt and Laury's (2002) risk aversion assessment. Risk aversion does not seem to be related to the dependent variable. One might argue that people act differently in the beginning and in the end of a run. However, when excluding the first and final 10% of the trading periods, the analyses lead to the same results. Including a dummy capturing whether the stock price development was based on a DAX or on a Brownian motion does not affect the results.

5. Experiment II: Replication and Cognitive Load

Experimental Task

The purpose of Experiment II was twofold. First, we wanted to replicate the findings of Experiment I with a different set of stock market developments and participants. Moreover, we tried to approach Hypothesis 2. Inducing real stress in the lab via the stock market development seems difficult since too little money is on stake. However, as mentioned in Section 3, in stress situations, decisions are based more on System 1. Therefore, we tried to

trigger this System. Thus, we lowered the processing resources by cognitive load. Cognitive load impedes System 2, yielding a greater reliance on System 1. System 1 processing is said to remain unaffected (see, e.g., Shriffin and Schneider 1977; Rottenstreich, Sood, and Brenner 2007; De Neys 2006). In the style of Shiv and Fedorikhin (1999) and Rottenstreich, Sood, and Brenner (2007), one group of participants was requested to memorize a seven-digit number during each run. The number was shown for 15 seconds before the run starts and had to be recalled after the run.[34] For each correct answer, participants received 100 Experimental Dollars (= 0.50 Euro).[35] Auxiliary means were not allowed. The control group was not put under cognitive load. Since we did not find any difference between the DAX and the Brownian motion groups in Experiment I, the stock price development of this experiment was based on a Brownian motion only. Subjects played six rounds.

Afterwards, each participant was asked to indicate the basis of his/her investment decisions in the previous task on five seven-point items concerning the following statements (see Shiv and Fedorikhin 1999): "My final decision to trade or not to trade was mainly driven by…". These items were anchored by "my thoughts (1)/my feelings (7)", "my willpower (1)/my desire (7)", "my prudent self (1)/my impulsive self (7)", "the rational side of me (1)/the emotional side of me (7)", and "my head (1)/my heart (7)".[36] The responses to these five items were averaged to form a single variable, the participants' decision basis (see Shiv and Fedorikhin 1999). Internal consistency as measured by Cronbach's Alpha was 0.80. This proxy allows us to analyze whether stress indeed leads to more intuitive decisions.

[34] Note that the participants, on average, correctly recalled the number in 5 out of 6 runs. This indicates that participants really put effort into the memorization.

[35] The incentivization mechanisms of the investment decisions are the same as in Experiment I.

[36] Shiv and Fedorikhin (1999) adapted these items from Rook and Fisher (1995), Hoch and Loewenstein (1991), and Puri (1996).

Data and Participants

Just like Experiment I, this experiment took place at the computer laboratory at LMU Munich. The 105 participants were randomly assigned to the treatment (cognitive load) and control (no cognitive load) group. With exception of the average Faith in Intuition score, which was slightly greater in the cognitive load condition, the personal characteristics of the subjects did not significantly differ between the two conditions (see Appendix H).[37] Moreover, they were similar to Experiment I as described in Section 3. See Appendix I for summary statistics of the personal and trading characteristics.

Results

First of all, we successfully replicated the findings of Experiment I. The results of the Tobit regression that are summarized in Table IV are in line with Experiment I and confirm the hypothesized interaction effect of financial literacy and Faith in Intuition. Financially literate investors deviate less frequently from their investment strategy. This effect is most pronounced if they do not tend to think in an intuitive manner (Columns 1 and 2). This conclusion also holds when classifying the participants into four groups (Columns 3 and 4) according to their level of financial literacy and Faith in Intuition. The conclusions qualitatively do not change when applying an OLS model (see Columns 5 and 6). Moreover, the results are robust for an alternative strategy classification that splits the participants into three equally sized groups according to the correlation between the initial allocation and the past return of the stock market (not reported).

[37] For the sake of brevity and manageability for the participants, we abstained from including a risk aversion assessment in the Experiments II and III. This decision seems justified since it did not drive our results in Experiment I. Moreover, there is neither an empirical nor a theoretical consideration why this should be the case. In addition, we achieved a greater leverage of the investment decision incentivization.

[Table IV about here]

Next, we compared the classification according to the Faith in Intuition scale with the response on the basis of the trading decisions. 65% of the subjects that were classified as acting highly intuitive stated that their trades were driven more by affect than by cognitions. This share is greater in the cognitive load treatment (66.67% vs. 62.50%). Taking the absolute values of the responses, this effect gets even stronger. The correlation between the Faith in Intuition scale and the Decision Basis scale increases from 0.26 to 0.48 when put under cognitive load (see Figure I). This effect is also reflected in the results of a univariate linear regression. The Chow test indicates that the coefficients significantly differ between the two treatments (p=0.0556). This result suggests that System 1 was successfully activated by the cognitive load treatment, i.e., intuitive decisions were triggered.

[Figure I about here]

Note that the analyses concerning hypothesis 2 are not fully completed yet. Results are therefore not reported in this version.

6. Experiment III: Two Assets and Transaction Costs

Experimental Task

In the first two experiments, a bad performance might be attributed to bad luck. Thus, the main purpose of Experiment III was to find out whether financially literate but intuitive investors really made a mistake, i.e., whether they performed worse. With respect to this goal, the experimental design described in Section 3 was adjusted by adding transaction costs and a second risky asset. Thus, in this experiment, the past performance of two uncorrelated stocks

was shown to the participants.[38] Afterwards, they were asked to allocate their initial endowment of 1,000 Experimental Dollars between the two stocks and the risk-free asset. For each transaction during the run, participants were charged 0.5% of the transaction volume. The initial allocation was free of charge. As in Experiment II, the stock price development of this experiment was based on a Brownian motion. Subjects played five rounds and were incentivized by a randomly chosen and into Euro converted final portfolio value of one of these rounds.

Data and Participants

Just like the other two experiments, the experiment took place at the computer laboratory at LMU Munich. The demographics of the 98 participants were similar to the first Experiment as described in Section 3. Appendix I provides summary statistics of the personal and trading characteristics.

Results

The performance of the participants was measured in two ways: The final portfolio value net of transaction costs and the risk-adjusted performance[39]. As illustrated in Table V, the final portfolio value of subjects who tend to rely on intuitive thinking is significantly lower compared to participants with a low Faith in Intuition (p=0.060). The performance difference of about 1.6% is also economically notable. This difference is most pronounced for participants with a low level of financial literacy (performance difference of about 2.2%). Since this measure ignores the risk taken by the participant, we adjust the participant's portfolio return by considering the volatility of the underlying portfolio. The comparison of the risk-adjusted

[38] See Appendix C for a screenshot.

[39] We calculate the risk-adjusted performance by dividing the portfolio return by the annualized volatility of the daily portfolio returns.

performance confirms the finding that intuitive decision makers performed worse in our experiment. This measure significantly decreases when moving from lowly to highly intuitive investors ($p<0.01$). This finding holds for both groups of financial literacy. These conclusions remain stable after controlling for a set of control variables like gender, education, and stock market experience (see Appendix J). These analyses also reveal that, not surprisingly, the performance significantly decreases with the number of trades (see, e.g., Barber and Odean 2000).

[Table V about here]

It is noteworthy that financially literate subjects had a better risk-adjusted performance than financially illiterate subjects. Although this difference marginally misses the hurdle of statistical significance ($p=0.14$) in our experiment, it is in line with the generally positive impact of financial literacy on "good" investment behavior as discussed in Section 2.

7. Discussion and Conclusion

Combining recent empirical findings on the usefulness of financial literacy for investment decisions and literature from psychology, we hypothesized that financial literacy might not be helpful in all situations and for all people. In particular, we argued that the investment behavior of people with a high level of financial literacy might depend on the prevalence of the two thinking styles according to dual-process theories. Applying the Rational-Experiential Inventory of Epstein et al. (1996), we hypothesized that a high level of financial literacy might be overruled if subjects believe in trusting their hunches (high level of FI). Based on evidence from psychology and neuroeconomics, we expected this interaction effect to be most pronounced when people are stressed.

