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THE LINK BETWEEN NEGATIVE INVESTING EXPERIENCE AND EXPECTED MARKET RETURNS: THE CASE OF ESTONIAN INVESTORS

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ABSTRACT

The aim of this thesis is to determine the relationship between the investors' prior and current negative experience and 10-years expected market returns, proxied with expected returns for the S&P 500 index. Ordinary linear squares regression was run on the data obtained from the survey among Estonian investors, with the expected return as a dependent variable and groups of socioeconomic, behavioral, and experience-related explanatory variables. Contrary to expectations, neither past nor current negative experience have a negative association with expected returns. While no statistically significant relationship was found between the prior experience and expected returns, the coefficient estimate for the first-hand negative experience approaches the conventional threshold of statistical significance and has a positive sign. Likewise, the current negative experience triggered by the Covid-19 crisis was found to have a positive association with expected returns. In addition, investors' recent portfolio returns positively correlate with expected returns, which might suggest that investors are affected by the hot-hand fallacy. Finally, investors with a higher level of education and income as well as a higher level of overconfidence tend to expect future 10-years market returns to be higher, while the impact of the investors' optimism on the expected market returns is negative. The study also provides strong evidence that investors' expectations about future returns can be affected by the framing effect.

Keywords: negative experience, expected return, risk-taking behavior, behavioral finance

INTRODUCTION

Some investors are generally more risk-averse than others. However, in some cases, the cause of investors' risk-aversion or risk-taking may be explained by their previous investment failures or other negative experiences, the most studied one being the latest financial crisis. As it has been more than 10 years since the last crisis and we are on the verge of a new one, understanding how the investors are affected by the negative experience is now more crucial than ever.

The interest of this thesis is on the investors' previous negative experience, be it their own personal investment failures or negative events triggered by macroeconomic market circumstances, as well as the current negative experience due to ongoing market declines all over the world. More specifically, the goal is to understand what kind of impact the investors' exposure to such negative experiences, the magnitude of the experienced losses and the risk-taking behavior changes triggered by the losses have on their expectations regarding the future market returns. The negative experience from previous investments may have a positive impact on the investors' future investment decisions and returns as they learn from their mistakes or on the contrary, a negative impact since the investors are afraid to repeat the same mistakes and are therefore more risk-averse, which in turn leads to lower returns.

Even though the markets have performed exceptionally well during the recent years, with the latest financial crisis being over 10 years ago and there having been almost no other large market declines, the investors are still believed to having been experienced some negative returns in their portfolio, especially at the beginning of their investment career or with the introduction of various highly volatile investment assets and instruments, such as cryptocurrencies and crowdfunding platforms. Furthermore, the timing of this thesis was lucky enough to coincide with the beginning of the new financial crisis or crisis-like market situation, ensuring that the majority of the respondents actually

have encountered a loss in their portfolio value as well as allowing the author to study their planned behavioral changes due to the experience they are encountering at this moment.

Consequently, the aim of this study is to determine whether and how the investors' previous and current negative experience affect their expected returns.

Due to this, the research questions are the following:

1. What kind of impact does the investors' previous negative experience have on their expected market returns?
2. What kind of impact does the investors' current negative experience have on their expected market returns?

The hypotheses are set to be the following:

1. There is a negative link between investors' prior negative experience and their expected market returns.
2. There is a negative link between investors' current negative experience and their expected market returns.

In order to test the hypotheses, ordinary linear regression model is used. For the first hypothesis, first-hand and second-hand negative experience, the extent of the loss and actions relating to the changes in risk-taking behavior after experiencing the loss are taken into account in the model. As for the second hypothesis, it is addressed by focusing on the events of the ongoing Covid-19 crisis, specifically the investors' exposure to the market declines, obtained losses or returns since the beginning of the year and planned risk-taking behavioral changes they plan on making in the light of the current events.

The data for the regression analysis is collected via a survey distributed in two groups of Estonian investors, as the Estonian active investors is the target group for the respondents. The survey consists of 8 sections and 59 questions, of which 31 variables are compiled for analysis purposes.

In the first chapter of this thesis, a theoretical overview of the approaches and previous studies supporting the relationship between the negative experience and future returns and expectations is given. In addition, the behavioral biases such as hot-hand and gambler's fallacy, overconfidence, risk behavior and cognitive reflection are addressed in the chapter. The second chapter focuses on giving an overview of the data collection, set-up of the questions, the data itself and the methodology used for the analysis. In the third chapter, an overview of the model composition and interpretation as well as the discussion of the empirical results are given.

1. RELATIONSHIP BETWEEN EXPERIENCE AND RETURNS

1.1. Theoretical approaches

There are two approaches by which the theoretical background of the relationship between investors' previous experience and future returns could be explained - the prospect theory first introduced in 1979 by Kahneman and Tversky, and the choice reinforcement approach.

The prospect theory is an expansion of the subjective expected utility (SEU) theory as it comprises certainty effect and isolation effect. The difference with the SEU theory lies in the value being assigned to gains and losses rather than assets by replacing the utility function with the value function, and the decision weights being used instead of probabilities via the decision weights function (Thaler, Johnson 1990). The certainty effect indicates that due to the investors outweighing probable outcomes compared to the certainly obtained outcomes, they are more risk-averse in situations of sure gains and more risk-taking when it comes to decisions associated with sure losses. As for the isolation effect, it takes into account the investors' conflicting behavior once the question or situation is formed in a different way. (Kahneman, Tversky 1979)

According to the prospect theory, risk-aversion is exposed if the situation is formed as a gain, while people tend to lean towards risk-taking behavior in case the outcome is framed as a loss (Meir 1995; Grable 2016). For example, if given a choice between a sure gain or loss of a smaller amount and a 50:50 chance of a larger amount or nothing, investors tend to choose the certain option when it comes to losses and are thus risk-averse, trying to minimize their losses, while when it comes to gains, they are more risk-seeking and lean towards the lottery option in the hope of a larger win (Ibid.). The main objective of prospect theory can be concluded as the investors having a reference point that they rely on. This is reflected in the behavior that when the investors' returns exceed their reference point i.e.

their portfolio performs better than expected, they are risk-averse and vice versa, they tend to be more risk-seeking if the returns are below their reference point. (Chou et al. 2009)

However, Thaler and Johnson (1990) have found that only a small proportion of their target group was behaving in accordance with the prospect theory, while for the major part followed the quasi-hedonic editing rule approach. According to this, an increase in risk-aversion is related to having experienced a loss, especially if there is no chance to recover from the loss, while when it comes to gains, an opposite effect is observed. Therefore, the prospect theory and approaches based on it do not conclude on one specific type of relationship, but rather leave us with several options for interpretation.

Another theory, the choice reinforcement approach is suggesting that the investors solely focus on the prior payoff and do not care about the drivers of those payoffs, the behavior of other investors nor any historical events they do not have a direct relationship with, but only reckon their own prior experience (Camerer, Ho 1999). The investors tend to rely more on strategies that have previously proven themselves to be successful, even if it is not certain that the same strategy would also result in future success (Choi et al. 2009). This kind of theoretical approach easily applies to standalone stocks as well, meaning that the investors are not willing to repurchase stocks that they have previously encountered a negative experience with - the negative experience being such as selling the stock for a loss, seeing a significant increase in the stock price after the stock was sold or any situation indicating that they could have had the chance for a larger profitability. The corresponding hypothesis proved is thus that investors prefer buying stocks they associate with positive emotions and stay away from stocks that reinforce negative emotions. (Strahilevitz et al. 2011)

1.2. Behavioral biases

1.2.1. Hot-hand and gambler's fallacy

The impact of prior experience on future returns and behavior in both directions can be supported by two reverse beliefs - hot hand fallacy and gambler's fallacy.

The hot hand fallacy represents a belief that there is a stronger possibility for a random event to recur in the same manner as before, rather than change its course (Rabin, Vayanos 2010). Investors under the belief of hot hand fallacy, for example, would expect the stock price to continue to rise after it has been rising for a couple of consecutive months, and vice versa, continue to fall after declining for some time. In the context of the topic of this study, investors could have the belief that their negative experiences will keep on recurring in the future or that they will continuously experience similar gains as they used to before, even if in reality, the experience was most likely a one-off event.

The gambler's fallacy is simply contradicting the hot hand fallacy, as it is a belief that a random event will behave in an exact opposite way to as it did before. The most common example would be flipping a coin and expecting to see a tail after the streak of heads. (Ibid.) Investors belief when it comes to the stock market would thus be that after seeing a stock price increase in some time, it is supposed to fall. It could also be explanatory to the fact that after experiencing a loss or a sequence of losses, investors would expect to start seeing gains in their portfolio, even without any solid evidence to support this belief.

With either one of these fallacies, the investor's belief would have a significant impact on their overconfidence (or lack of it), risk-taking behavior and overall attitude against investing. The expectancy of recurring losses under the belief of hot hand fallacy could have a considerable impact on the investor's risk tolerance and preference as well as decrease their overconfidence, as the investor might even start to refrain from investing in the fear of losses. The presumption of recurring gains under hot hand fallacy or turning their losses into gains under gambler's fallacy, however, would most likely boost the investor's overconfidence as well as possibly manifest itself in their risk behavior.

1.2.2. Overconfidence

Overconfidence is an important behavioral bias to consider when assessing investors' behavior. Due to overconfidence, investors often overestimate their trading skills and consider their private information to be more accurate than it really is, as stated by Puetz and Ruenzi (2011), and therefore they tend to take on too many risks.

The investor's overconfidence is largely influenced by their experience - the more an investor gains experience and thus increases their knowledge, success and wealth, the more overconfident they become (Gervais, Odean 2001). Positive experience can therefore, in addition to having a positive impact, also negatively affect the investor's future investing decisions and returns, as overconfidence leads them to a biased behavior and thus lower expected returns. According to the studies by Ekholm (2006) as well as Ekholm and Pasternack (2007), overconfidence is also impacted by the investor's size as larger investors tend to be less overconfident than most of the other investors, although the reasoning behind such a relationship is not completely clear.

Overconfidence can be split into three different types. The first type would be simply the people's overestimation of their own abilities, performance or knowledge. Secondly, overconfidence can be looked at as whether a person considers themselves to be better than others or better than an average person in various aspects of life, the most basic example being driving a car. The third alternative is a person's overprecision of their beliefs and knowledge, observable by attaching confidence intervals to knowledge-based questions. (Moore, Healy 2008)

Overestimation of own abilities is the easiest to determine out of the three, as it focuses on comparing the estimated performance to the actual performance. For example, if a student answers 7 quiz questions out of 10 correctly instead of the estimated 5, they have underestimated their performance and vice versa, overestimated if the actual result would be 3 out of 10. (Moore, Healy 2008)

The better-than-average approach focuses on determining whether people consider themselves to be better than others. Svenson (1981) has applied this approach on the example of driving skill and found that the majority of people considered themselves to be more skillful and less risky drivers than the average. According to Kaustia and Perttula (2012), the proportion of drivers considering themselves to be better than average driver is 90%, while Moore and Healy (2008) have also emphasised that beginning drivers actually tend to consider themselves to be worse than average. Although the overconfident thinking pattern can be attributed to cognitive mechanisms, e.g. insufficient or no memory of negative experiences, it was also proven by Peter and Harris (1965) that in some cases, the reason is that people are simply not capable of learning from their previous experiences. The latter study found that by comparing groups of people who have been in car accidents with the ones that

have not, both groups have similar opinions on the level of their driving abilities as well as both consider themselves to be above average drivers.

Thirdly, in order to determine the investors' overprecision of their traits, the calibration approach is usually applied by asking basic knowledge questions and letting the respondents give confidence intervals to assess how certain they are that they have responded correctly. People typically tend to overestimate their confidence interval, therefore be overconfident by overestimating their knowledge. However, when it comes to very easy tasks, people are mostly underconfident. (Lichtenstein, Fischhoff 1980)

1.2.3. Risk behavior

Risk preference represents people's willingness to take on risk (Charness et al. 2013). In particular, risk preference is expressed by the means of a reference point in the form of investors preferring risk when their return on investments falls behind their reference point and pull away from risk if the return exceeds the reference point (Chou et al. 2009).

The concept of risk tolerance is substantially related to that of risk preference and the two are occasionally even used as synonyms, but there is actually a distinction between the two. Risk tolerance represents a person's willingness to make a choice where the realization of a goal is uncertain and that may probably even result in a loss (Grable 2016) or receptiveness of situations involving financial risk (Roszkowski et al. 2005). For individuals, risk tolerance affects the choice of credit cards, mortgage and loan type decisions, debt versus savings decisions as well as the choice of pension funds (Grable 2016). Investors with lower risk tolerance are also clearly less likely to invest in public equity (Campbell 2006) as the risk-tolerant investors are the ones preferring more risky assets. Thus, while risk preference focuses strictly on investor's subjective opinions and feelings, i.e. has a more behavioral approach, risk tolerance is more related to investor's actual willingness and psychological comfort to take part in situations involving financial risk (Roszkowski et al. 2005).

