

Marcin Rzeszutek

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Marcin Rzeszutek¹

*Institute of Finance, Collegium of Management and Finance,
Warsaw School of Economics, Poland*

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Abstract

The aim of this paper is to investigate whether susceptibility to selected behavioral biases (overconfidence, mental accounting and sunk-cost fallacy) is correlated with the Eysenck's [1978] personality traits (impulsivity, venturesomeness, and empathy). This study was conducted on a sample of 90 retail investors frequently investing on the Warsaw Stock Exchange. Participants filled out a survey made up of two parts: 1) three situational exercises, which assessed susceptibility to behavioral biases and 2) an Impulsiveness Questionnaire, which measures impulsivity, venturesomeness, and empathy. The results demonstrated the relationship between venturesomeness and susceptibility to all behavioral biases explored in this study. We find that higher level of venturesomeness was linked with a lower probability of all behavioral biases included in this study.

Keywords: personality traits, behavioral biases, behavioral finance

JEL: G

Introduction

There is a wide consensus in the behavioral finance literature that the investment decision-making process is significantly shaped by psychological factors, such as moods, emotions or personality traits [Akerlof, Schiller, 2009; Camerer, Loewenstein, 2003;

Pompian, Longo, 2004; Szyszka, 2013]. Consistent findings from psychological research, evidencing that humans have limited cognitive abilities and are controlled by emotions while making choices in risky and uncertain situations, drew financial behaviorists' attention to drawbacks of the *homo economicus* assumption and the hypothesis about the market's efficiency [cf. Markowitz, 1952; Fama, 1970, 1991; Von Neumann, Morgenstern, 1944] and the susceptibility of investors to so-called behavioral biases, resulting from cognitive and heuristics biases as well as emotions [Agnew, 2006]. These biases disrupt the rationality of the process of making investment decisions and contribute to inefficient market reactions to information and, as a result, to asset mispricing [Coval, Shumway, 2005; Rzeszutek, Czerwonka, 2011, 2012].

Nevertheless, a substantial amount of behavioral models of capital markets disregard the problem of how individual investors differ from each other psychologically and treat investors as a homogenous group in their underlying psychological processes and the impact these have on their decision-making [Durand et al., 2008, 2013]. Some authors claim that the individual differences paradigm, which is widely used in the methodology of psychology [Franken, Murriss, 2005; Strelau, 2012], should be incorporated into behavioral finance models, where representative agents capture the average behavior of every investor on the stock market and there is no obvious role for subjective psychological characteristics [Borghans et al., 2008]. In particular, most studies in behavioral finance rely only on observable factors; being either socio-demographic variables such as gender, age, or investment characteristics, like portfolio characteristics as a proxy for the underlying psychological processes that drive investors' decision-making [Graham et al., 2009]. Unobservable, individual-level differences in psychological traits may help to better explain the underlying mechanisms of a wide variety of behavioral biases [Ferguson et al., 2011]. Despite the wide scope of published research considering the influence of psychological factors on investing behavior, the problem of how individual investors differ from each other in terms of intensity of some personality traits, and how these differences may be related to the susceptibility to behavioral biases, is still not well researched in the behavioral finance literature [Baddeley, 2013].

This study is focused on the role of individual differences in personality traits in investor behavior, as increasing number of authors proved that personality traits influence portfolio selection [Hunter, Kemp, 2004], investors' risk attitude [Sultana, Pardhasaradhi, 2010] and investors' financial outcomes [Moradi et al., 2013]. There is also considerable research on the relationship between personality traits and susceptibility to behavioral biases among stock market investors [Baddelley et al., 2010, 2013; Belcher, 2010; Sadi et al., 2011]. While there are many studies on the link between personality traits and risky behaviors [Weller, Tikir, 2011; Zuckerman, Kuhlman, 2000; Zuckerman, 2007], little attention has been devoted to the relationship between the personalities of investors and investment outcomes, strategies and the susceptibility to behavioral biases.