We tested these hypotheses within an innovative experimental design which made the participants experience the stock market performance and their personal performance. Our results provide evidence in favor of the hypothesized interaction effect. We show that the positive effect of financial literacy on reasonable investment decisions is diminished by a high prevalence of System 1 (high Faith in Intuition). Our conclusions still hold when including a standard set of control variables and after several robustness checks. Moreover, we successfully replicated the results in a second experiment that contained different subjects and different stock price developments. Note that aggregating the data of Experiment I and II into one dataset leads to consistently robust results.

In a third experiment, we found evidence that intuitive behavior indeed has negative consequences by leading to a lower risk-adjusted performance – independent of the level of financial literacy.

As a whole, this paper provides one further step towards a better understanding of the mechanism of how and when personal characteristics affect behavior. It also helps to understand the heterogeneity across different investors and "within" investors over time. Furthermore, the results cast doubt on whether attempts to increase the level of financial literacy of people alone are helpful to enhance the quality of investment and savings decisions of the population in a country.

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Table I: Summary Statistics of Personal Characteristics (Experiment I)

This table reports descriptive statistics of participants' personal characteristics in Experiment I. See Appendix A for the coding of the variables.

Panel A: Personal Characteristics

	N	Mean	S.D.	Min	p25	p50	p75	Max
Age	119	22.45	3.00	18	20	22	24	32
Gender (1: male)	119	0.50	0.50	0	0	1	1	1
Interest in Financial Markets	119	4.23	1.93	1	2	5	6	7
Experience with Financial Markets	119	2.58	1.61	1	1	2	4	7
Willingness to Take Financial Risk	119	4.97	2.20	0	3	5	7	10
Financial Literacy	119	11.54	2.49	5	10	12	13	15
Need for Cognition	119	4.22	0.81	1.86	3.71	4.29	4.79	5.93
Faith in Intuition	119	4.12	0.83	1.67	3.67	4.13	4.73	6.20

Panel B: Education

	N	Percentage
University-Entrance Diploma	98	82.35%
Bachelor Degree	14	11.76%
Diploma Degree	3	2.52%
Master Degree	4	3.36%
Doctorate	0	0.00%
	119	100.00%

Panel C: Field of Study

	N	Percentage
Business / Management	50	42.02%
Economics	34	28.57%
Psychology	4	3.36%
Other	31	26.05%
	119	100.00%

Panel D: Investments in Financial Markets

	N	Percentage
Stock / Stock Funds	31	26.05%
Bonds	20	16.81%
Option / Derivatives	9	7.56%
None	79	66.39%
One Asset Class	25	21.01%
Two Asset Classes	10	8.40%
Three Asset Classes	5	4.20%
	119	100.00%

Table II: Summary Statistics of Trading Behavior (Experiment I)

Panel A reports descriptive statistics of participants' trading behavior in Experiment I. *Avg. Stock Quota* is defined as the average share invested in the stock market. The variable *Number of Trades* (Buys, Sales) counts the number of trades (buys/sales) within a run resulting in 1,190 observations. Panel B reports summary statistics about the *Trading Volume* and *Turnover* split up into stock purchases and sales. *Turnover* of subject i at time t is defined as $turnover_{i,t} = \frac{trading\ volume_{i,t}}{portfolio\ value_{i,t}}$. Panel C summarizes the classification of the trading strategies for the whole sample and divided in subgroups according to the level of financial literacy and Faith in Intuition. The classification is based on the individual correlation between the past performance of the stock market and the initial allocation. See Appendix A for the coding of all variables.

Panel A: Trading Characteristics

	N	Mean	S.D.	Min	p25	p50	p75	Max
Initial Allocation	1,190	451.47	353.77	0	100	450	800	1,000
Avg. Stock Quota	1,190	0.42	0.28	0	0.19	0.39	0.61	1
Number of Trades	1,190	3.41	3.76	0	1	2	5	25
Number of Buys	1,190	1.63	1.97	0	0	1	2	13
Number of Sales	1,190	1.78	1.99	0	0	1	3	12

Panel B: Trading Volume

		N	Mean	S.D.	Min	p25	p50	p75	Max
Trading Volume	**Buy**	1,934	528.03	364.77	0.50	200.00	500.00	900.00	1,340.00
	Sell	2,121	517.27	382.31	1,396.00	900.00	431.60	194.51	1.50
Turnover	**Buy**	1,934	0.52	0.35	0.00	0.19	0.47	0.94	1.00
	Sell	2,121	0.50	0.36	1.00	0.92	0.43	0.18	0.00

Panel C: Trading Strategy Classification

	Total		Financial Literacy				Faith in Intuition			
			low		high		low		high	
	N	***Perc.***	**N**	***Perc.***	**N**	***Perc.***	**N**	***Perc.***	**N**	***Perc.***
Momentum Strategy	67	*56.30%*	31	*58.49%*	36	*54.55%*	27	*49.09%*	40	*62.50%*
Reversal Strategy	28	*23.53%*	9	*16.98%*	19	*28.79%*	12	*21.82%*	16	*25.00%*
Neither Nor	24	*20.17%*	13	*24.53%*	11	*16.67%*	16	*29.09%*	8	*12.50%*
	119	*100.00%*	53	*100.00%*	66	*100.00%*	55	*100.00%*	64	*100.00%*

Table III: Share of Deviating Trades (Experiment I)

This table reports Tobit regression analyses of Experiment I using the share of trades that deviate from the personal investment strategy as dependent variable (Columns 1-4). Columns 5 and 6 illustrate the results of OLS regression analyses using the same dependent variable. *FL* and *FI* stand for Financial Literacy and Faith in Intuition, respectively. In the interaction term, *FI* is reversed and the variables are normalized by setting the observed minimum to zero and the observed maximum to one. The variables' median is taken as a cut-off point to distinguish between high and low. See Appendix A for an overview of all control variables. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level; standard errors are clustered by participant; robust p-values are reported in parentheses.