One approach for measuring risk tolerance would be real-life observation, such as of the investor's portfolio and assessing the decisions of the portfolio composition. In that case, if the portfolio is

largely composed of equity or other riskier assets, the investor is considered to be highly risk-tolerant (Grable 2016).

Another option would be conducting an experiment of giving the investors a specific amount of money, hypothetically or actually, and assessing the investment decisions they make in a specifically compiled lottery-choice environment. The limitation of using this approach on a hypothetical payoff level is that as there are some differences in the investors' risk-aversion between when using real-money payoffs and hypothetical lottery choices, thus the hypothetical scenario may not accurately represent the decisions people would make with their actual money. (Faff et al. 2008)

As the observational approaches are not always feasible, questionnaires are also often used as an alternative approach for determining the risk tolerance. While some studies prefer to focus on asking a single question, it being how willingly the investor takes financial risks when saving or investing, others believe the one answer is not a good proxy for actual risk-aversion and prefer to compile a multi-question survey. (Grable 2016)

1.2.4. Cognitive reflection

There are two types of processes people's brains use to make decisions: the first i.e. "System 1" being the spontaneous and automatic one, used for making decisions subconsciously, while lots of more thinking, consideration and deliberation is required to make a decision using the second one, "System 2" (Frederick 2005). Most of the people use their subconscious mind to make most of the decisions - it is believed that people make up to 95% of decisions relying on System 1 alone.

People's decision-making is often affected by the cognitive reflection bias that occurs when something they have considered to be the truth, often by relying on their subconscious mind, turns out to actually be wrong (sometimes leading to cognitive dissonance). For investors, it could result in portfolio decisions that turn out to be non-profitable or irrational. In this case, the investors tend to ignore the recently learned truth due to the occurred psychological conflict as they do not want to admit they had made a mistake and continue to keep the investments made under false pretenses (Pompian 2017).
In order to determine the degree of cognitive reflection among people, the concept of Cognitive Reflection Test (CRT) has been introduced. The test originally consists of three questions that are set

up so that the question would first trigger an incorrect answer in the subconscious mind. Based on the test it has been proven, for example, that people relying on their subconscious mind are much more impatient than the ones using their rational thinking. (Frederick 2005) The aim of CRT is therefore to determine whether the respondents are patient enough to look past the incorrect answer they first think of and think further to get to the correct answer.

1.3. Previous studies

The impact of the investors' past experience on their risk-taking behavior as well as expected and actual returns has been the subject of various studies with contradicting conclusions. While some studies suggest that negative experience makes investors be more risk-averse and thus expect and earn lower returns, others suggest an opposite relationship where investors start to take on more risks after experiencing a loss, resulting in an increase in their expected and actual returns.

The event most frequently studied as a negative experience in relation to the investing behavior is the 2008-2009 financial crisis, due to which lots of people around the world suffered significant losses, be it a loss of a job, house, portfolio value etc. The study by Andersen *et al*. (2018) focused on determining whether common shocks are enough to make the investors more risk-averse or it has to come from a personal experience, such as owning stocks of banks that defaulted during the crisis. While the financial crisis by itself as a common shock has a slight negative effect on risk-taking behavior, the main driver behind risk-aversion was determined to be the personal experience.

The financial crisis was also the focus of the study by Weber *et al.* (2013), surveying investors at 3-month intervals during the period of the crisis for information on their current financial risk-taking, risk attitudes, expected risk and return as well as past performance. The results of the study suggested that while the numeric risk and return expectations nor recent gains or losses do not show any effect on the investors' risk-taking, the risk-taking is influenced by the changes in risk and return subjective expectations, i.e. the decline in risk-taking behavior is related to investor's feelings about future market risk and return. Necker and Ziegelmeyer's (2015) study however indicated some contradicting results based on data from German households, suggesting that even though the investors decreased their risk tolerance, those that blame the crisis for their wealth losses expect a higher return and a

lower risk in the future. As risk and return are usually positively related, the conflict in results was explained by a common psychological trait that investors are simply not willing to accept the losses and hope for better returns in the future without changing the basis of their investing, behavior corresponding to the gambler's fallacy. It was therefore concluded that the general expectation of investors would be an increase in both risk and returns.

Some studies also suggest the decline in stock ownership after the financial crisis - for example, the evidence of American households indicates that in 2009, the stock ownership declined by 5.9% (2.9 ppt) in comparison with 2007. However, the ones that left the stock market following the crisis were mainly less-educated, poor or households with non-white household heads. (Zhou 2019) Not to focus on one financial crisis only, according to Ampudia and Ehrmann (2017) and based on European data, the more market crashes the investors have experienced the less willing they are to take risks and buy stocks. Yet it is emphasised that the tougher the last crisis in the country, the more weight these investors give to the most recent crisis when it comes to their investing behavior, suggesting that the countries that had the roughest shock during the 2008 crisis also have the most underinvested stock market due to it.

Jin *et al.* (2019) have managed to take their study a step further and prove the reduction in investors' risk-taking nature due to negative market shocks, having eliminated the effect of change in market fundamentals by investigating a fat-finger shock. However, the study determined that the negative shock negatively affected the risk-taking of only these investors that were trading during the specific shock and not the ones that experienced the shock from afar, i.e. only the first-hand experience is the one that matters when it comes to the future behavior.

Aside from focusing on negative market shocks affecting the whole economy, the relationship between experience and return is also supported on a personal level. For example, Koestner *et al.* (2012) have stated that investors gaining more experience by 100 additional trades is thought to negatively impact monthly turnover of the portfolio by 0.8 percentage points, suggesting that investors learn from their earlier overconfidence and failures and take less risks in the future. The gain of experience, however, does not result in the decrease in investors' under-diversification and disposition effects. De Bondt (1993) has proven the same on a macroeconomic level, as the investors tend to be

more optimistic and thus risk-taking at the times of great wins and market increases, while in bear markets they're more risk-averse as their expectations for future returns are much lower.

Lippi et al. (2018) has addressed the matter by analysing Italian investors' value-at-risk (VaR) statistics, also finding evidence of an increase in risk-aversion after experiencing a loss and an increase in risk-seekingness after gains, demonstrating that without an expert's assistance, the investors' decisions are driven by confidence that is built by success and undermined by failure. However, such relationship has also been determined in the case of institutional investors that are more likely to be considered experts in the field. According to O'Connell and Teo (2009), experiencing a loss leads the institutional investors to rapidly decrease their risk-taking, while gains have a much less severe impact and increase risk-taking only slightly.

Additionally, there is evidence to support that lower previous returns in general, without the investors necessarily experiencing any significant shocks, have an impact on investors' behavior. According to Malmendier and Nagel (2011), investors are less likely to be risk seeking and participate in the stock market at all if their stock market returns have previously been low, thus it impacts their future returns significantly. In addition, their personal expectations for future stock market returns are lower than of those who don't have a negative investing experience. An interesting thing to note here is that similarly to the study by Ampudia and Ehrmann (2017), the investors' give more weight to more recent returns, and yet the past returns still slightly affect the investors' risk tolerance.

The behavioral pattern of leaving the financial market altogether after experiencing a loss is apparent in the study by Meyer and Pagel (2018) as well, as it was determined that after realizing a gain investors are likely to reinvest approximately 85% of their funds, while after a loss has occurred the investors tend to lean towards transferring the funds to a savings account and therefore the reinvestment only amounts to 50% of the total funds.

The fact that past returns have a positive impact on future return expectation and risk tolerance as well as the negative relationship between past returns and risk perceptions has also been proven by Hoffmann and Post (2017). On the other hand, according to the study the investors' previous risk experience itself is in no way related to the expectations of return nor risk tolerance and perception.

Khan *et al.* (2017) have stated that investors are generally optimistic and thus prefer to believe that their portfolio's returns would perform even better in the future than in the past, a belief consistent with hot hand fallacy. The resulting overconfidence and risk attitude would lead the investors to a higher portfolio turnover, greater trading intention and higher willingness of risk-taking, which would also indicate a negative relationship between the encountered negative experience and future risk-taking behavior. The study by Schneider et al. (2016) came to a contradicting conclusion, implying a positive experience would decrease the investor's risk-taking behavior and vice versa, negative experience would lead to increased risk-taking.

It is worth mentioning that the investors also tend to rely on their prior outcomes for making their future decisions when it comes to IPO subscriptions, as Kaustia and Knüpfer (2008) have proven a strong positive relationship between IPO returns in the past and future subscriptions in Finland. Similar conclusion has been made using the Indian IPO market as a case study, where the gains from participating in IPOs are associated with increased trading and tendency to take part in future IPOs as well as a stronger disposition effect (Anagol *et al.* 2015), as well as the Taiwan's IPO market with the addition that more experienced investors bid more aggressively and become overly confident and optimistic having previously experienced positive returns (Chiang *et al.* 2011).

The conclusion from assessing the previous studies is that there is no basis to make one direct conclusion, as the relationship has been found to be both positive and negative across various studies. Weber and Zuchel (2005) have also emphasized that by not taking a specific stand on the matter and suggesting that the relationship between previous returns and future risk attitude can be two-way, depending on the way the problem is established. The options addressed were the portfolio treatment, where individuals receive a certain amount of money and either hold it in cash or invest in a risky asset on two periods, and a two-stage betting game, where individuals receive money in each period and can purchase lottery tickets with the amount given. According to the study, as for portfolio decision, the previous negative experience results in investors' willingness to take on more risks, while for a two-stage betting game it is the opposite and the prior experience of losses induces investors to be more risk-averse.

In addition, Imas (2016) has suggested that it makes a large difference whether the loss is a paper loss or an actually realized loss. Investors tend to change their risk-taking strategy after experiencing a paper loss by increasing their risk-taking, while they tend to decrease their risk-taking behavior and start to more avoid risks following the loss that has actually been realized. It was also proven in the study by Jin *et al.* (2019) addressed above, where they found that when it comes to decreasing the risk-taking behavior post-loss, the investors with realized losses rather than paper losses were fairly more affected. The reasoning behind increasing risk following a paper loss is believed to be that the investors are hesitant to realize their losses and instead take more risks to earn the loss back, which in total could lead to even more significant losses (Imas 2016). Imas's theory was challenged by Nielsen (2019) who found no difference between the investors' reaction to paper or realized losses other than better data explanation by a model including realized losses. According to the study, investors are more risk-averse after suffering losses and more risk-seeking after experiencing gains on both cases, no matter if the loss was on paper or realized.

2. DATA AND METHODOLOGY

2.1. Data and variables

The aim of this thesis is to determine the relationship between investors' prior and current negative experience and their expected future returns. The data required for the analysis was collected via a survey conducted among the Estonian investors. The survey consisted of a total of 59 questions distributed between 8 sections and was supposed to take the respondents a maximum of 15 minutes to complete. The full list of questionnaire questions can be found in the Appendix 1.

The survey was distributed via the following investors groups in Facebook:

- Finantsvabadus with 24 299 members
- Naisinvestorite klubi with 12 883 members

The responses were collected during a 2-week period and a total of 175 people responded to the survey. During the data quality check, not many significant errors were found. The responses of 2 people were eliminated due to gender being marked as "do not want to disclose", as it would not have been efficient to include dummy variables instead of binary coding for the purpose of only 2 responses. One response was also eliminated due to unrealistic response to expected return. Therefore, the final data used in the analysis included responses from 172 investors.

The respondents were in the age group of 17-69 with average age of 33 years. 38% of the respondents (65 people) were male and 62% (107 people) female. Descriptive statistics is presented in Table 1.

2.1.1. Dependent variable: Expected return

The investors were asked about their expectation of the S&P 500 index's average return in the upcoming 10 years. The question included a statement for the investors to rely on - the S&P 500

index's historical return in a certain time period. However, the respondents were randomly presented with either an optimistic or pessimistic version of this example. In the optimistic version, it was stated that the average annual return of the S&P 500 index was 11.1% during the years 2010-2019, while the pessimistic version emphasised the 5.0% return during the years 2000-2019.

The optimistic or pessimistic framing did not have an impact on how the expected return itself is recorded as a variable, but an additional variable (*condition*) has been included as an explanatory variable. Explanatory variable *condition* controls for the impact of the presented example on the reported expected return, thus controlling for the framing effect on the response.

The mean of the investors' expected returns is 7.8%. However, the mean expected return of investors presented with the optimistic version of the historical S&P 500 index return was 9.73%, while the mean expected return of investors presented with the pessimistic version was 5.89%. The difference is large and statistically significant, as the investors presented with the pessimistic version reported on average 3.84% lower expected return than the ones presented with the optimistic version.

2.1.2. Main variables of interest: Negative experience

The group of the explanatory variables related to the negative experience consists of 9 variables in total: three types of experience (first-hand, second-hand, recent) that were measured in three dimensions (fact of the experience, magnitude, and response to the experience).

The investors' prior negative experience is addressed as both first-hand and second-hand experience, the first of which focuses on the individual experience and the latter on the experience of the respondents' close family members and/or friends. The respondents were questioned about their history of experiencing large drops in their own and their close family member's and/or friend's portfolio value (variables *1st hand experience* and *2nd hand experience*) and the magnitude of this drop as a proportion of the portfolio's value (variables *1st hand magnitude* and *2nd hand magnitude*). In addition to these two approaches, it was also studied how the investors had changed their risk-taking behavior following the losses by using multiple-answer questions, where the answers were later grouped into three: decrease in their risk-taking behavior, increase in their risk-taking behavior and

not changing anything or making some logical, reasonable changes, e.g. learning more about investing (variables *1st hand risk* and *2nd hand risk*).

In addition to the previously encountered negative experiences, the focus was also on the investors' current negative experience and the behavioral changes they plan to make due this experience. Specifically, in the light of the recent market declines and hence the losses in the investors' portfolio values triggered by the Covid-19 virus outbreak at the first quarter of the ongoing year, the investors were questioned about their portfolio's performance during the crisis. The investors were asked to report whether their portfolio has suffered since the beginning of the year (*current experience*), their portfolio's return in the period since the beginning of this year (*current return*) as well as the changes they plan to make in their investing behavior following the recent market declines (*current risk*).

130 respondents (76%) reported having experienced first-hand negative experience before and 97 respondents (56%) told the same about second-hand negative experience. As for the current negative experience, the portfolio value has decreased since the beginning of this year for 151 respondents, amounting to 88% of all respondents.

41 respondents (24%) decreased their risk-taking behavior after encountering a first-hand negative experience, while only 9 respondents (5%) said the same about second-hand negative experience. 30 respondents (17%) reported the increase in their risk-taking behavior post first-hand loss and 11 (6%) post second-hand loss. As for the investors' plans triggered by the current market situation, 26 respondents (15%) plan on decreasing their risk-taking behavior, while a total of 78 respondents (45%) plan to start taking more risks. This is a significant indicator supporting the hypothesis that the occurrence of a loss directs the investors to seek higher returns in the future.

2.1.3. Preferences, attitudes and behavioral biases

In the survey, separate sections were included in order to account for behavioral characteristics such as risk tolerance, optimism and overconfidence, as well as cognitive reflection.

In order to determine the investors’ risk tolerance, the respondents were asked to state their own view of their behavior in two questions as well as presented with two lottery-choice questions. This kind of

combination of questions was thought to be the most accurate representation of the actual risk tolerance, as it was not possible to use real monetary payoffs nor observe the investor's portfolio. Using this kind of questionnaire in order to determine risk tolerance is approved by the study by Grable (2016) addressed in more detail in the first chapter.

The mean of the responses on a 1-10 scale was 4.6 and most responses fell in the range of 3.75-5.75, suggesting that the respondents are slightly more inclined towards risk-aversion. However, only a few respondents were extremely risk-averse or risk-seeking (three observations with the minimum score of 2 and only one observation with a score higher than 8).

Cognitive reflection has originally been measured using the Cognitive Reflection Test (CRT) consisting of three questions by Frederick (2005). However, as these questions have been used so many times, especially in investing-related surveys, it was decided to use a different set of questions in order to try to prevent the respondents having encountered the questions before and thus giving biased answers, as they would already know the answers. To complement the initial CRT, the additional set of questions was developed and proven to be significant for determining cognitive reflection by Toplak et al. (2014) and it consists of four questions. The Cognitive Reflection Test used in the survey is presented in Appendix 2.

The mean of CRT responses was 2.76, indicating that the respondents mostly answered more than half of the questions correctly (2.76 out of 4 questions), in other words managed to look past their brain's automatic response and think further. Out of the 172 responses, only 3 people did not get any of the responses correct which contributes less than 2% to total responses. However, 31% (54 people) got all the responses correct. It is worth mentioning that only 8 people in total had prior experience with these questions, of whom just 3 people answered all questions correctly. When Toplak et al. (2014) first introduced the CRT of 4 questions, their test group averaged on 1 correct answer, thus the respondents in current thesis are significantly more patient and self-aware when it comes to decisions made by using their subconscious mind. In principle, the investors are expected to have higher CRT, especially considering that in the study by Toplak et al. (2014), a sample of student population was used.

For determining the investors' optimism, a reevaluated Life Orientation Test (LOT) based on Scheier and Carver (1985) and slightly modified by Scheier et al. (1994) was used. The LOT consists of 10 questions, of which 4 were filler questions and out of the remaining six, 3 were reverse scored and 3 regularly scored. This kind of set-up makes it certain that the respondents do not realize the objective of the questions too easily and thus their responses are less likely to be biased. The Life Orientation Test used in the survey is presented in Appendix 3.

It was possible to receive a score from in the range of 0-24, where 0 accounts for an extremely pessimistic and 24 for an extremely optimistic person. The mean of the responses was 15.8, while the minimum score was 5 and the most popular scores were 14 and 16, obtained by 20 and 19 people respectively. The results therefore prove a definite above average optimism among the respondents.

In addition, there were ten questions focusing on determining the investors' overconfidence in the survey. The questions were formed by relying on the better-than-average approach and the suggestion that 90% of drivers consider themselves to be better than average drivers (Kaustia, Perttula 2012). It was decided to use the better-than-average approach rather than the calibration approach since the latter would require answering the quite difficult basic knowledge questions with no cheating, which is impossible to control when the respondents are filling in the survey online. The questions on overconfidence were formed as better-than-average questions with the objective to cover as many different situations and areas of life as possible, as a person without a driver’s licence may not value their driving skills too highly but may show their overconfidence in another area. Out of the ten questions, two were specifically regarding investing attitudes, based on the survey introduced in a study by Khan et al. (2017).

The mean score of overconfidence related questions was 5.66 with the most popular scores falling in the range of 5.1-6.5, suggesting a slightly above average overconfidence among investors. For reference, in this survey, the mean of the question regarding driving skills was 5.2, suggesting that roughly half of the respondents believe themselves to be a better than average driver.

2.1.4. Descriptive statistics

All variables but the dependent variable can be divided into three groups: socioeconomic variables, characteristics and attitudes and negative experience related variables. The variables with their coding are presented in Appendix 4, while the descriptive statistics are presented here in Table 1.

Table 1. Descriptive statistics of the variables

Variable	Min	Max	Std. Dev	Mean	Median
expected return	0.000	0.250	0.035	0.078	0.080
Socioeconomic variables					
gender	0.000	1.000	0.486	0.378	0.000
age	17.000	69.000	9.197	33.087	31.000
country	0.000	1.000	0.235	0.058	0.000
city	0.000	1.000	0.500	0.459	0.000
education	0.000	3.000	0.807	1.198	1.000
income	0.000	2.000	0.701	1.110	1.000
income group	1.000	10.000	1.855	6.616	7.000
fin satisfaction	2.000	10.000	2.040	6.645	7.000
Characteristics and attitudes					
condition	0.000	1.000	0.501	0.500	0.500
risk tolerance	2.000	8.250	1.303	6.618	4.500
optimism	5.000	24.000	4.110	15.814	16.000
overconfidence	2.200	9.500	1.300	5.655	5.800
cognitive reflection	0.000	4.000	1.086	1.756	3.000
experience	0.000	30.000	5.380	4.720	3.000
knowledge	2.000	10.000	1.443	6.640	7.000
style	1.000	10.000	1.705	2.605	2.000
size	0.000	3.000	1.124	0.831	0.000
diversification	1.000	10.000	1.926	4.806	5.000
risk evolution	1.000	10.000	1.487	5.436	5.000
crypto	1.000	10.000	1.246	5.145	5.000
crisis	0.000	1.000	0.299	0.100	0.000
Variables for the negative experience					
1st hand experience	0.000	1.000	0.420	0.773	1.000
1st hand magnitude	0.000	1.000	0.380	0.173	0.000
1st hand risk	0.000	2.000	0.844	1.337	2.000
2nd hand experience	0.000	1.000	0.497	0.564	1.000
2nd hand magnitude	0.000	1.000	0.457	0.289	0.000
2nd hand risk	0.000	2.000	0.514	1.818	2.000
current experience	0.000	1.000	0.328	0.878	1.000
current return	-0.500	0.288	0.153	-0.080	-0.100
current risk	0.000	2.000	0.670	1.244	1.000

Source: Compiled by the author

The socioeconomic variables include traits of investors such as their gender, age, country and city they live in, their education and income. The characteristics and attitudes group include 13 different variables, from the behavioral traits such as the investors' risk tolerance, optimism, overconfidence, cognitive reflection and the framing condition of the question regarding the expected return, to various investing related variables such as years of investing experience, financial and investing knowledge, experience in trading cryptocurrency and in investing during the crises, portfolio's size and diversification of the portfolio across asset classes, instruments and countries, investing style and the evolution of risk-taking over time. The group of variables regarding the negative experience consists of 9 variables, representing three different types of experiences with three different proxies.

2.2. Methodology

The study is focused on determining whether the negative experience has an impact on the investors' expected returns, therefore the most suitable method for analysing the data is the regression analysis. The regressions were run to test for two hypotheses, first concerning the impact of the prior experience and the second for the current experience. As the surveys were distributed at the beginning of the Covid-19 crisis, it presented the author with a good opportunity to assess the expectations for future returns and the planned changes in risk-taking behavior triggered by the current losses.

The dependent variable in the regressions is the investor's expected return of the S&P 500 index for the upcoming 10 years (*expected return*).

The explanatory variables are introduced to the models by three groups: firstly, the socioeconomic variables, followed by characteristics and attitudes and as the last step, variables relating to negative experience with the addition of variable for cognitive reflection. As for the negative experience, these can also be grouped into three, as we are looking for three separate experiences: the first-hand experience, the second-hand experience and the current experience. Firstly, there are variables for controlling whether the respondent even has an exposure to the losses for each kind of experience (*1st hand experience*, *2nd hand experience* and *current experience*) and the extent of this loss, if they have occurred any (*1st hand magnitude*, *2nd hand magnitude* and *current return*). The third variable controlling for negative experience is the investors' behavioral changes regarding their risk-taking

behavior after the occurred negative experience (*1st hand risk* and *2nd hand risk*) and/or the changes in their risk-taking that they plan on implementing due to the impact of the current market declines on their portfolio (*current risk*). The models also include a variable regarding the investors' exposure to the 1998 and/or 2008 crisis via active investing during that time (*crisis*) in order to control for the impact of prior crisis exposure to the expected return, as the main explanatory variables mentioned above are focused on all kinds of negative experiences.

The estimated models are tested against three possible shortcomings that may occur with the regression model: nonlinearity, heteroskedasticity, and abnormal distribution of residuals.

The nonlinearity test is certainly important, as fitting the nonlinear data to a linear regression is considered to be an extreme error and can result in inefficient or even extremely biased and/or inaccurate confidence intervals, therefore making it impossible to make any definite conclusions based on the model. The nonlinearity problem would require a nonlinear transformation of variables or logarithmic transformation of the data.

In the case of heteroskedasticity, the variability of one variable is impacted by the variability of another variable. This could result in possible incorrect conclusions from the model as the parameter estimates are not efficient and confidence limits are incorrect. Heteroskedasticity may occur due to the wrong specification of the model, omission of one or more significant explanatory variables, asymmetrical variables and occurrence of outliers. Heteroskedasticity is tested using the White's test.

It is also important that the residuals would follow a normal distribution in a linear regression. The abnormal distribution of residuals could therefore indicate a systematic error in the model that makes the composition of the model itself unreliable.

3. EMPIRICAL RESULTS

3.1. Model composition

As the aim of the thesis was determining whether there exists a relationship between the investors' prior and current negative experience and expected returns, the dependent variable in all composed models is the investors' expected return of S&P 500 index in the upcoming 10 years.

It was firstly checked whether the investors' socioeconomic variables by themselves as well as in collaboration with the investors' characteristics and attitudes have a significant impact on the expected returns without including the negative experience variables. The first model was conducted with the socioeconomic variables only, including *gender*, *age*, proxies for location (*country* and *city*), *education* and proxies for income. The data has several proxies of income: the monthly actual income (*income*), the income group to which they believe their income is most likely belong (*income group*) and their satisfaction with their household's financial situation (*fin satisfaction*). The income proxies were introduced to the basic model both separately and together. The correlation between the variables *income* and *income group* was 0.5, between *income* and *fin satisfaction* 0.3 and between *income group* and *fin satisfaction* 0.6, thus low enough that using the variables in the same regression would not raise multicollinearity concerns. The model including a combination of the variables *income* and *income group* was found to be of the largest explanatory power. The variable regarding the satisfaction with the financial situation of the household was left out from the base models as well as the following models, as it did not improve the model in any way.