Share of deviating Trades

	(1) Tobit	(2) Tobit	(3) Tobit	(4) Tobit	(5) OLS	(6) OLS
Financial Literacy	0.0115	0.100**			0.0518**	
	(0.6502)	(0.0228)			(0.0427)	
Faith in Intuition	0.0729	-0.170*			-0.0792	
	(0.2441)	(0.0648)			(0.1190)	
Financial Literacy * (rev)Faith in Intuition		-1.847**			-0.862**	
		(0.0149)			(0.0407)	
Total Number of Trades	-0.0117	-0.0152*	-0.0131	-0.0150*	-0.0191***	-0.0189***
	(0.1850)	(0.0946)	(0.1304)	(0.0790)	(0.0000)	(0.0000)
Age	-0.000805	-0.00689	-0.00622	-0.0126	-0.000889	-0.00348
	(0.9658)	(0.7194)	(0.7372)	(0.5011)	(0.9303)	(0.7309)
Education	0.0220	0.00948	0.0397	0.0513	0.00214	0.0196
	(0.8096)	(0.9132)	(0.6514)	(0.5581)	(0.9567)	(0.6249)
Field of Study: Economics	0.0909	0.0885	0.118	0.140	0.0392	0.0600
	(0.4145)	(0.4156)	(0.2955)	(0.2130)	(0.5326)	(0.3441)
Field of Study: Psychology	-0.281	-0.222	-0.275	-0.217	-0.0783	-0.0709
	(0.4260)	(0.5303)	(0.4308)	(0.5324)	(0.6068)	(0.6393)
Field of Study: Other	0.00954	0.0281	-0.0137	-0.0131	0.0156	-0.00520
	(0.9382)	(0.8139)	(0.9015)	(0.9042)	(0.7910)	(0.9244)
Gender (1: male)	0.00490	-0.000167	0.0177	0.0322	0.0202	0.0371
	(0.9698)	(0.9989)	(0.8896)	(0.7939)	(0.7660)	(0.5860)
Stock Market Investments	0.0392	0.0316	0.0139	0.0215	0.0232	0.0168
	(0.5643)	(0.6400)	(0.8365)	(0.7468)	(0.5255)	(0.6508)
Interest in Financial Markets	0.0223	0.0321	0.0254	0.0246	0.0147	0.0125
	(0.5846)	(0.4285)	(0.5068)	(0.5116)	(0.4917)	(0.5458)
Experience in Financial Markets	-0.0481	-0.0447	-0.0414	-0.0424	-0.0272	-0.0256
	(0.3213)	(0.3484)	(0.3990)	(0.3645)	(0.2866)	(0.3136)
Willingness to Take Risk	-0.000850	-0.00179	-0.00530	0.000651	-0.00448	-0.00387
	(0.9752)	(0.9466)	(0.8386)	(0.9802)	(0.7510)	(0.7771)
High Financial Literacy			0.0505			
			(0.6847)			
High Faith in Intuition			0.254**			
			(0.0105)			
High FL & High FI				0.431***		0.199***
				(0.0015)		(0.0055)
Low FL & High FI				0.223		0.0780
				(0.2065)		(0.3628)
Low FL & Low FI				0.176		0.0593
				(0.3182)		(0.4913)
Constant	-0.425	0.209	-0.0367	0.0113	0.363	0.335
	(0.3864)	(0.6892)	(0.9349)	(0.9805)	(0.2000)	(0.1639)
Observations	935	935	935	935	935	935
(Pseudo) R-squared	0.025	0.036	0.040	0.051	0.078	0.095
Participant clustered standard errors	YES	YES	YES	YES	YES	YES
Run Dummies	YES	YES	YES	YES	YES	YES

Table IV: Share of Deviating Trades (Experiment II)

This table reports the results of Experiment II (see Section 5). It illustrates the results of a Tobit regression analysis using the share of trades that deviate from the personal investment strategy as dependent variable (Columns 1-4). Columns 5 and 6 illustrate the results of an OLS regression analysis using the same dependent variable. *FL* and *FI* stand for Financial Literacy and Faith in Intuition, respectively. In the interaction term, *FI* is reversed and the variables are normalized by setting the observed minimum to zero and the observed maximum to one. The variables' median is taken as a cut-off point to distinguish between high and low. See Appendix A for an overview of all control variables. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level; standard errors are clustered by participant; robust p-values are reported in parentheses.

Share of deviating Trades

	(1) Tobit	(2) Tobit	(3) Tobit	(4) Tobit	(5) OLS	(6) OLS
Cognitive Load Dummy	-0.105	-0.146	-0.114	-0.143	-0.0768	-0.0800
	(0.4700)	(0.3016)	(0.4271)	(0.3236)	(0.2216)	(0.2214)
Financial Literacy	-0.0845***	0.0943			0.0317	
	(0.0044)	(0.3045)			(0.4423)	
Faith in Intuition	0.0466	-0.626*			-0.259*	
	(0.7043)	(0.0680)			(0.0740)	
Financial Literacy * (rev)Faith in Intuition		-4.447**			-1.790*	
		(0.0453)			(0.0624)	
Age	0.0276	0.0297	0.0289	0.0300	0.0168	0.0151
	(0.3382)	(0.2919)	(0.3346)	(0.3116)	(0.1428)	(0.2067)
Education	0.114	0.105	0.0997	0.105	0.0306	0.0308
	(0.2462)	(0.2989)	(0.3236)	(0.3023)	(0.4979)	(0.5062)
Field of Study: Economics	0.507*	0.600**	0.554*	0.574*	0.188	0.185
	(0.0942)	(0.0346)	(0.0969)	(0.0770)	(0.1288)	(0.1955)
Field of Study: Psychology	-0.625	-0.421	-0.579	-0.531	-0.154	-0.170
	(0.1643)	(0.3230)	(0.1894)	(0.2258)	(0.2147)	(0.2002)
Field of Study: Other	0.00743	0.0927	0.0544	0.0633	0.0141	0.0204
	(0.9735)	(0.6625)	(0.8115)	(0.7728)	(0.8690)	(0.8195)
Gender (1: male)	-0.0294	0.0123	-0.0358	-0.0173	0.00384	-0.00996
	(0.8482)	(0.9367)	(0.8189)	(0.9129)	(0.9541)	(0.8825)
Stock Market Investments	0.181	0.230	0.163	0.168	0.0955	0.0729
	(0.1908)	(0.1237)	(0.2497)	(0.2542)	(0.1008)	(0.2173)
Interest in Financial Markets	0.0108	0.0176	0.0141	0.0112	0.0126	0.0113
	(0.8494)	(0.7521)	(0.8066)	(0.8442)	(0.5738)	(0.6222)
Experience in Financial Markets	0.0445	0.0207	0.0297	0.0267	0.0112	0.00761
	(0.5440)	(0.7856)	(0.6811)	(0.7093)	(0.7343)	(0.8043)
High Financial Literacy			-0.407***			
			(0.0073)			
High Faith in Intuition			0.0487			
			(0.7600)			
High FL & High FI				0.183		0.0814
				(0.3895)		(0.3352)
Low FL & High FI				0.466**		0.187**
				(0.0447)		(0.0366)
Low FL & Low FI				0.589**		0.256***
				(0.0122)		(0.0062)
Constant	0.0989	1.847	-0.460	-0.955	1.010*	-0.179
	(0.9048)	(0.1398)	(0.5348)	(0.2305)	(0.0645)	(0.5766)
Observations	466	466	466	466	466	466
(Pseudo) R-squared	0.0619	0.0734	0.0672	0.0708	0.127	0.118
Participant clustered standard errors	YES	YES	YES	YES	YES	YES
Run Dummies	YES	YES	YES	YES	YES	YES

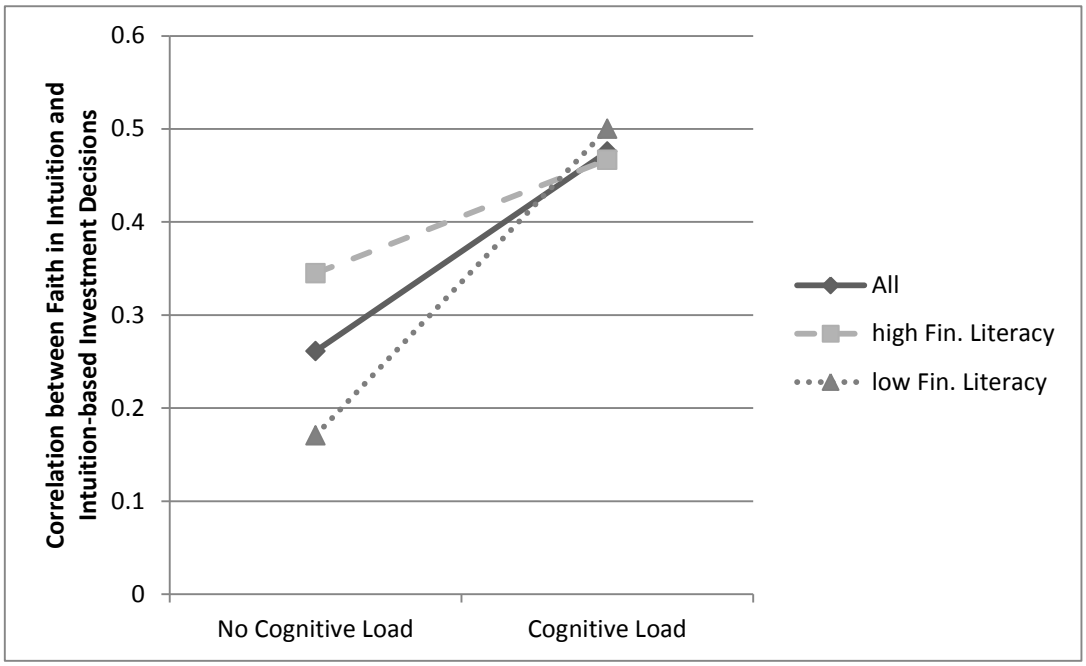
Table V: Performance by Faith in Intuition (Experiment III)

This table reports the results of a t-test that compares the final portfolio value and the Risk-adjusted Performance, respectively, between participants with a low and high level of Faith in Intuition. Moreover, the results are split up into two groups according their level of financial literacy. The variables' median is taken as a cut-off point to distinguish between high and low.