The proxies for location (*country* and *city*) were determined to be insignificant in the base models as well as in the following models that were tested separately for the cases of both including and excluding the location proxies. The explanatory power of the models (measured with adjusted R^2) also increased in all of the models once the location proxies were excluded, therefore a decision was made

not to include location in any of the models. This should not raise any concerns, as most of the respondents are located in Estonia and the respondents' group was divided approximately as 50% respondents living in Tallinn and 50% elsewhere by the size of the city. Since the income of these two groups was not markedly different, it can be concluded that the majority of investors who reside not in Tallinn are actually living in its suburbs (and, thus, not markedly different).

The selected socioeconomic variables are believed to be important when determining the impact of the main explanatory variables on the expected return, therefore the socioeconomic variables included in the base model (Model 1.2) are kept in the following models regardless of the statistical significance. The statistical insignificance may occur due to a small sample size or not precise measurement of specific underlying constructs via questionnaire questions, resulting in, for example, measuring the variables with a lot of noise and therefore not coming up with the correct parameter estimates.

After testing the socioeconomic models, the variables representing the investors' characteristics and attitudes were added to the base model of the socioeconomic variables, including two income proxies *income* and *income group* (Model 1.2). The variables *condition*, *overconfidence*, *optimism* and *risk tolerance* are believed to certainly have an impact on the expected return. However, as *overconfidence* and *optimism* were initially far from statistical significance, it was decided to test for whether the explanatory power of the model would improve by excluding these two variables from the model. Therefore, firstly the Model 1.3 was estimated where all four before-mentioned models were included regardless of their statistical significance, and secondly, Model 1.4 where only variables *condition* and *risk tolerance* were considered as definite variables and *overconfidence* and *optimism* were treated as regular explanatory variables. There was some improvement in explanatory power in the model, though the increase was not large enough to support excluding the variables for good. The final model is, however, tested once again by excluding variables *overconfidence* and *optimism*, which is addressed in more detail later in this chapter.

Additionally, the variables representing investing and financial knowledge (*knowledge*), years of investing experience (*experience*), investing style (*style*), portfolio's size (*size*) and diversification across asset classes, instruments and countries (*diversification*), prior exposure to financial crisis

(*crisis*), prior experience with trading cryptocurrency (*crypto*) and the evolution of investors' risk-taking behavior (*risk evolution*) were added to the models to check whether these are statistically significant or improve the model fit and therefore explain the expected return. The only variable out of the additional explanatory variables found to be statistically significant was *style*. The models are presented in Table 2.

Table 2. Overview of the base models

Variables	**1.1**	**1.2**	**1.3**	**1.4**
constant	0.064 ***	0.075 ***	0.091 ***	0.099 ***
	(0.012)	(0.015)	(0.018)	(0.015)
gender	$4.3 * 10^{-4}$	$4.1 * 10^{-4}$	0.004	0.004
	(0.006)	(0.006)	(0.005)	(0.005)
age	$-4.6 * 10^{-5}$	$-6.6 * 10^{-5}$	$2.4 * 10^{-5}$	$-6.2 * 10^{-5}$
	(0.000)	(0.000)	(0.000)	(0.000)
D2 education	-0.002	-0.002	-0.004	-0.003
	(0.007)	(0.007)	(0.006)	(0.006)
D3 education	0.002	0.003	-0.001	$4.0 * 10^{-4}$
	(0.007)	(0.007)	(0.006)	(0.006)
D4 education	0.062	0.061 ***	0.039 **	0.041 **
	(0.020)	(0.021)	(0.017)	(0.017)
D2 income	0.015 *	0.017 **	0.014 **	0.014 **
	(0.007)	(0.008)	(0.006)	(0.006)
D3 income	0.021 **	0.027 ***	0.023 ***	0.024 ***
	(0.008)	(0.009)	(0.008)	(0.008)
income group		-0.002	-0.003 **	-0.003 *
		(0.002)	(0.002)	(0.001)
condition			-0.038 ***	-0.037 ***
			(0.005)	(0.005)
risk tolerance			0.002	0.002
			(0.002)	(0.002)
optimism			$-1.7 * 10^{-4}$	
			(0.001)	
overconfidence			0.003	
			(0.002)	
style			-0.004 **	-0.003 *
			(0.002)	(0.002)
N	159	159	159	159
Adjusted R^2	0.06	0.06	0.33	0.37
P-value (F)	0.02	0.02	$1.14 * 10^{-10}$	$7.88 * 10^{-13}$

Source: compiled by the author

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

All of the models presented in Table 2 were tested for heteroskedasticity, nonlinearity and normality of residuals. None of the models had a heteroskedasticity problem at probabilities of $p_{1.1} = 0.41$, $p_{1.2} = 0.69$, $p_{1.3} = 0.91$ and $p_{1.4} = 0.82$. There was also no problem with nonlinearity in most of the models at probabilities $p_{1.1} = 0.91$, $p_{1.3} = 0.48$ and $p_{1.4} = 0.23$. As for Model 1.2, when testing for nonlinearity using squares, the p-value amounted to 0.04, indicating a nonlinearity problem. However, when testing for the nonlinearity using logs, the p-value was 0.16, indicating a linear relationship. The distribution of residuals was abnormal in all basic models at probabilities of $p_{1.1} = 8.76 * 10^{-7}$, $p_{1.2} = 7.74 * 10^{-7}$, $p_{1.3} = 9.43 * 10^{-7}$ and $p_{1.4} = 8.33 * 10^{-10}$. The basic models do not, however, include all the variables and are thus not final and not used for any definite conclusions, thus the abnormality of residuals is not considered to be such a significant shortcoming in this case.

The explanatory power of the basic models is quite significant, as for Model 1.3 the R^2 amounts to 0.33 and in Model 1.4 to even 0.37, indicating that the variables used in the base models are able to explain 33-37% of the dependent variable, investors' expected return for the next 10 years. It is also evident here that the model excluding *optimism* and *overconfidence* has a higher explanatory power than the model including these two variables. As the following models were estimated in both ways, by including and excluding the two variables, the explanatory power of the base model does not require that much focus as that of the following models.

Next, the proxies for all three negative experiences (prior first-hand, prior second-hand and current experience) were added to the model (Table 3). In models 2.1-2.4, only the proxies of the exposure to negative experience (*1st hand experience*, *2nd hand experience*, *current experience*) are used to represent the negative experience, while in models 3.1-3.4 these variables are replaced with the magnitude of the negative experience (*1st hand magnitude*, *2nd hand magnitude*, *current return*) to test for which of the two proxies explains the exposure to the experience better.

The proxies for different types of experiences are introduced to the model one by one (Models 2.1-2.3 and 3.1-3.3) and by groups (Models 2.4 and 3.4). The models were also tested by using both the base model including variables *overconfidence* and *optimism* as well as the base model excluding the two variables in order to find the best fitting solution, relying on the models' explanatory power.

Table 3. Overview of the models including negative experience

Variable	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4
1st hand experience	0.002 (0.006)			0.001 (0.006)				
1st hand magnitude					0.004 (0.007)			-0.002 (0.015)
2nd hand experience		0.004 (0.005)		0.004 (0.005)				
2nd hand magnitude						-0.001 (0.008)		-0.002 (0.010)
current experience			0.002 (0.008)	0.002 (0.008)				
current return							0.028 * (0.017)	0.036 (0.033)
Base model	YES	YES	YES	YES	YES	YES	YES	YES
N	159	159	159	159	125	74	136	55
Adj. R^2	0.37	0.37	0.37	0.36	0.40	0.29	0.31	0.32
P-value(F)	$9.42^{*}10^{-12}$	$6.72^{*}10^{-12}$	$9.38^{*}10^{-12}$	$5.00^{*}10^{-11}$	$8.86^{*}10^{-10}$	$7.57^{*}10^{-4}$	$7.24^{*}10^{-8}$	0.007

Source: compiled by the author
Note: * p < 0.1; ** p < 0.05; *** p < 0.01

All of the models presented in Table 3 were tested for heteroskedasticity, nonlinearity and normality of residuals. The heteroskedasticity was not present in any of the models at probabilities $p_{2.1} = 0.97$, $p_{2.2} = 0.70$, $p_{2.3} = 0.84$, $p_{2.4} = 0.48$, $p_{3.1} = 0.93$, $p_{3.2} = 0.43$, $p_{3.3} = 0.87$ and $p_{3.4} = 0.33$. There was also no problem with non-linearity in most of the models at probabilities $p_{2.1} = 0.49$, $p_{2.2} = 0.49$, $p_{2.3} = 0.47$, $p_{2.4} = 0.48$, $p_{3.1} = 0.97$, $p_{3.3} = 0.26$ and $p_{3.4} = 0.68$, while for Model 3.2 the test's p-value was $p_{3.2} = 0.07$ that could be considered as indication of nonlinear relationship when relying on significance scale of 0.1. However, testing the nonlinearity against the statistical significance of 0.05 or running the test with logs instead of squares, the p-value then being 0.20, would suggest a linear relationship.

In any of the models, the residuals were not normally distributed at probabilities $p_{2.1} = 1.73 * 10^{-10}$, $p_{2.2} = 2.73 * 10^{-10}$, $p_{2.3} = 1.13 * 10^{-10}$, $p_{2.4} = 3.90 * 10^{-10}$, $p_{3.1} = 4.51 * 10^{-9}$, $p_{3.2} = 4.21 * 10^{-6}$, $p_{3.3} = 3.92 * 10^{-10}$ and $p_{3.4} = 5.16 * 10^{-6}$. The normal distribution of the residuals is undoubtedly a noteworthy issue and the author is aware of the impact it may have on the standard errors. However, as the sample

size is believed to be large enough, no forecasts are compiled based on the model and the deviations do not seem to be too large on the residual distribution graph, at least the directions of the variable coefficients can be considered to be trustworthy even with the abnormal distribution of the residuals.

The explanatory power (adjusted R^2) is again quite significant, as the explanatory power of all of the models is in the range of 0.30-0.40, indicating that the variables are able to explain approximately 30-40% of the investors' expected return. The only model with a statistically significant explanatory variable for negative experience has an explanatory power of 0.31 (31%) and the model is statistically significant with a p-value of $7.24 * 10^{-8}$.

As a next step, the variables representing the change in risk-taking behavior were introduced to the models in cooperation with variables of exposure to negative experience and/or magnitude of such experience. The risk behavior related variables are treated as discrete variables and included in the models as dummies for decreasing the risk-taking behavior (*D1 1st hand risk* and *D1 2nd hand risk*) and increasing the risk-taking behavior (*D2 1st hand risk* and *D2 2nd hand risk*), which were tested against the dummy variable for not changing the risk-taking behavior or making rational changes in their investing behavior.

The models were herein also tested for whether the variables for the exposure to the losses (*1st hand experience*, *2nd hand experience* or *current experience*) would indicate a statistically significant relationship if together in the model with the variables for the magnitude of the losses (*1st hand magnitude*, *2nd hand magnitude* or *current magnitude*) instead of treating the variables as substitutes as in the previous models.

While the model including all variables at once has an explanatory power of 0.21, the other models estimated in such way have an explanatory power in the range of 0.31-0.39, suggesting that the variables included in those models can explain 31-39% of the dependent variable *expected return*. The models 4.1-4.7 including all proxies for all negative experiences are presented in Table 4.

Table 4. Overview of the models including negative experience and response to negative experience

Variable	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8
1st hand experience	-0.033 (0.028)				-0.018 (0.042)	-0.029 (0.032)	0.009 (0.007)	
1st hand magnitude	0.005 (0.007)				-0.004 (0.022)	-0.002 (0.015)		
D1 1st hand risk	-0.002 (0.006)				0.001 (0.018)			
D2 1st hand risk	0.006 (0.007)				0.016 (0.015)			
2nd hand experience		0.002 (0.005)			-0.009 (0.025)	-0.003 (0.020)		
2nd hand magnitude					-0.003 (0.012)	0.001 (0.010)		
D1 2nd hand risk		0.014 (0.010)			0.014 (0.019)			
D2 2nd hand risk		0.014 (0.009)			-0.004 (0.021)			
current experience			0.009 (0.010)	0.010 (0.010)	0.052 * (0.028)	0.036 * (0.020)		
current return			0.035 * (0.018)	0.036 * (0.019)	0.047 (0.045)	0.055 (0.035)	0.035 * (0.018)	0.028 * (0.017)
D1 current risk			0.005 (0.008)		-0.013 (0.023)			
D2 current risk			0.005 (0.006)		-0.013 (0.014)			
Base model	YES	YES	YES	YES	YES	YES	YES	YES
N	125	147	136	136	51	55	136	136
Adj. R^2	0.39	0.35	0.31	0.31	0.21	0.34	0.31	0.31
P-value (F)	$5.54*10^{-9}$	$6.07*10^{-10}$	$4.02*10^{-7}$	$1.11*10^{-7}$	0.142	0.008	$9.44*10^{-8}$	$7.24*10^{-8}$

Source: compiled by the author
Note: * p < 0.1; ** p < 0.05; *** p < 0.01

All models were also tested for all three possible shortcomings. Heteroskedasticity was not existent in the models with statistical significance of $p_{4.1} = 0.57$, $p_{4.2} = 0.37$, $p_{4.3} = 0.71$, $p_{4.4} = 0.81$, $p_{4.5} = 0.15$, $p_{4.6} = 0.36$, $p_{4.7} = 0.71$ and $p_{4.8} = 0.87$. There were also no nonlinearity problems at p-values of $p_{4.1} = 0.98$, $p_{4.2} = 0.88$, $p_{4.3} = 0.32$, $p_{4.4} = 0.29$, $p_{4.5} = 0.50$, $p_{4.6} = 0.57$, $p_{4.7} = 0.26$ and $p_{4.8} = 0.26$ existent in the models. However, similarly to all previous models, the ones presented here also had a problem with the abnormal distribution of residuals at probabilities $p_{4.1} = 8.98 * 10^{-9}$, $p_{4.2} = 1.76 * 10^{-7}$, $p_{4.3}$

$=7.26 * 10^{-10}$, $p_{4.4} = 6.31 * 10^{-10}$, $p_{4.5} = 0.001$, $p_{4.6} = 1.16 * 10^{-5}$, $p_{4.7} = 3.01 * 10^{-9}$ and $p_{4.8} = 3.92 * 10^{-10}$. As before, the author is here again aware of the issues that may arise from the abnormality of the residuals, however the problem is not considered to be to such extent that it would prevent the correct interpretation of the models.

As a final step, the *cognitive reflection* variable was also introduced to the final models to check for the investors' ability to override the decisions made by their subconscious mind and therefore make more reasoned investing decisions in cooperation with the relationships already found significant, as the selected models with the best fit from Table 4 were treated as base models for the models presented in Table 5.

Models 5.4 and 5.5 were found to be the models with the best fit for explaining the dependent variable, the investors' expected return for upcoming 10 years, with the negative experience explanatory variables. The Model 5.4 was estimated based on the basic model. The models were also estimated by eliminating statistically insignificant explanatory variables that had previously been considered to certainly impact the *expected return*, such as *overconfidence*, *optimism* and *risktolerance*, in order to determine whether the first-hand experience would turn out statistically significant in any of the models. While the elimination of *risk tolerance* did not improve the model in any way, eliminating the *overconfidence* and *optimism* slightly improved the explanatory power of the models as well as decreased the p-value of both *cognitive reflection* and *1st hand experience*.

The lowest p-value found for variable *1st hand experience* was 0.15 in Model 5.6, which is slowly approaching 0.1 and thus statistical significance, suggesting that if we had a larger sample size, the variable could turn out to be statistically significant. Similar fact could be stated for *cognitive reflection*, as the lowest p-value for this variable, also in Model 5.6, is 0.16. The models including cognitive reflection as well as the models from Table 4 with excluded optimism and overconfidence are presented in Table 5.

Table 5. Overview of the additional models

Variable	5.1	5.2	5.3	5.4	5.5	5.6
1st hand experience			-0.019 (0.033)	0.009 (0.003)	0.009 (0.007)	0.003 (0.002)
1st hand magnitude			-0.003 (0.015)			
2nd hand experience			-0.002 (0.020)			
2nd hand magnitude			0.003 (0.010)			
current experience	0.009 (0.010)	0.01 (0.010)	0.036 * (0.020)			
current return	0.037 ** (0.019)	0.038 ** (0.019)	0.055 (0.035)	0.039 ** (0.018)	0.036 ** (0.018)	0.040 ** (0.007)
D1 current risk	0.004 (0.008)					
D2 current risk	0.005 (0.006)					
cognitive reflection	0.003 (0.002)	0.003 (0.002)	0.006 (0.005)	0.003 (0.002)		0.003 (0.002)
Base model	YES	YES	YES	YES	excl. optimism & overconfidence	excl. optimism & overconfidence
N	136	136	55	136	136	136
Adj. R^2	0.31	0.31	0.35	0.32	0.32	0.32
P-value (F)	$5.68*10^{-7}$	$1.55*10^{-7}$	0.008	$7.72*10^{-8}$	$1.74*10^{-8}$	$1.97*10^{-8}$

Source: compiled by the author
Note: * p < 0.1; ** p < 0.05; *** p < 0.01

None of the models had problem with heteroskedasticity (p-values of $p_{5.1} = 0.64$, $p_{5.2} = 0.59$, $p_{5.3} = 0.35$, $p_{5.4} = 0.63$, $p_{5.5} = 0.93$ and $p_{5.6} = 0.90$), nor with non-linearity in the first five models (p-values of $p_{5.1} = 0.16$, $p_{5.2} = 0.17$, $p_{5.3} = 0.55$, $p_{5.4} = 0.12$ and $p_{5.5} = 0.13$). For Model 5.6, running non-linearity test with squares resulted in a p-value of 0.05, as on the edge of statistical significance, while running the test with logs results in p-value of 0.19. However, all models once again have abnormal distribution of residuals at statistical significance of $p_{5.1} = 1.63 * 10^{-9}$, $p_{5.2} = 1.52 * 10^{-9}$, $p_{5.3} = 1.87 * 10^{-5}$, $p_{5.4} = 8.13 * 10^{-9}$, $p_{5.5} = 6.67 * 10^{-9}$ and $p_{5.6} = 2.03 * 10^{-8}$. The abnormal residuals will be kept in mind when interpreting the models, as the coefficients of the variables cannot be entirely relied upon.

However, the author considers statistically significant relationships and the direction of the relationship to be reliable.

The robustness checks were also performed for the final models by running the regressions with robust standard errors. The results of the regressions remain effectively unchanged in the model with robust standard errors, therefore the set-up of the model is correct and fit to estimate the dependent variable.

3.2. Model interpretation

In the models including only the socioeconomic variables (Model 1.1 and Model 1.2), the variables found to be statistically significant are *income* and the fourth level dummy for *education*, in essence the proxy representing the investors with a Doctorate degree. The positive coefficients of the second level (salary of €1000-€2000) and third level (salary of over €2000) dummies for *income* suggest that the higher the income, the higher is the respondent's expected return. The fourth level dummy for *education* indicates that the investors with a PhD degree have higher expectation for future returns. Although the variables *gender* and *age* are not statistically significant in the Models 1.1 and 1.2, the basic socioeconomic variables are by common knowledge considered to have an impact on the investors' expected returns, thus none of the variables *gender*, *age*, *education* and *income* are omitted from the model even if they turn out to not be statistically significant. The only exception made here was for location proxies *country* and *city*, as they did not improve the models' explanatory power, were insignificant in all models and did not have such variability that would make the variables necessary in the models, thus including the two variables in the model would have only resulted in additional noise.

In the following models (Model 1.3 and Model 1.4), various characteristics and attitudes were added to the model, of which the variables *condition*, *risk tolerance*, *optimism* and *overconfidence* were believed to certainly impact the dependent variable, once again regardless of the statistical significance in the current models. Out of the four variables, only the *condition* variable was proven to be statistically significant in the base models with coefficients in the range of -0.037 to -0.038 (and the variable was also significant in all of the following models with coefficients in a range of -0.033 to -0.040), suggesting that the investors presented with the pessimistic example of the historical return

of the S&P 500 index have lower expectations for the return of the S&P 500 index in the upcoming 10 years and therefore confirming the existence of a framing effect. As the *optimism* and *overconfidence* were quite far from statistical significance, in Model 1.4 it was tried to estimate a model without including these two variables. Although the explanatory power of the model increased, omitting the variables did not have such a significant impact in the following models that it would be efficient.

In addition to the variables mentioned, the respondent's investing style (*style*) was also proven to be significant in both of the base models with a coefficient of -0.004 and -0.003, indicating that the more the investor leans towards intraday trading style rather than the long-term buy and hold investing style, i.e. the more active trader the investor is, the lower return they expect from the S&P 500 index. The *style* variable remained significant in most of the following models as well with a coefficient of -0.003 to -0.008.

One of the main tests in the composition of base models was choosing the most accurate income variable to use. It was found that the models including two proxies for income - the actual monthly income (*income*) and the variable representing to which income group the respondent classifies their household (*income group*) - were of higher explanatory power and statistical significance than the ones including only the *income* or the *income group* variable. Both income proxies were also statistically significant in most of the models, proving that the decision to include both *income* and *income group* in the models is valid.

The variables representing negative experience were introduced to the models one by one as well as by groups. In the models including only the respondents' exposure to the negative experience (*1st hand experience*, *2nd hand experience* and *current experience*) or the magnitude of such experience (*1st hand magnitude*, *2nd hand magnitude*, *current return*), the *current return* was found to be statistically significant only once, in Model 3.3 with a coefficient of 0.028. The explanatory power of this model is 0.31 (31%) and it is statistically significant at p-value of $p = 7.24 * 10^{-8}$. An interesting fact here is that out of all estimated models, Model 3.1 was the only one where the behavioral variable *overconfidence* was found statistically significant with a coefficient of 0.004 and with a p-value of 0.097, and Model 3.4 the only one where *optimism* was statistically significant with a coefficient of -

0.002 and with a p-value of 0.081. This would indicate that while more overconfident investors expect higher returns, the more optimistic investors tend to have a lower expected return.

In the models in group 4 (Table 4), the variables were introduced to the model in separate groups of variables regarding the same experience (exposure, magnitude and risk-taking changes of negative experience) as well as all variables together. While no statistically significant relationship was found in the case of prior first-hand nor second-hand experience, the impact of current negative experience (*current experience*) as well as the portfolio's return since the beginning of this year (*current return*) were determined to be statistically significant in various models. The variables were also found to be statistically significant in the final models (Table 5), though never in the same models at once.

The coefficients of variable *current experience* were in the range of 0.036-0.052, indicating a positive relationship and therefore that the investors who have experienced losses in their portfolio since the beginning of this year, during the Covid-19 crisis, expect higher returns in the upcoming 10 years than the ones whose portfolio has not suffered this year. The variable *current return* had coefficients in the range of 0.035-0.038, also suggesting a positive relationship, as in the investors with higher portfolio's return this year expect higher returns in the future.

It is also worth mentioning that even though the first-hand experience did not prove to be statistically significant in any of the models, the final models were tested in various ways and the p-value of variable *1st hand experience* dropped to 0.175 in Model 5.4 (the Model 4.7 with an addition of *cognitive reflection*) and even to 0.161 in Model 5.5 (Model 4.7 with elimination of *overconfidence* and *optimism*) and 0.148 in Model 5.6 (Model 5.5 with an addition of *cognitive reflection*). Such results suggest that in the case of a larger sample size or data of higher quality, this variable could possibly be statistically significant, as it is not that far from significance in the final models.

As for the changes in the investors' risk-taking behavior, although the variables provided interesting background information, the variables were not proven to be statistically significant in any of the models.

The final part of the modelling was including the variable relating to cognitive reflection in the models to determine how the investors' critical thinking and ability to override the decisions made by their subconscious mind influences the expected return. The *cognitive reflection* variable was not found to be statistically significant, as in models 5.1-5.3 the p-value was in the range of 0.21-0.30. However, in Model 5.4 including only the *1st hand experience* and *current return* from the negative experience variables group, the p-value of *cognitive reflection* was 0.177, and for Model 5.6 tried out with the elimination of *overconfidence* and *optimism* variables, p-value amounted to 0.166. The variable is therefore much closer to statistical significance in the models with best fit to the data, thus similarly to the conclusion made regarding the impact of *1st hand experience*, the *cognitive reflection* could also be considered to possibly have a statistically significant impact in the case of a larger sample size.

3.3. Discussion

The regression models were conducted using socioeconomic variables, investors' characteristics and attitudes, as well as the main explanatory variables corresponding to the negative experience. In addition to the statistical significance of various basic explanatory variables, the analysis indicates a statistically significant positive relationship between the investors' expected return and the investors' portfolio's year-to-date return. Additionally, it is believed that in case of a larger sample size, the negative experience in the beginning of this year during the worldwide Covid-19 crisis as well as the prior first-hand negative experience could have a positive impact on the expected return.