	Mean		p-values			N			
	Faith in Intuition		two-sided	lower one-sided	upper one-sided	Faith in Intuition		t statistic	df
	low	high				low	high		
Net Portfolio Value	1032.03	1016.51	0.12	0.94	0.06	240	250	1.55	488
low Financial Literacy	1032.22	1009.57	0.09	0.96	0.04	150	155	1.72	303
high Financial Literacy	1031.70	1027.83	0.80	0.60	0.40	90	95	0.26	183
Risk-Adj. Net Performance	5648.18	1557.21	0.00	1.00	0.00	240	250	3.10	488
low Financial Literacy	5595.01	840.07	0.00	1.00	0.00	150	155	3.02	303
high Financial Literacy	5736.78	2727.28	0.20	0.90	0.10	90	95	1.29	183

Figure I: Correlation between Faith in Intuition and Intuitive Decisions (Experiment II)

In this figure, the correlation between Faith in Intuition and the Decision Basis scale is illustrated for the cognitive load and the control treatment. Moreover, the results are split up into subjects with a high and low level of financial literacy, respectively.



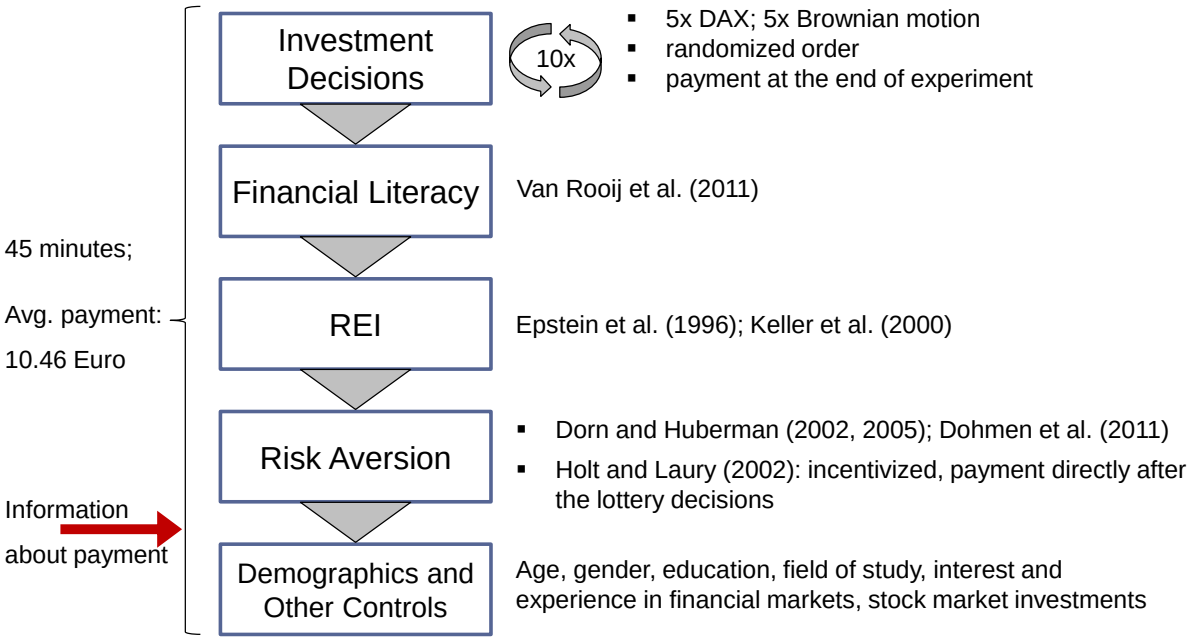
Appendix

Appendix A: List and Coding of Variables

Variable	Coding
Age	Age of the participant.
Cognitive Load	Dummy that indicates the Cognitive Load Treatment
Crisis	We define a "crisis" as an extraordinary decrease of a participant's portfolio value, i.e. participant's 10% lowest 5-day portfolio returns in each run.
Decision Basis	The participants' basis of his/her trading decisions in the style of Shiv and Fedorikhin (1999) on a scale from 1 to 7: 1: Decisions were driven by cognition; 7: Decisions were driven by intuition.
Education	Highest educational achievement: 0: University-entrance Diploma 1: Bachelor Degree 2: Diploma Degree 3: Master Degree 4: Doctorate
Faith in Intuition	Faith in Intuition subscale of Rational-Experiential Inventory (Epstein et al. 1996, German version: Keller, Bohner, and Erb 2000).
Field of Study	Dummy variables for "Business", "Economics", "Psychology", and "Other".
Financial Literacy	Number of correct answers to the financial literacy questions, i.e. 0 to 15.
Gender	1: male, 0: female
Initial Allocation	Amount of provided money (1000 Experimental Dollars) that is initially put into the stock market.
Need for Cognition	Need for Cognition subscale of Rational-Experiential Inventory (Epstein et al. 1996, German version: Keller, Bohner, and Erb 2000)
Number of Trades	This variable counts the number of trades within a run.
Portfolio Value	The Portfolio Value is defined as the sum of the value of the (in Experiment III: two) risky and the risk-free asset.
Rallye	We define a "rallye" as an extraordinary increase of a participant's portfolio value, i.e. participant's 10% highest 5-day portfolio returns in each run.
Risk Aversion	Number of safe choices in the Holt and Laury (2002) lottery.
Risk-adjusted Performance	The Risk-adjusted Performance of a participant in a specific run

Variable	Coding
	is calculated as the return of the participant's portfolio divided by the annualized volatility of the daily portfolio returns.
Stock Market Experience / Interest	Self-reported on a scale from 1 to 7: 1: no experience / interest, …, 7: much experience / interest
Stock Market Investments	0: not invested at all +1 if invested in stocks +1 if invested in bonds +1 if invested in options
Stock Quota	Average share invested in the stock market during a run.
Total Number of Trades	This variable measures the participant's total number of trades during a specific run.
Trading Volume	Trading Volume is defined as the absolute value of a transaction.
Trading Strategy	The classification is based on the correlation between the initial allocation and the observed past performance of the stock market. Participants with a correlation below or equal (above) -0.15 (0.15) are classified as contrarian (momentum) traders. None of these strategies is assigned to subjects with a coefficient between -0.15 and 0.15.
Turnover	Turnover of subject i at time t is defined as $turnover_{i,t} = \frac{trading\ volume_{i,t}}{portfolio\ value_{i,t}}$.
Willingness to Take Risk	Willingness to take financial risk (Dorn and Huberman 2005, 2010) 0: Not willing to accept any risk 10: Willing to accept substantial risk to potentially earn a greater return

Appendix B: Overview of Experimental Setup (Experiment I)