Firstly, the base model (Model 1.3) suggests that out of all the basic explanatory variables included in the models, education, income represented by two variables, condition and investing style were found to be statistically significant in explaining the investors' future return expectations by themselves. According to the model, the investors earning a higher monthly income have a higher return expectation, while the investors classifying themselves into a higher income group expect a lower return. This might suggest that investors who are overoptimistic about their income relative to others have lower return expectations. This is in line with another finding, a negative association between optimism and expected returns (Model 3.4). Since in both cases, the underlying optimism attitude corresponds to broad optimism, it might be the case that more optimistic investors are more dedicated and thus have higher knowledge and experience, that is not fully captured by other variables in the

models. Thus, such investors are more realistic about the returns (especially controlling for overconfidence) in comparison to the less dedicated investors.

The basic explanatory variable statistically significant in all estimated models was the condition variable, suggesting that there is a significant variance in reported return depending on which example of the S&P 500 index's historical return the respondent was presented. The statistical significance of *condition* is a certain indication of people responding to framing effect, as the people relying on the negative example of the S&P 500 index's historical return had on average 3.82% lower expected return (Model 1.3) than the ones with a positive example. The magnitude of the effect is large, as it is 1.5 percentage points higher than the effect of having the highest level of income in comparison to the lowest level of income, and on the same level as having PhD in contrast to the lowest level of education.

As for the experience of the investors, the current experience was found to be statistically significant in various models and in two dimensions: the exposure to the portfolio losses due to the current Covid-19 crisis well as the return of the investors' portfolio since the beginning of this year. The two variables are, however, only statistically significant in separate models. The final model (Model 4.8 presented in full in Appendix 6) includes only the variable *current return* that suggests a positive relationship between the investors' current return and expected return, meaning that investors with higher portfolio returns since the beginning of this year also expect higher future returns from the S&P 500 index in the upcoming 10 years. This kind of relationship is consistent with the hot-hand fallacy, suggesting that investors with better prior experience expect their positive streak to continue. The positive relationship also coincides with the findings of Malmendier and Nagel (2011) who suggested that investors expect lower returns if their prior return has been lower, therefore would expect higher returns in case of higher prior returns.

Relying on the *current return* coefficient of 0.03 and standard error of 0.02, the coefficient is with 95% confidence in the range of -0.005 to 0.062 (-0.5% to 6.2%), thus there is a possibility that the actual coefficient may be negative, even though the mean coefficient strongly indicates a positive relationship. Also interestingly, while no other variable relating to the negative experience is statistically significant when together in the model with the *current return*, adding for example *1st*

hand experience or *current experience* to the model significantly increases the p-value for *current return*.

Additionally to the current return, variables *income*, *style* and *condition* are also statistically significant in the final model. While the impact of the average level of income (1000-2000 EUR) on the expected return is believed to be in the range of -0.002 to 0.028 (-0.2% to 2.8%) according to the confidence intervals, monthly income higher than 2000 euros certainly has a positive impact (with 95% confidence, the magnitude of such impact is in the range of 0.01% to 0.7%). More sophisticated investors are generally thought to let their return expectations be less driven by beliefs that market will continue moving forward in the same trend (Hoffmann, Post 2017) as well as investors with higher income usually tend to have lower expectations, while in the case of this study, the average expected return of people with average level of income is 7.8% and for people with higher level of income 8.5%.

Evident from the model is also the fact that the more actively trading investors tend to have lower return expectations for the S&P 500 index than the ones leaning towards buy-and-hold investing style. The *condition* variable has a coefficient of -0.036 (3.6%), indicating that the investors presented with the more pessimistic example of the S&P 500 index's historical return have 3.6% lower expected returns than the ones presented with an optimistic example, a result showing that people strongly respond to the framing effect.

It is interesting to note here that in some of the models tested, it was also evident that the investors tend to expect higher returns when their portfolio has very recently suffered or still is suffering from losses. This kind of relationship is only statistically significant in models where the current return is not (Model 4.6 in full in Appendix 7), while this finding is also contradicting to the one of the final model. The results, however, could be considered to be logical when taking into account the unexpected nature of the current market shock, which could make the investors expect the decline to be short-lived and the market to recover quickly. In addition, most of the investors that reported having experienced losses since the beginning of this year are long-term buy-and-hold investors – relying on the *style* variable, it is evident that 135 of the respondents who have experienced losses this year are leaning towards buy-and-hold investing style (values 1-4), 10 respondents classify themselves

somewhere in the middle (value 5) and only 6 are active traders. Investors with long-term investing horizon most likely also have more diversified portfolios and tend to be calmer about market shocks.

No statistically significant relationship was found between the prior negative experience and expected return, even though the variable representing the first-hand experience approached statistical significance in the lastly tested models with the smallest p-value of 0.15 for a coefficient of 0.01 (Model 5.6 in full in Appendix 8). This kind of results suggest that in the case of larger sample size or slightly better explanatory power or fit of the data in the models, the first-hand negative experience could possibly reach statistical significance. The coefficient of the variable is positive in the models of the highest p-value, therefore the relationship would most likely be positive and having experienced first-hand losses would thus increase the expected return of the investors.

CONCLUSION

The investors' responses to negative experiences have been studied numerous times. However, the results so far have not been conclusive on one specific direction, but rather divided into two groups: one that suggests that the negative experience directs the investors to decrease their risk-taking and thus expect lower returns, while the other believes that the investors start taking more risks and therefore increase their future returns.

It was time to have another look at the matter due to two main reasons. Firstly, most of the prior work on this topic has focused on the last financial crisis which was more than 10 years ago. The data of prior conclusions is therefore rather dated and it is believed that the investors' behavior and beliefs have changed quite a lot during the past 10 years. Secondly, we are currently on the verge of a new crisis triggered by the Covid-19 virus outbreak which provided a rare opportunity for studying the investors' planned behavior in regard to the negative experience and getting further insight into the thinking patterns behind the risk-taking behavior.

The aim of this thesis was to determine whether and how the investors' previous and current negative experience affects their expected returns.

The focus of the empirical part of this thesis was on answering the following research questions:

1. What kind of impact does the investors' previous negative experience have on their expected market returns?
2. What kind of impact does the investors' current negative experience have on their expected market returns?

The hypotheses were set to be the following:

1. There is a negative link between investors' prior negative experience and their expected market returns.
2. There is a negative link between investors' current negative experience and their expected market returns.

The data used in the thesis was collected via a survey among Estonian investors. The survey consisted of 59 questions, based on which the data set was formed that consists of 33 variables and roughly 172 observations for each variable. The main explanatory variable, negative experience, was studied on three different levels: prior first-hand experience, prior second-hand experience and current experience. There were also three variables corresponding to each: the exposure to the experience, the magnitude of the loss and the risk-taking related behavioral changes triggered by the experience.

Firstly, it was evident that the investors earning a higher income expect higher returns in the future, while investors classifying themselves in a higher-earning group reported lower expected returns, consistent with the finding of a negative relationship between optimism and expected returns. More active traders were also found to expect lower returns and investors were certainly responding to the framing effect, as the respondents presented with more pessimistic example of the historical S&P 500 index's return reported lower expected returns in every model tested. Additionally, investors with PhD degree and higher level of overconfidence were found to expect higher market returns.

The accuracy of the first hypothesis addressed in the thesis remained unknown, as none of the variables relating to first-hand nor second-hand experience were found to be statistically significant in the models. However, the proxy for first-hand experience approached the threshold of statistical significance in the final models with such coefficient that would suggest a positive relationship with the expected return.

The second hypothesis stated that the current negative experience should impact the expected return negatively. It was proven that the investors with higher returns since the beginning of this year, i.e. during the current market declines, have reported higher expected returns, a result consistent with the hot-hand fallacy – the expectation that the current luck will continue in the future. It was also proven based on several models that the investors having experienced losses due to the current crisis expect

higher returns in the future. The results are supported by the unexpected nature of the current crisis, thus expectation for quick market recovery, as well as the long-term buy-and-hold investing style of the respondents.

For the future studies focusing on a similar topic, the first suggestion would be either increasing the sample size for the survey or observing the investors' portfolios' performances directly instead of relying on the survey answers. Additionally, some proxies for the attitudes do not seem to explain the variables as effectively as they should, thus the set-up of some survey questions could possibly be improved or using the experimental approached, if possible, could fit even better to explain the variables under observation.

KOKKUVÕTE

SEOS NEGATIIVSE INVESTEERIMISKOGEMUSE JA OODATAVA TURUTOOTLUSE VAHEL EESTI INVESTORITE NÄITEL

Lisette Starostin

Investorite negatiivse investeerimiskogemuse järgset investeerimiskäitumist on korduvalt uuritud. Senini läbiviidud uuringud ei ole aga jõudnud ühtsete tulemusteni antud suhte suuna osas, vaid on pigem jagunenud kahte gruppi: esimese näitel suunab negatiivne investeerimiskogemus investoreid riskantsemate investeeringute vähendamiseni ja seega ka madalama oodatava ja reaalse tootluseni, samas kui teised usuvad, et investorid hakkavad rohkem riske võtma ja seeläbi suurendavad enda tuleviku tootlust.

Antud suhte lähemaks uurimiseks on kaks peamist põhjust. Antud teemat on uuritud peamiselt viimase suurema ülemaailmse finantskriisi näitel, mis toimus aastal 2008 ning millest on möödas juba enam kui 10 aastat. Eelnevate sarnaste uuringute läbiviimiseks kasutatavad andmed on seega üsna aegunud ning usutavasti on ka investorite käitumusmustrid ja uskumused viimase 10 aasta jooksul omajagu muutunud. Praegusel hetkel on maailmamajandus uue, Covid-19 viiruse põhjustatud kriisi lävel, mis võimaldas antud töö raames uurida ka investorite hiljutise ja praegugi käimasoleva negatiivse kogemuse mõju nende käitumisele ning saada täiendavaid teadmisi investorite riskikäitumise taga olevatest mõttemustritest.

Käesoleva töö eesmärgiks oli seega leida, kas ja kuidas mõjutab investorite varasem ja praegune negatiivne investeerimiskogemus nende oodatavat tootlust.

Töö empiiriline osa oli fokuseeritud järgnevatele uurimisküsimustele vastamisele:

1. Kuidas mõjutab investorite varasem negatiivne investeerimiskogemus nende oodatavat tootlust?
2. Kuidas mõjutab investorite praegune negatiivne investeerimiskogemus nende oodatavat tootlust?

Käesolevas töös analüüsiks kasutatavad andmed koguti 59 küsimusest koosneva küsimustiku abil, mida levitati Eesti investorite seas. Kogutud andmete põhjal koostati 175 vastaja vastustest ning 33 muutujast koosnev andmekogum.

Andmete analüüsiks kasutati lineaarset regressioonmudelit, mille sõltuvaks muutujaks oli oodatav tootlus. Selgitavad muutujad jagunesid kolme gruppi: sotsiaalmajanduslikud muutujad (sugu, vanus, riik, linn, haridus ja sissetulek), käitumuslikud muutujad (sõltuva muutuja tingimus, riskitolerants, optimism, liigne enesekindlus, kognitiivsete võimete peegeldus, investeerimiskogemus, finants- ja investeerimisalased teadmised, krüptovaluuta ja kriisiaegse investeerimise kogemused, portfelli suurus ja hajutatus varaklasside, instrumentide ja riikide lõikes, investeerimisstiil ja ajaloolise riskikäitumise areng) ning negatiivse investeerimiskogemusega seonduvad muutujad. Viimases jaotati negatiivne kogemus kolmeks: varasem isiklik kogemus, varasem kaudne kogemus ning praegune kogemus. Kõiki kolme investeerimiskogemuse liiki hinnati kolme dimensiooni lõikes, milleks on sellise kogemuse olemasolu, kogemuse ulatus ning muutused tulevases riskikäitumises tingitult antud kogemusest.

Töös leiti, et kõrgemat palka teenivad investorid ootavad tulevikus kõrgemat tootlust, samas kui investorite, kes paigutavad enda sissetuleku kõrgema sissetuleku gruppi, oodatav tootlus on madalam - viimane on kooskõlas leiuga, et investorite optimismi ja oodatava tootluse vahel on negatiivne seos. Doktorikraadiga ning kõrgema ülemäärase enesekindluse tasemega investorite oodatav tootlus oli kõrgem, samas kui aktiivsemalt kauplevad investorid ootavad madalamat tootlust kui pikaajalise osta-ja-hoia investeerimisstiiliga investorid. Igas testitud mudelis osutus statistiliselt oluliseks muutuja, mis esindab reageeringut oodatava tootluse küsimuses esitatud näitele. Investorid, kellele esitati oodatava tootluse küsimuse juures optimistlik versioon S&P 500 indeksi ajaloolisest tootlusest, raporteerisid keskmiselt 3.84% kõrgemat oodatavat tootlust järgnevaks 10 aastaks kui pessimistlikule versioonile toetunud vastajad.

Investorite varasema negatiivse kogemuse ja oodatava tootluse vahel statistiliselt olulist seost ei tuvastatud, kuigi individuaalsele kogemusele vastav muutuja lähenes lõplikes mudelites statistilisele olulisusele, mistõttu võib eeldada, et suurema valimi puhul võiks antud seos osutuda statistiliselt oluliseks. Investorite praeguse negatiivse kogemuse ja oodatava tootluse vahel tuvastati positiivne seos ehk hiljuti seoses Covid-19 kriisiga enda portfellis langust kogenud investorid ootavad tulevikus turuindeksilt suuremat tootlust. Antud tulemus viitab sellele, et tulenevalt antud kriisi olemusest ootavad investorid lühikest kriisi kestust ning kiiret turgude taastumist. Enamik investoritest, kes on käesoleval aastal kogenud enda portfelli väärtuse langust, on pikaajalised osta-ja-hoia stiiliga investorid ning seega tõenäoliselt rohkem hajutatud portfelliga ning rahulikumalt meelestatud erinevate turušokkide suhtes. Lisaks tuvastati statistiliselt oluline positiivne seos investorite käesoleva aasta portfelli tootluse ja oodatava turuindeksi tootluse vahel, mis on kooskõlas niiöelda kuuma-käe eksiarvamusega (*hot-hand fallacy*) ning indikeerib, et sel aastal enda portfellilt kõrgemat tootlust teeninud investorid ootavad ka edaspidi kõrgemat tootlust.

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APPENDICES

Appendix 1. Survey

I. General

1. Gender
2. Age
3. Which country do you live in?
4. Which city do you live in?
5. What is your highest finished education?
6. Please provide your monthly net income
7. On a scale of income, to which group is your household most likely to belong?
   1 - Lowest 10%, 10 - Highest 10%
8. How satisfied are you with the financial situation of your household?
   1 - Completely dissatisfied, 10 - Completely satisfied
9. Please rate your financial knowledge.
   1 - Virtually none, 10 - I know a lot
10. Please rate your investing knowledge.
    1 - Virtually none, 10 - I know a lot
11. Please rate your investing style.
    1 - Long-term buy and hold investing, 10 - intraday trading
12. How many years of investing experience do you have?
13. Were you actively investing at the time of the 1998 or 2008 financial crisis?
14. Please provide the size of your portfolio as a proportion of your annual income.
15. Do you have any experience in trading crypto assets?
16. If yes, how successful was your experience?
    1 - Large losses, 10 - Large gains
17. How diversified is your portfolio across different instruments?
    1 - Not diversified at all, 10 - very diversified
18. How diversified is your portfolio across different asset classes?
    1 - Not diversified at all, 10 - very diversified

19. How diversified is your portfolio across different countries?
    1 - Not diversified at all, 10 - very diversified

II. Risk

1. For a 50/50 chance lottery to gain €100 or gain €0, I would be willing to pay...
   1 - €0, 10 - €100
2. If given the chance to choose between (1) a sure gain of €500 and (2) a 50/50 chance to gain €1,000 or €0, I would lean towards option 1.
   1 - Strongly disagree, 10 - Strongly agree
3. I consider myself a high risk taker.
   1 - Strongly disagree, 10 - Strongly agree
4. If I had €10,000 for investing purposes, I would choose to allocate ... in high-risk investments.
   1 - 0%, 10 - 100%

III. Expected return

Version 1. What would you expect the average return of the S&P 500 index to be in the upcoming 10 years? You can rely on the information that the average annual return of S&P 500 index was 5.0% during the years 2000-2019.

Version 2. What would you expect the average return of the S&P 500 index to be in the upcoming 10 years? You can rely on the information that the average annual return of S&P 500 index was 11.1% during the years 2010-2019.

IV. First-hand experience

1. Have you experienced a large drop in your portfolio value?
2. Approximately how many such events can you recall?
3. Approximately how large was the largest drop in your portfolio value? If there have been more than one occasion, please focus on the most significant one.
4. How has your risk-taking evolved over time?
   1 - Decreased substantially, 10 - Increased substantially

5. After the experienced loss, I ...
    a. Took a break from investing
    b. Doubled my efforts in the market
    c. Learned more about investing
    d. Started to more thoroughly analyse my investment opportunities
    e. Decreased my trading activity
    f. Increased my trading activity
    g. Decreased my risk-taking behavior
    h. Increased my risk-taking behavior
    i. Decreased the share of low-risk assets in my portfolio
    j. Increased the share of low-risk assets in my portfolio
    k. Didn't change anything
    l. Other:
6. Has your portfolio suffered since the beginning of this year?
7. What has been your portfolio's return since the beginning of this year?
8. In the light of recent events and its impact on my portfolio, I plan to ...
    a. Take a break from investing
    b. Double my efforts in the market
    c. Learn more about investing
    d. Start to more thoroughly analyse my investment opportunities
    e. Decrease my trading activity
    f. Increase my trading activity
    g. Decrease my risk-taking behavior
    h. Increase my risk-taking behavior
    i. Decrease the share of low-risk assets in my portfolio
    j. Increase the share of low-risk assets in my portfolio
    k. Not change anything
    l. Other:

V. Second-hand experience

1. Has any of your close relatives and/or close friends experienced a large drop in their portfolio value that you're aware of?
2. Approximately how many such events can you recall?
3. Approximately how large was the largest drop in their portfolio value? If there have been more than one occasion, please focus on the most significant one.
4. After the loss they experienced, I ...
    a. Took a break from investing
    b. Doubled my efforts in the market
    c. Learned more about investing
    d. Started to more thoroughly analyse my investment opportunities
    e. Decreased my trading activity
    f. Increased my trading activity
    g. Decreased my risk-taking behavior
    h. Increased my risk-taking behavior
    i. Decreased the share of low-risk assets in my portfolio
    j. Increased the share of low-risk assets in my portfolio
    k. Didn't change anything
    l. Other:

VI. Investors' attitudes, preferences, and characteristics. Part I

1. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?
    a. 4 days
    b. 6 days
    c. 9 days
    d. 11 days
2. A man buys a pig for €60, sells it for €70, buys it back for €80, and sells it finally for €90. How much has he made?
    a. €0
    b. €10
    c. €20

    d. €30
3. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class?
    a. 28
    b. 29
    c. 30
    d. 31
4. Simon decided to invest €8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon ...
    a. has broken even in the stock market.
    b. is ahead of where he began.
    c. has lost money.
5. Have you encountered these questions before?

VII. Investors' attitudes, preferences, and characteristics. Part II

All questions are to be answered on a scale of 1-10, where 1 - Strongly disagree and 10 - Strongly agree

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax.
3. If something can go wrong for me, it will.
4. I'm always optimistic about my future.
5. I enjoy my friends' company a lot.
6. It's important for me to keep busy.
7. I hardly ever expect things to go my way.
8. I don't get upset too easily.
9. I rarely count on good things happening to me.
10. Overall, I expect more good things to happen to me than bad.

VII. Investors' attitudes, preferences, and characteristics. Part III

All questions are to be answered on a scale of 1-10, where 1 - Strongly disagree and 10 - Strongly agree

1. I am more skilled than an average investor.
2. I am a better than average driver.
3. I make healthier choices than an average person.
4. I have much more experience than an average investor.
5. I am more aware of the global issues than an average person.
6. I make more rational decisions than an average person.
7. I am better than average in my profession.
8. I make a better first impression than an average person.
9. I am more educated than an average person.
10. I am more open to new innovative and technological solutions than an average person.

Appendix 2. Cognitive Reflection Test

Question 1.

If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?

Options:

1. 4 days
2. 6 days
3. 9 days
4. 11 days

Correct answer: 1. 4 days

Intuitive answer: 3. 9 days

Question 2.

A man buys a pig for €60, sells it for €70, buys it back for €80, and sells it finally for €90. How much has he made?

Options:

1. €0
2. €10
3. €20
4. €30

Correct answer: 3. €20

Intuitive answer: 2. €10

Question 3.

Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class?

Options:

1. 28
2. 29
3. 30
4. 31

Correct answer: 2. 29

Intuitive answer: 3. 30

Question 4.

Simon decided to invest €8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon ...

Options:

1. has broken even in the stock market.
2. is ahead of where he began.
3. has lost money.

Correct answer: 3. has lost money

Intuitive answer: 2. is ahead of where he began

For each correct answer, the respondent receives 1 point, and for each incorrect answer 0 points. The total score of Cognitive Reflection Test is calculated as a sum of the points received and is therefore in the range of 0-4.

Appendix 3. Life Orientation Test

1. In uncertain times, I usually expect the best.
2. It's easy for me to relax. (Filler item)
3. If something can go wrong for me, it will. (Reverse scored)
4. I'm always optimistic about my future.
5. I enjoy my friends' company a lot. (Filler item)
6. It's important for me to keep busy. (Filler item)
7. I hardly ever expect things to go my way. (Reverse scored)
8. I don't get upset too easily. (Filler item)
9. I rarely count on good things happening to me. (Reverse scored)
10. Overall, I expect more good things to happen to me than bad.

The answers to the questions of Life Orientation Test are scored on a scale of 0-4, therefore the scale of 1-10 used in the survey for this thesis is adapted to the LOT scale. For questions 1, 4 and 10, strongly disagreeing is represented by 0 and strongly agreeing by 4. It is the opposite for questions 3, 7 and 9, as there strongly disagreeing is represented by 4 and strongly agreeing by 0. Filler items 2, 5, 6 and 8 are not taken into account. The total LOT score is calculated as the sum of all scores received for the 6 questions and the total value is therefore in the range of 0-24.

Appendix 4. Variables used in the analysis

Variable	Description
Dependent variable	
expected return	Expected return of the S&P 500 index in the upcoming 10 years
Explanatory variables	
Socioeconomic variables	
gender	Binary coding, where: 0 – female, 1 - male
age	The respondent's age
country	Binary coding, where: 0 – Estonia, 1 - Other
city	Binary coding, where: 0 - < 400 000 people, 1 - > 400 000 people
education	The respondent's highest finished education with coding, where: 0 - Secondary education 1 - Bachelor's degree or equivalent 2 - Master's degree or equivalent 3 - Doctorate degree
income	Monthly net income with coding, where: 0 - <€1 000 1 - €1 000 - €2 000 2 - >€2 000
income group	The proxy for income as a group where the respondent believes they belong by their income on a 1-10 Likert scale, where 1 - lowest 10% and 10 - highest 10%
fin satisfaction	The proxy for income as a respondent's reported satisfaction with their financial situation on a 1-10 Likert scale, where 1 - completely dissatisfied and 10 - completely satisfied
Characteristics and attitudes	
condition	Condition variable indicating whether the respondent was presented with optimistic or pessimistic example of the S&P 500 index return with binary coding, where: 0 - Optimistic, 1 - Pessimistic
risktolerance	Average of four risk-tolerance related questions on a 1-10 Likert scale, where 1 - risk-averse and 10 - risk-taking
optimism	Calculated according to LOT-R guidelines on a scale of 0-24
overconfidence	Average of ten overconfidence-related questions on a 1-10 Likert scale, where 1 - underconfident and 10 – overconfident
experience	Years of investing experience
knowledge	Average of self-reported financial and investing knowledge on a 1-10 Likert scale, where 1 - virtually none and 10 - knows a lot
crypto	Success of trading cryptocurrency as a numeric value on a 1-10 Likert scale, where 1-large losses, 5-zero gains/no experience, and 10-large gains

crisis	The investors' exposure to prior financial crises of years 1998 and 2008 with a binary coding, where: 0 - no existent exposure, 1 - existent exposure
size	The size of the respondent's portfolio as a proportion of their annual income with coding: 0 - < 50% 1 - 51-100% 2 - 101-300% 3 - > 300%
diversification	Average of diversification across instruments, asset classes and countries on a 1-10 Likert scale, where 1 - not diversified and 10 - very diversified
style	Self-reported investing style on a 1-10 Likert scale, where 1 - long-term buy and hold investing and 10 - intraday trading
risk evolution	The evolution of the respondent's risk-taking over time on a 1-10 Likert scale, where 1 - decreased substantially and 10 - increased substantially
cognitive reflection	Sum of correct answers on a Cognitive Reflection Test on a scale of 0-4
Variables for the negative experience	
1st hand experience	First-hand negative experience with binary coding, where: 0 - no existent negative experience, 1 - existent negative experience
1st hand magnitude	The extent of the first-hand loss with binary coding, where: 0 - < 40% of portfolio size, 1 - > 40% of portfolio size
1st hand risk	Risk-taking behavior after first-hand negative experience with coding: 0 - Decreased risk-taking behavior 1 - Increased risk-taking behavior 2 - Not changing anything or risk-neutral changes
2nd hand experience	Second-hand negative experience with binary coding, where: 0 - no existent negative experience, 1 - existent negative experience
2nd hand magnitude	The extent of the second-hand loss with binary coding, where: 0 - < 40% of portfolio size, 1 - > 40% of portfolio size
2nd hand risk	Risk-taking behavior after second-hand negative experience with coding: 0 - Decreased risk-taking behavior 1 - Increased risk-taking behavior 2 - Not changing anything or risk-neutral changes
current experience	Current crisis related negative experience with binary coding, where: 0 - no existent negative experience, 1 - existent negative experience
current return	The respondent's portfolio return since the beginning of the current year
current risk	Planned risk-taking behavior relating to the current Covid-19 crisis with coding: 0 - Decreasing risk-taking behavior 1 - Increasing risk-taking behavior 2 - Changing nothing or risk-neutral changes