Appendix C: Screenshots

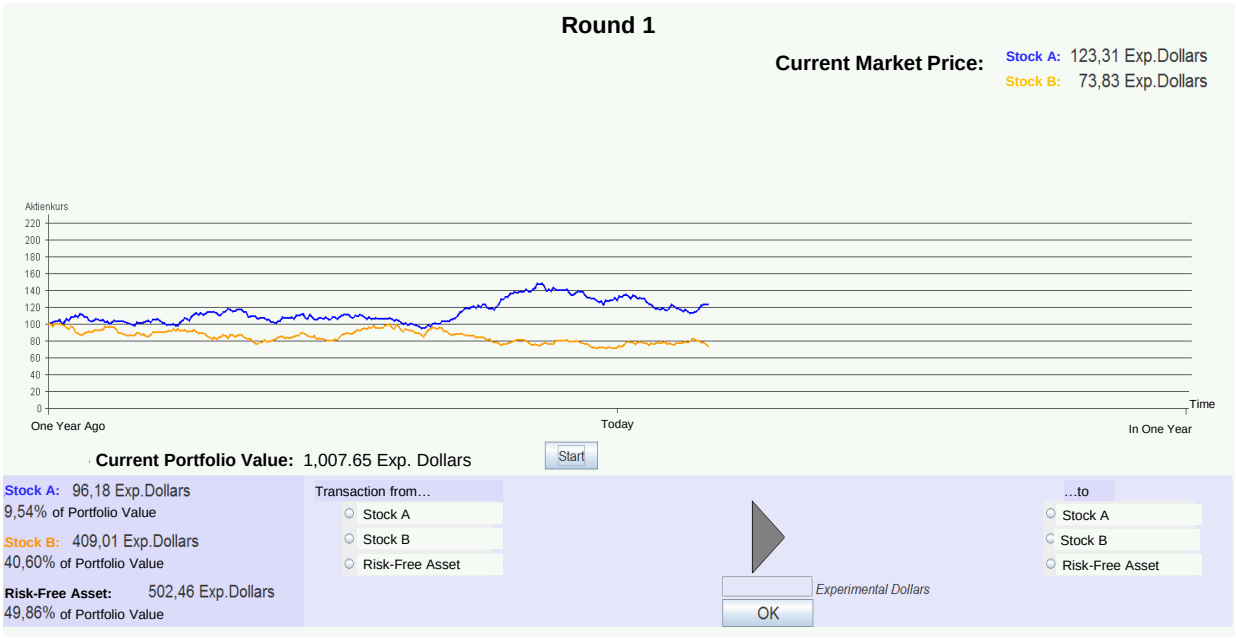
Experiments I and II:

Initial Allocation

During a Run

Experiment III: Two Assets and Transaction Costs

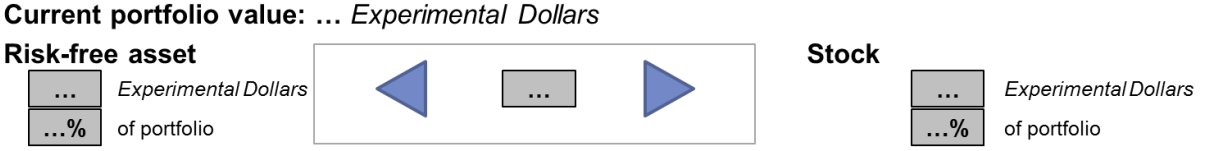
During a Run



Appendix D: Instructions

- You are in fund of 1,000 Experimental Dollars.
- You have the choice to invest your money into a risk-free asset (comparable to a savings bank account) and / or a risky asset, i.e. stock.
- The amount of money you invest in the risk-free asset yields interest of 3 per cent per year. In other words, 1,000 Experimental Dollars invested in the risk-free asset will be safe 1,030 Experimental Dollars after one year.
- The return of the risky asset depends on the performance of the stock.
- The data basis of the stock performance is random and simulated. However the stock price development has the same characteristics as usually assumed when trying to describe reality. The expected return of the share is 8.0% per year with a yearly standard deviation of 23.2%, i.e. when you invest 1,000 Experimental Dollars in the stock, there is an expected final value of 1,080 Experimental Dollars in one year. Even though the actually realized final value might be higher or lower, depending on the stock performance.

- At the beginning you see the stock performance of the last year. The initial value of the stock is 100 Experimental Dollars.
- Afterwards you have the opportunity to allocate your money between the risk-free asset and the stock. Both types of investments are divisible in any order, i.e., you may invest any amount of money available independent of the current market price.
- You will experience the performance of one year in real time.
- You have the opportunity to adjust your allocation at any time and as often as you like. By clicking the "STOP"-Button you have the opportunity to buy and sell shares at the current market price. Simply type the amount of money you would like to reallocate in the box and decide whether you want to invest more in the stock or the risk-free asset by using the arrows.



- The current market price can be seen in the chart.
- Below the chart you will be informed about the current value of your portfolio at any time.

In the following, several rounds will be played. The rounds are independent of each other, i.e.,

- The stocks perform completely independently of each other.
- You have your initial value of 1,000 Experimental Dollars at the beginning of every round.
- At the beginning of every round, you redefine your allocation.
- You may adjust your allocation at any time and as often as you like.

Compensation:

The compensation of this task depends on your performance:
One of the rounds is selected randomly. The compensation results according to the formula "Terminal value of the respective round, divided by 200", i.e. a terminal value of 1200 results in a compensation of 6 Euros.

Control questions

- The performance of the amount of money I have invested in the risk-free asset is independent of the stock performance.
  - True
  - False
- The investment in stocks will have a safe higher return than the investment in the risk-free asset.
  - True
  - False
- When investing in stocks I will get a positive performance.
  - True
  - False

The experiment goes on, as soon as you answered all questions correctly.

After the first 5 runs

In the next rounds, the performance of the stock is based on the historical development of the DAX (January 1988 to March 2012). In the past, the average return of the DAX was 8.0% per year with a yearly standard deviation of 23.2%.
Based on a random starting date, you will first see the development of the last year. Afterwards you will again experience the performance of one year in real time.

<u>Remark:</u>
The instructions for the group which first faced the DAX charts and afterwards the artificial charts (Brownian motion) are analogously defined.

Appendix E: Determinants of Initial Allocation (Experiment I)

This table reports Tobit regression analyses of the initial allocation to the stock in Experiment I. See Appendix A for an overview of all control variables. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. Standard errors are clustered by participant; robust p-values are reported in parentheses.

Initial Allocation

	Tobit			OLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Return of the first year	324.3***	322.9***	321.7***	0.499***	0.515***	0.512***
	(0.0002)	(0.0002)	(0.0002)	(0.0005)	(0.0002)	(0.0003)
Willingness to Take Risk	51.67***	56.57***	55.44***	0.0889***	0.0727***	0.0704***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0007)	(0.0012)
Age		18.81**	17.25**		0.00717	0.00559
		(0.0185)	(0.0257)		(0.6432)	(0.7101)
Gender (1: male)		-64.23	-78.76		0.219**	0.173*
		(0.3093)	(0.2020)		(0.0186)	(0.0676)
Education		-47.12	-44.86		0.0830	0.0854
		(0.3236)	(0.3770)		(0.1774)	(0.1773)
Field of Study: Economics		145.1***	144.3***		0.282***	0.272***
		(0.0065)	(0.0046)		(0.0015)	(0.0014)
Field of Study: Psychology		-109.9*	-112.6**		-0.0388	-0.0400
		(0.0540)	(0.0497)		(0.8364)	(0.8303)
Field of Study: Other		-118.2*	-92.88		0.0165	0.0800
		(0.0666)	(0.1786)		(0.8825)	(0.4821)
Stock Market Investments		-56.70	-54.14		-0.0436	-0.0364
		(0.1104)	(0.1272)		(0.3858)	(0.4380)
Interest in Financial Markets		-5.282	-11.94		-0.0324	-0.0456
		(0.7520)	(0.4925)		(0.2664)	(0.1405)
Experience in Financial Markets		15.07	11.48		0.0422	0.0327
		(0.4257)	(0.5597)		(0.1543)	(0.2932)
Financial Literacy			16.56			0.0398**
			(0.1790)			(0.0483)
Faith in Intuition			8.612			-0.0221
			(0.7251)			(0.6568)
Constant	164.8**	-232.0	-380.9*	5.637***	5.398***	5.165***
	(0.0179)	(0.2361)	(0.0977)	(0.0000)	(0.0000)	(0.0000)
Observations	1,190	1,190	1,190	957	957	957
(Pseudo) R-squared	0.005	0.009	0.010	0.081	0.133	0.143
Participant clustered standard errors	YES	YES	YES	YES	YES	YES

Appendix F: Panel Probit Regression: Trading vs. No trading (Experiment I)

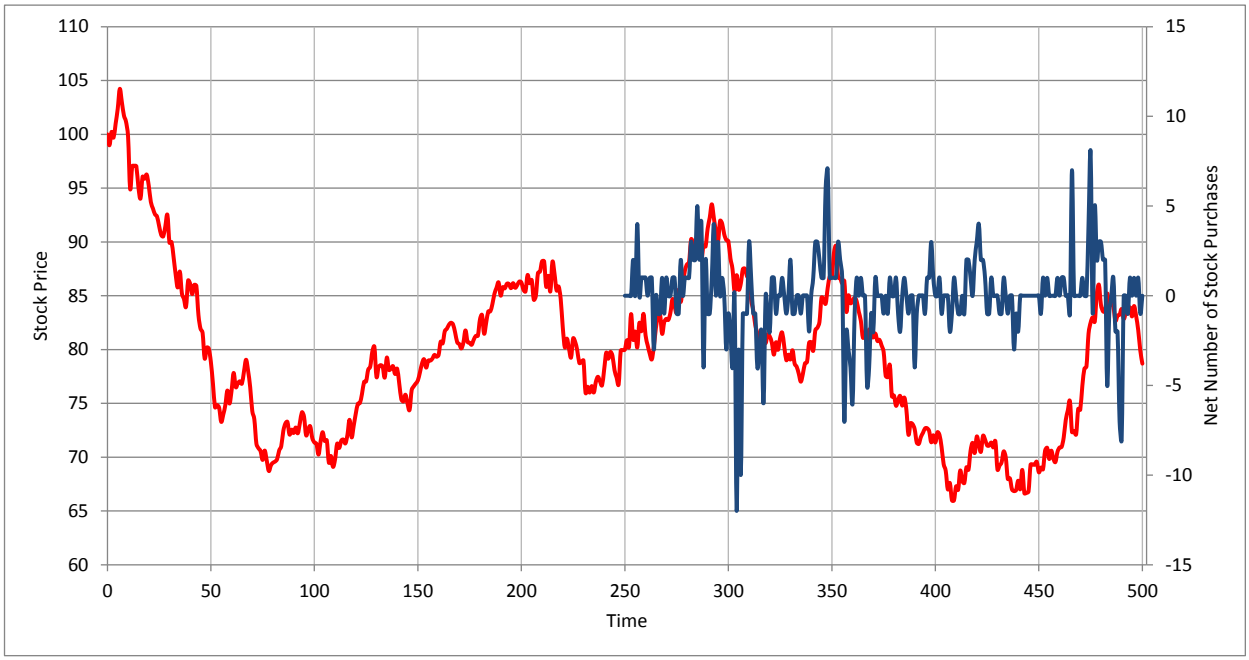
This table reports the results of a panel probit regression analysis of Experiment I. The dependent variables trading (buy/sell) equals one at time t if a participant traded (bought/sold stocks) at time t; and zero otherwise. The variable Crisis (Rallye) equals 1 at time t if a participant faced an extraordinary decrease (increase) of his/her portfolio value at time t. Extraordinary is defined to be the 10% lowest (highest) participant's daily returns in each run. See Appendix A for an overview of all control variables. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level, p-values are reported in parentheses.

Trading vs. No trading

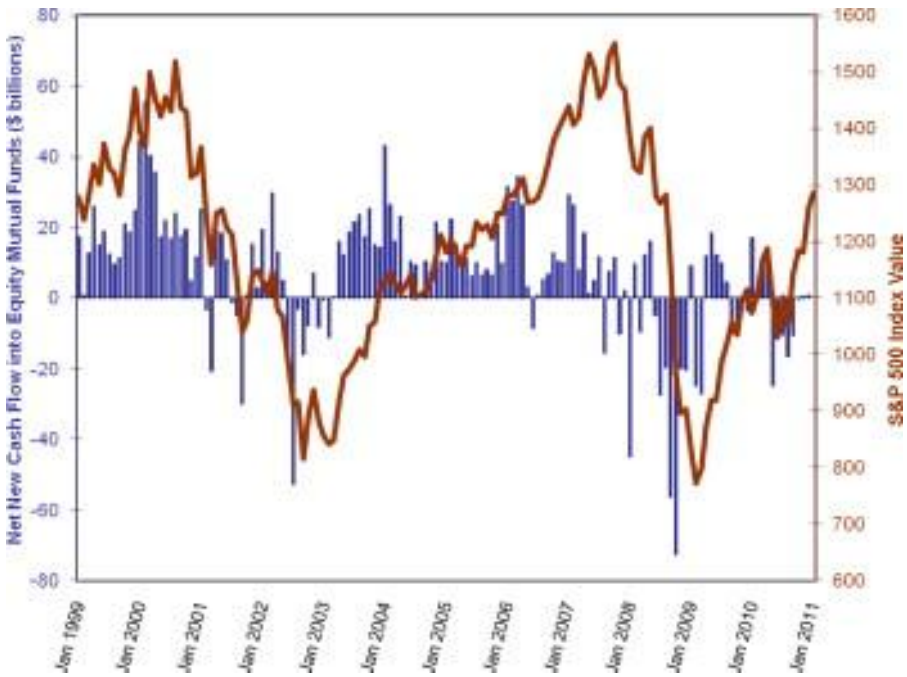
	Trading		**Buy**		**Sell**	
	(1)	(2)	(3)	(4)	(5)	(6)
Past Return t to t-5	-1.149***	-1.148***	0.813**	0.807**	-2.520***	-2.541***
	(0.0001)	(0.0001)	(0.0189)	(0.0196)	(0.0000)	(0.0000)
Past Return t-5 to t-10	0.311	0.310	0.0551	0.0481	0.326	0.324
	(0.2081)	(0.2099)	(0.8616)	(0.8788)	(0.3070)	(0.3113)
Past Return t-10 to t-15	-0.0859	-0.0844	0.527*	0.524*	-0.884***	-0.885***
	(0.7239)	(0.7285)	(0.0930)	(0.0945)	(0.0039)	(0.0039)
Past Return t-15 to t-20	0.433*	0.432*	1.353***	1.347***	-0.917***	-0.920***
	(0.0752)	(0.0753)	(0.0000)	(0.0000)	(0.0038)	(0.0038)
Crisis	0.353***	0.353***	-0.528***	-0.529***	0.644***	0.644***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Rallye	-0.0344	-0.0344	-0.252***	-0.251***	0.158***	0.158***
	(0.1290)	(0.1289)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Age		-0.0268***		-0.0235***		-0.0252***
		(0.0000)		(0.0000)		(0.0000)
Education		0.0585**		0.0653***		0.0540**
		(0.0127)		(0.0035)		(0.0137)
Field of Study: Economics		0.0149		-0.00788		0.0286
		(0.6600)		(0.8099)		(0.3730)
Field of Study: Psychology		0.00852		0.00342		-0.0178
		(0.9159)		(0.9659)		(0.8187)
Field of Study: Other		0.0165		-0.00252		0.0285
		(0.6563)		(0.9446)		(0.4163)
Gender (1: male)		-0.0603*		-0.0383		-0.0805**
		(0.0990)		(0.2820)		(0.0198)
Stock Market Investments		-0.0251		-0.0273		-0.0116
		(0.2106)		(0.1655)		(0.5398)
Interest in Financial Markets		0.0439***		0.0411***		0.0363***
		(0.0001)		(0.0002)		(0.0006)
Experience in Financial Markets		-0.00608		-0.00105		-0.0139
		(0.6371)		(0.9332)		(0.2539)
Willingness to Take Risk		0.0126*		0.0113		0.0121*
		(0.0883)		(0.1191)		(0.0844)
Need For Cognition		-0.00885		0.00127		-0.0141
		(0.6096)		(0.9400)		(0.3927)
Faith in Intuition		0.0125		0.00698		0.0169
		(0.4592)		(0.6718)		(0.2893)
Financial Literacy		-0.0203***		-0.0176**		-0.0174**
		(0.0049)		(0.0123)		(0.0106)
Constant	-2.416***	-1.809***	-2.558***	-2.071***	-2.730***	-2.135***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	298,670	298,670	298,670	298,670	298,670	298,670
Number of Participant Runs	1,189	1,189	1,189	1,189	1,189	1,189
Random Effects	YES	YES	YES	YES	YES	YES

Appendix G: Cash Flows into the Stock Market – Mutual Fund Flows vs. Experimental Flows

For an exemplary run of Experiment I, the graph reports both the net number of stock purchases (number of purchases minus the number of sales) and the stock price over time.