Appendix 5. Correlation matrix

	expected return	gender	age	country	city	education	income	income group	fin satisfaction	condition	risk tolerance	optimism	over-confidence	experience	knowledge
expected return	1.00														
gender	-0.01	1.00													
age	-0.02	-0.15	1.00												
country	-0.01	-0.04	-0.12	1.00											
city	0.11	0.08	-0.21	-0.03	1.00										
education	0.09	-0.21	0.17	0.03	0.12	1.00									
income	0.20	0.13	0.05	0.12	0.20	0.15	1.00								
income group	0.02	0.04	-0.04	0.12	0.07	0.15	0.53	1.00							
fin satisfaction	0.02	0.00	0.02	0.13	-0.01	0.03	0.32	0.61	1.00						
condition	-0.55	0.06	-0.10	0.00	-0.03	-0.09	-0.08	-0.08	0.01	1.00					
risk tolerance	0.09	0.27	-0.10	0.08	0.04	-0.19	0.06	0.05	-0.10	-0.08	1.00				
optimism	0.01	-0.20	0.02	-0.02	-0.01	0.11	0.06	0.11	0.07	0.01	0.02	1.00			
overconf	-0.01	0.17	-0.15	0.08	0.12	0.07	0.28	0.37	0.21	0.10	0.16	0.23	1.00		
experience	0.03	0.16	0.36	-0.08	-0.18	-0.02	0.12	0.05	0.05	-0.08	0.08	-0.02	0.14	1.00	
knowledge	0.03	0.12	0.02	-0.02	0.05	-0.02	0.20	0.34	0.24	-0.04	0.10	-0.03	0.45	0.33	1.00
style	-0.09	0.19	0.15	0.04	-0.05	-0.27	-0.06	-0.01	-0.08	-0.02	0.30	-0.10	0.19	0.20	0.19
crypto	-0.06	-0.02	0.13	0.11	-0.04	-0.02	0.03	0.15	0.08	0.00	0.03	-0.03	0.12	0.11	0.18
crisis	-0.09	0.14	0.36	0.11	-0.15	-0.01	0.04	-0.02	0.07	0.02	0.04	0.04	0.14	0.65	0.23
size	0.02	0.25	0.15	0.04	0.11	-0.09	0.02	0.03	0.11	-0.07	0.05	-0.04	0.06	0.38	0.33
diversification	-0.16	0.06	0.00	-0.01	0.10	-0.07	0.01	0.10	0.01	0.08	0.04	-0.02	0.17	0.13	0.30
risk evolution	0.07	-0.08	-0.02	-0.22	0.08	0.02	-0.15	-0.12	-0.12	0.00	0.15	0.03	0.04	-0.02	-0.05
cognitive reflection	0.19	0.13	-0.07	-0.04	0.12	0.20	0.13	0.23	0.13	-0.12	-0.03	-0.02	0.04	0.07	0.11
1st hand experience	-0.02	0.11	-0.02	-0.04	0.05	-0.11	0.00	0.02	0.01	0.04	0.07	-0.18	-0.01	0.09	0.07
1st hand magnitude	0.00	0.19	0.17	-0.02	-0.12	-0.06	-0.10	-0.12	-0.05	0.01	0.16	-0.06	-0.07	0.38	0.04
1st hand risk	0.01	-0.11	-0.01	0.00	0.18	0.14	0.10	0.07	0.03	-0.02	-0.04	0.24	-0.03	-0.17	-0.18
2nd hand experience	0.04	0.11	-0.05	0.12	0.03	0.03	0.05	0.16	0.07	-0.01	-0.06	-0.03	0.10	0.11	0.06
2nd hand magnitude	-0.11	-0.19	-0.01	0.00	0.07	-0.08	-0.14	0.00	0.19	0.04	-0.09	0.12	-0.07	0.05	-0.07
2nd hand risk	-0.10	-0.02	-0.01	-0.03	0.07	0.01	-0.06	0.08	0.01	-0.07	-0.03	0.05	-0.02	-0.01	0.09

current experience	0.05	0.03	-0.20	-0.14	0.13	-0.04	-0.05	-0.07	-0.01	0.02	-0.07	-0.02	0.03	-0.02	0.01
current return	0.04	-0.19	0.21	-0.01	-0.05	0.05	-0.01	0.05	-0.01	0.03	-0.02	0.18	0.01	-0.06	-0.04
current risk	-0.08	0.02	-0.03	0.09	0.03	0.19	0.09	0.18	-0.01	0.07	0.07	0.11	-0.04	-0.10	-0.06

Source: calculations by the author

Appendix 5. Correlation matrix (cont.)

	style	crypto	crisis	size	diversi-fication	risk evolution	cognitive reflection	1st hand experience	1st hand magnitude	1st hand risk	2nd hand experience	2nd hand magnitude	2nd hand risk	current experience	current return	current risk
[…]																
style	1.00															
crypto	0.16	1.00														
crisis	0.17	0.16	1.00													
size	0.15	0.03	0.33	1.00												
diversification	0.16	0.02	0.04	0.19	1.00											
risk evolution	0.08	0.08	-0.06	0.01	0.03	1.00										
cognitive reflection	-0.17	-0.04	-0.02	0.21	-0.11	-0.02	1.00									
1st hand experience	0.07	-0.01	0.09	0.13	0.16	0.08	0.01	1.00								
1st hand magnitude	0.11	0.00	0.34	0.15	-0.06	-0.15	-0.05	0.04	1.00							
1st hand risk	-0.22	0.06	-0.16	-0.15	0.06	0.02	0.08	-0.19	-0.24	1.00						
2nd hand experience	0.04	0.10	0.02	0.12	0.18	-0.14	0.16	0.11	-0.03	-0.07	1.00					
2nd hand magnitude	0.00	0.12	-0.05	0.09	0.14	0.11	-0.12	0.02	0.07	0.05	0.17	1.00				
2nd hand risk	-0.03	-0.02	-0.08	0.02	0.10	0.06	0.14	0.01	-0.05	0.19	-0.20	0.13	1.00			
current experience	-0.15	-0.10	-0.06	-0.01	0.20	0.12	0.13	0.31	-0.19	-0.04	0.03	0.08	0.11	1.00		
current return	-0.03	0.10	-0.03	0.00	-0.09	-0.07	-0.18	-0.35	0.11	0.12	-0.11	-0.07	0.06	-0.41	1.00	
current risk	-0.26	0.01	-0.03	-0.13	-0.05	-0.01	0.02	-0.07	-0.15	0.36	0.01	-0.08	0.18	-0.05	0.06	1.00

Source: calculations by the author

Appendix 6. Model 4.8 – final model including current return

4.8: OLS, using observations 1-172 (n = 136)
Missing or incomplete observations dropped: 36
Dependent variable: expected return

	coefficient	std. error	t-ratio	p-value	
const	0.0927731	0.02171	4.273	$3.86*10^{-5}$	***
gender	0.0068087	0.00581009	1.172	0.2435	
age	$8.67817*10^{-5}$	0.00030991	−0.2800	0.7799	
D2 education	$-5.23626*10^{-5}$	0.00726377	−0.007209	0.9943	
D3 education	0.00218153	0.00726801	0.3002	0.7646	
D4 education	0.0271256	0.0213517	1.27	0.2064	
D2 income	0.0129083	0.00742865	1.738	0.0848	*
D3 income	0.0189154	0.008892	2.127	0.0354	**
income group	−0.00276682	0.00174008	−1.590	0.1144	
style	−0.00387269	0.00190236	−2.036	0.044	**
risk tolerance	0.00262237	0.00208708	1.256	0.2114	
condition	−0.0362098	0.00510985	−7.086	$9.93*10^{-11}$	***
optimism	−0.000389260	0.000668598	−0.5822	0.5615	
overconfidence	0.0025032	0.00224144	1.117	0.2663	
current return	0.0282434	0.0170224	1.659	0.0997	*

Mean dependent var	0.076779	S.D. dependent var	0.034263
Sum squared resid	0.097775	S.E. of regression	0.028426
R-squared	0.38306	Adjusted R-squared	0.311678
F(14, 121)	5.366369	P-value(F)	$7.24*10^{-8}$
Log-likelihood	299.1909	Akaike criterion	−568.3818
Schwarz criterion	−524.6920	Hannan-Quinn	−550.6274

Appendix 7. Model 4.6 – model including current experience

4.6: OLS, using observations 1-172 (n = 55)
Missing or incomplete observations dropped: 117
Dependent variable: expected return

	coefficient	std. error	t-ratio	p-value	
const	0.0851916	0.0651351	1.308	0.1992	
gender	0.00941057	0.0100876	0.9329	0.3571	
age	0.000985412	0.00103249	0.9544	0.3462	
D2 education	−0.00210858	0.0133742	−0.1577	0.8756	
D3 education	0.000673634	0.0131469	0.05124	0.9594	
D2 income	0.00486235	0.0153906	0.3159	0.7539	
D3 income	0.0232632	0.0169358	1.374	0.1781	
income group	−0.00450332	0.00270053	−1.668	0.1041	
style	−0.00631051	0.00365751	−1.725	0.093	*
risk tolerance	0.00597402	0.00445128	1.342	0.188	
condition	−0.0360420	0.00958927	−3.759	0.0006	***
optimism	−0.00191216	0.00122916	−1.556	0.1285	
overconfidence	0.00331485	0.00419759	0.7897	0.4349	
1st hand experience	−0.0292190	0.0324553	−0.9003	0.374	
1st hand magnitude	−0.00231477	0.014646	−0.1580	0.8753	
2nd hand experience	−0.00289674	0.019927	−0.1454	0.8852	
2nd hand magnitude	0.000522721	0.00975175	0.0536	0.9575	
current experience	0.03552	0.0199784	1.778	0.0839	*
current return	0.0548013	0.0350884	1.562	0.1271	

Mean dependent var	0.075655	S.D. dependent var	0.036529
Sum squared resid	0.031598	S.E. of regression	0.029626
R-squared	0.561489	Adjusted R-squared	0.342234
F(18, 36)	2.56089	P-value(F)	0.008005
Log-likelihood	127.1636	Akaike criterion	−216.3273
Schwarz criterion	−178.1879	Hannan-Quinn	−201.5785

Appendix 8. Model 5.6 – model including first-hand experience

5.6: OLS, using observations 1-172 (n = 136)
Missing or incomplete observations dropped: 36
Dependent variable: expected return

	coefficient	std. error	t-ratio	p-value	
const	0.0876736	0.0190446	4.604	$1.03*10^{-5}$	***
gender	0.00517859	0.00573043	0.9037	0.3679	
age	−0.000197883	0.000295674	−0.6693	0.5046	
D2 education	−0.00100126	0.00696045	−0.1438	0.8859	
D3 education	0.00063677	0.00695238	0.09159	0.9272	
D2 income	0.0105728	0.00732115	1.444	0.1513	
D3 income	0.0177187	0.00879472	2.015	0.0461	**
income group	−0.00252852	0.00169533	−1.491	0.1384	
style	−0.00308563	0.00185338	−1.665	0.0985	*
risk tolerance	0.00276672	0.00204981	1.35	0.1796	
condition	−0.0361492	0.00499756	−7.233	$4.54*10^{-11}$	***
1st hand experience	0.00951204	0.0065363	1.455	0.1482	
current return	0.039327	0.0177784	2.212	0.0288	**
cognitive reflection	0.00339183	0.00243263	1.394	0.1658	

Mean dependent var	0.076779	S.D. dependent var	0.034263
Sum squared resid	0.097062	S.E. of regression	0.028206
R-squared	0.387556	Adjusted R-squared	0.322295
F(13, 122)	5.938603	P-value(F)	$1.97*10^{-8}$
Log-likelihood	299.6883	Akaike criterion	−571.3766
Schwarz criterion	−530.5994	Hannan-Quinn	−554.8058

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