Nofsinger (2012, Figure 1):
"Buy High, Sell Low: Equity Mutual Fund Flow and the S&P 500 Index. Monthly flow into (or out of) domestic stock mutual funds are represented by the bars. The level of the S&P 500 Index is shown by the line."



Appendix H: Treatment Comparison of Experiment II

This table reports descriptive statistics of the participants' personal characteristics in the two conditions of Experiment II. Moreover, the result of a t-test that compares the mean values between the groups is documented. See Appendix A for the coding of the variables.

	Mean		p-values			N		t statistic	df
	Cognitive Load		two-sided	lower one-sided	upper one-sided	Cognitive Load			
	No	Yes				No	Yes		
Age	23.49	23.83	0.58	0.29	0.71	53	52	-0.56	103
Gender (1: male)	0.43	0.46	0.78	0.39	0.61	53	52	-0.56	103
Interest in Financial Markets	3.55	3.19	0.36	0.82	0.18	53	52	-0.31	103
Experience with Financial Markets	2.64	2.10	0.09	0.96	0.04	53	52	1.98	103
Financial Literacy	10.74	10.87	0.78	0.39	0.61	53	52	1.00	103
Need for Cognition	4.11	4.26	0.41	0.20	0.80	53	52	-1.43	103
Faith in Intuition	3.79	4.07	0.05	0.03	0.97	53	52	-0.28	103
Decision Basis (1: Mind/Rationality; 7: Emotions/Impulsivity)	3.39	3.24	0.52	0.74	0.26	53	52	0.23	103

Appendix I: Comparison of Personal and Trading Characteristics in the three Experiments

Panel A reports descriptive statistics of participants' personal characteristics in the three experiments. Panel B compares the trading behavior in Experiment I with the behavior observed in Experiment II. Since Experiment III contains two risky assets, the investment task is not directly comparable with Experiment I and II. Panel C reports main characteristics of the trading behavior in Experiment III. *Avg. Stock Quota* is defined as the average share invested in the stock market. The variable *Number of Trades* (Buys, Sales) counts the number of trades (buys, sales) within a run resulting in 1,190 observations. Turnover of subject i at time t is defined as $turnover_{i,t} = \frac{trading\ volume_{i,t}}{portfolio\ value_{i,t}}$. See Appendix A for the description of the variables.

Panel A: Personal Characteristics

	Experiment I		Experiment II		Experiment III	
	N	Mean	N	Mean	N	Mean
Age	119	22.45	105	23.66	98	23.68
Gender (1: male)	119	0.50	105	0.45	98	0.40
Interest in Financial Markets	119	4.23	105	3.37	98	3.18
Experience with Financial Markets	119	2.58	105	2.37	98	2.18
Financial Literacy	119	11.54	105	10.80	98	10.55
Need for Cognition	119	4.22	105	4.19	98	4.15
Faith in Intuition	119	4.12	105	3.93	98	3.89

Panel B: Trading Characteristics

		Experiment I		Experiment II	
		N	Mean	N	Mean
Initial Allocation		1,190	451.47	630	476.66
Avg. Stock Quota		1,190	0.42	630	42.23%
Number of Trades		1,190	3.41	630	3.50
Number of Buys		1,190	1.63	630	1.52
Number of Sales		1,190	1.78	630	1.98
Trading Volume	**Buy**	1934	528.03	958	542.84
	Sell	2121	517.27	1248	487.76
Turnover	**Buy**	1934	0.52	958	0.53
	Sell	2121	0.50	1248	0.47

Panel C: Trading Characteristics Experiment III

		N	Mean	S.D.	Min	p25	p50	p75	Max
Initial Allocation	**Stock A**	490	292.96	270.19	0	0	250	500	1000
	Stock B	490	281.82	265.16	0	50	250	400	1000
Avg. Stock Quota		490	51.83%	29.84%	0.00%	29.36%	50.31%	72.25%	100.00%
Number of Trades	**All Trades**	490	2.45	2.70	0	0	2	3	15
	Go into Stock Market	490	0.56	1.05	0	0	0	1	7
	Leave Stock Market	490	0.94	1.34	0	0	0	1	10
	Within Stock Market	490	0.94	1.34	0	0	0	1	10
Trading Volume	**Go into Stock Market**	274	260.00	192.02	7.31	100.00	200.00	390.48	998.00
	Leave Stock Market	461	252.98	240.06	5.00	100.00	174.68	300.00	1343.26
	Within Stock Market	520	294.79	261.38	1.00	100.00	200.00	400.00	1344.24
Turnover	**Go into Stock Market**	274	0.26	0.20	0.01	0.10	0.20	0.37	1.00
	Leave Stock Market	461	0.25	0.22	0.01	0.10	0.17	0.33	1.00
	Within Stock Market	520	0.30	0.27	0.00	0.10	0.20	0.40	1.00

Appendix J: Determinants of Performance (Experiment III)

This table reports an OLS regression analysis of Experiment III with the final portfolio value (Columns 1 and 2) and the Risk-adjusted Performance (Columns 3 and 4), respectively, as dependent variable. *FL* and *FI* stand for Financial Literacy and Faith in Intuition, respectively. The variables' median is taken as a cut-off point to distinguish between high and low. See Appendix A for an overview of all control variables. * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. Robust p-values are reported in parentheses.

Performance

	Final Portfolio Value		Sharpe Ratio	
	(1)	(2)	(3)	(4)
High Financial Literacy	-3.140		4,889	
	(0.7386)		(0.1149)	
High Faith in Intuition	-12.99		-4,324	
	(0.1028)		(0.1139)	
High FL & High FI		-15.01		-5,065
		(0.1109)		(0.1769)
Low FL & High FI		-7.371		-8,306**
		(0.6521)		(0.0431)
Low FL & Low FI		0.00674		-6,036
		(0.9995)		(0.1819)
Total Number of Trades	-0.0235	-0.0134	-945.9***	-942.2***
	(0.9894)	(0.9939)	(0.0050)	(0.0046)
Age	-0.995	-0.980	254.9	260.4
	(0.4712)	(0.4748)	(0.3735)	(0.3707)
Education	1.616	1.450	-75.89	-136.4
	(0.7908)	(0.8110)	(0.9716)	(0.9505)
Field of Study: Other	15.27*	14.97*	-1,016	-1,124
	(0.0827)	(0.0855)	(0.7238)	(0.6988)
Gender (1: male)	25.12**	24.80**	-5,651**	-5,767**
	(0.0119)	(0.0132)	(0.0289)	(0.0285)
Stock Market Investments	11.66	11.56	-2,353	-2,391
	(0.1296)	(0.1352)	(0.2616)	(0.2600)
Interest in Financial Markets	-1.331	-1.399	-1,187	-1,212
	(0.6535)	(0.6352)	(0.1461)	(0.1429)
Experience in Financial Markets	3.753	3.892	792.1	842.9
	(0.3726)	(0.3591)	(0.4112)	(0.4015)
Constant	1,003***	1,001***	4,180	9,500
	(0.0000)	(0.0000)	(0.6204)	(0.3544)
Observations	490	490	490	490
R-squared	0.249	0.249	0.130	0.131
Participant clustered standard errors	YES	YES	YES	YES
Run Dummies	YES	YES	YES	YES

Appendix K: The Rational-Experiential Inventory Questionnaire

We used the German translation of the original Rational-Experiential Inventory questionnaire (Epstein et al. 1996) by Keller, Bohner, and Erb (2000). Questions 1, 2, 4, 7, 12, and 14 were developed by Keller, Bohner, and Erb (2000) and translated into English by Alós-Ferrer and Hügelschäfer (2012).
Participants are asked to evaluate each item and indicate how true each statement is about oneself on a 7-point Likert scale ranging from 1 (completely false) to 7 (completely true). We found the experiential and rational scales of the REI to be uncorrelated (pairwise correlation: 0.01, p-value: 0.91). Cronbach's Alpha (see Cronbach 1951) is 0.84 for the Faith in Intuition scale (Questions 1 to 15) and 0.85 for the Need for Cognition scale (Questions 16-29), denoting a high internal consistency. (R) denotes reverse scoring.

Faith in Intuition Items

1. When I need to form an opinion about an issue, I completely rely on my intuition.
2. For most decisions it is reasonable to rely on one's hunches.
3. I am a very intuitive person.
4. When it comes to people, I can trust my first impressions.
5. I trust my initial feelings about people.
6. I believe in trusting my hunches.
7. The first idea is often the best one.
8. When it comes to trusting people, I usually rely on my gut feelings.
9. I can usually feel when a person is right or wrong even if I can't explain how I know.
10. My initial impressions of people are almost always right.
11. I am quick to form impressions about people.
12. When it comes to buying decisions, I often follow my gut feelings.
13. I can typically sense right away when a person is lying.
14. If I get lost while driving or cycling, I typically decide spontaneously which direction to take.
15. I believe I can judge character pretty well from a person's appearance.

Need for Cognition Items

16. Learning new ways to thin doesn't excite me very much. (R)
17. I find little satisfaction in deliberating hard and for long hours. (R)
18. The notion of thinking abstractly I not appealing to me. (R)
19. The idea of relying on thought to make my way to the top does not appeal to me. (R)
20. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities (R)
21. Thinking is not my idea of fun. (R)
22. I don't like to have the responsibility of handling a situation that requires a lot of thinking. (R)
23. I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something. (R)
24. It is enough for me that something gets the job done, I don't care how or why it works. (R)
25. I generally prefer to accept things as they are rather than to question them. (R)
26. Simply knowing the answer rather than understanding the reasons for the answer to a problem is fine with me. (R)
27. I feel relief rather than satisfaction after completing a task that required a lot of mental effort. (R)
28. I have difficulty thinking in new and unfamiliar situations. (R)
29. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

Appendix L: Financial Literacy Questionnaire

The Financial Literacy questions are taken from van Rooij et al. (2011a). The correct answers are highlighted.

Basic Financial Literacy

1. *Numeracy:* Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
   (i) More than €102. (ii) Exactly €102. (iii) Less than €102. (iv) Do not know. (v) Refusal.
2. *Interest compounding:* Suppose you had €100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?
   (i) More than €200. (ii) Exactly €200. (iii) Less than €200. (iv) Do not know. (v) Refusal.
3. *Inflation:* Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?
   (i) More than today. (ii) Exactly the same. **(iii) Less than today**. (iv) Do not know. (v) Refusal.
4. *Time value of money:* Assume a friend inherits €10,000 today and his sibling inherits €10,000 3 years from now. Who is richer because of the inheritance?
   (i) My friend. (ii) His sibling. (iii) They are equally rich. (iv) Do not know. (v) Refusal.
5. *Money illusion:* Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income?
   (i) More than today. **(ii) The same**. (iii) Less than today. (iv) Do not know. (v) Refusal.

Advanced Financial Literacy

6. *Which of the following statements describes the main function of the stock market?*
   (i) The stock market helps to predict stock earnings.
   (ii) The stock market results in an increase in the prices of stocks.
   (iii) The stock market brings people who want to buy stocks together with those who want to sell stocks.
   (iv) None of the above. (v) Do not know. (vi) Refusal.
7. *Which of the following statements is correct? If somebody buys the stock of firm B in the stock market:*
   (i) He owns a part of firm B.
   (ii) He has lent money to firm B.
   (iii) He is liable for firm B's debts.
   (iv) None of the above. (v) Do not know. (vi) Refusal.
8. *Which of the following statements is correct?*
   (i) Once one invests in a mutual fund, one cannot withdraw the money in the first year.
   (ii) Mutual funds can invest in several assets, for example invest in both stocks and bonds.
   (iii) Mutual funds pay a guaranteed rate of return which depends on their past performance. (iv) None of the above. (v) Do not know. (vi) Refusal.
9. *Which of the following statements is correct? If somebody buys a bond of firm B*:
   (i) He owns a part of firm B. **(ii) He has lent money to firm B**. (iii) He is liable for firm B's debts. (iv) None of the above. (v) Do not know. (vi) Refusal.
10. *Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return*?
    (i) Savings accounts. (ii) Bonds. **(iii) Stocks.** (iv) Do not know. (vi) Refusal.
11. *Normally, which asset displays the highest fluctuations over time*?
    (i) Savings accounts. (ii) Bonds. **(iii) Stocks.** (iv) Do not know. (v) Refusal.

12. *When an investor spreads his money among different assets, does the risk of losing money:*
    (i) Increase. **(ii) Decrease**. (iii) Stay the same. (iv) Do not know. (v) Refusal.
13. *Stocks are normally riskier than bonds*. True or false?
    (i) True. (ii) False. (iii) Do not know. (iv) Refusal.
14. *Buying a company stock usually provides a safer return than a stock mutual fund. True or false?*
    (i) True. **(ii) False.** (iii) Do not know. (iv) Refusal.
15. *If the interest rate falls, what should happen to bond prices*?
    (i) Rise. (ii) Fall. (iii) Stay the same. (iv) None of the above. (v) Do not know. (vi) Refusal.

Appendix M: Risk Aversion Assessment in the Style of Holt and Laury (2002)

Decision	Option A	Option B
1	10%: 240 Exp.Dollars 90%: 192 Exp. Dollars	10%: 462 Exp.Dollars 90%: 12 Exp.Dollars
2	20%: 240 Exp.Dollars 80%: 192 Exp. Dollars	20%: 462 Exp. Dollars 80%: 12 Exp. Dollars
3	30%: 240 Exp. Dollars 70%: 192 Exp. Dollars	30%: 462 Exp. Dollars 70%: 12 Exp. Dollars
4	40%: 240 Exp. Dollars 60%: 192 Exp. Dollars	40%: 462 Exp. Dollars 60%: 12 Exp. Dollars
5	50%: 240 Exp. Dollars 50%: 192 Exp. Dollars	50%: 462 Exp. Dollars 50%: 12 Exp. Dollars
6	60%: 240 Exp. Dollars 40%: 192 Exp. Dollars	60%: 462 Exp. Dollars 40%: 12 Exp. Dollars
7	70%: 240 Exp. Dollars 30%: 192 Exp. Dollars	70%: 462 Exp. Dollars 30%: 12 Exp. Dollars
8	80%: 240 Exp. Dollars 20%: 192 Exp. Dollars	80%: 462 Exp. Dollars 20%: 12 Exp. Dollars
9	90%: 240 Exp. Dollars 10%: 192 Exp. Dollars	90%: 462 Exp. Dollars 10%: 12 Exp. Dollars
10	100%: 240 Exp. Dollars 0%: 192 Exp. Dollars	100%: 462 Exp. Dollars 0%: 12 Exp. Dollars