Mayfield et al. [2008] found that extraversion from the NEO-FFI Model of Personality [Costa and McCrae, 1992] is related to short-term investing and greater risk tolerance among a sample of US retail investors, while neuroticism is positively associated with risk aversion and short-term investing avoidance. Sadi et al. [2011] observed that neuroticism is positively correlated with propensity toward the sunk cost fallacy among Tehran investors. Research by Camgoz et al. [2011] indicates that extraversion is positively related with the level of overconfidence and the degree of portfolio turnover among investment fund managers. In addition, Durand et al. [2008] showed a positive relationship between extraversion and the susceptibility to disposition effect and overconfidence among Australian investors. On the other hand, Baddeley et al. [2010] discovered an association between particular Eysenck's [1978] personality traits (impulsivity, venturesomeness and empathy) and the susceptibility to herding behavior among British investors. From the aforementioned personality traits, impulsivity was negatively linked to the degree of hyperbolic discounting and the level of risk aversion in another study conducted on British investors [Borghans et al., 2008].

The Current Study

This study was based on the assumption that personality traits of investors are important psychological antecedents that affect their investment behavior and susceptibility to behavioral biases in particular. The main goal of the research is to test if susceptibility to selected behavioral biases (overconfidence, mental accounting and sunk-cost fallacy) is correlated with the Eysenck's [1978] personality traits (impulsivity, venturesomeness, and empathy). Since there is limited research in the behavioral finance literature investigating the issues mentioned in this article (or the existing results are ambiguous) the author treated this study as an exploratory research. Therefore, the following hypothesis is tested:

Susceptibility to behavioral biases (overconfidence, mental accounting, and sunk-cost fallacy), i.e. the tendency to display irrational behaviors in the decision-making process is correlated with certain personality traits (impulsivity, venturesomeness, and empathy) among participants.

Method

Participants and Procedure

This study was conducted on a convenience sample of 90 retail investors frequently investing on the Warsaw Stock Exchange. There were 42 men and 48 women. The average

participant age was 26.34 (SD= 8.08). The average years of investing on the Warsaw Stock Exchange was 4.23 (SD=2.12). The participants were recruited from among attendees of a conference organized by the Association of Individual Investors.

This research was focused on certain behavioral biases in order to measure their influence on an investor's behavior, *ceteris paribus*. The survey was delivered to the participants in person and participants were provided an explanation regarding the purpose of the study and details of the questionnaires as well as the anonymity and confidentiality of individual results.. The total response rate was 53%.

Materials

The survey was comprised of two parts. First, participants filled out a form made up of three situational scenarios [see, Appendix], in which they had to choose how they would behave in a hypothetical situation, where they were faced with a number of options. In each scenario, susceptibility to the behavioral biases mentioned in the hypotheses was assessed. These scenarios were used in classical studies on decision-making and in each scenario there was a rational answer, which means no susceptibility to behavioral bias measured by the particular scenario, and an irrational answer, which proved that the participant revealed a propensity toward a particular bias within the decision-making process. In the first scenario, which was adapted from Heath, Tversky [1991] the susceptibility to overconfident behavior was measured. In this scenario, according to Heath, Tversky [1991], answer A indicates a tendency to display overconfident behavior, and is treated as an irrational answer.

The second scenario, adapted from Thaler [1999], checked susceptibility to mental accounting. In this scenario, according to Thaler [1999], resigning from seeing the movie in A option and buying a new ticket to the cinema in B option is the answer indicating a propensity towards mental accounting, i.e. irrational behavior. Finally, the last scenario, adapted from Arkes, Blumer [1985], measured the propensity towards the sunk cost fallacy. In this scenario, according to Arkes, Blumer [1985], answer A indicates a tendency to display the sink cost fallacy, and is treated as an irrational answer.

In the second part of the survey, participants filled out the Impulsiveness Questionnaire: Impulsiveness, Venturesomeness, Empathy [IVE; Eysenck, Eysenck, 2006]. This tool is used to measure three personality traits: impulsivity, venturesomeness, and empathy. Impulsivity is defined as the pathological aspect of risk-taking behaviors, and indicates a very strong tendency to undertake risky, unplanned activities, quick decision-making and rash reactions. It is primarily manifested in problems with self-control and the inability to delay gratification. Venturesomeness measures not only readiness to undertake risky behaviors but also self-confidence, self-efficacy, perseverance in goal pursuit, and novelty-seeking. Although this trait is similar to impulsivity, the two traits differ in that impulsive people take risks without considering the consequences of their actions, whereas venturesome people seek out challenges and take risks, all the while taking into account

the possible consequences of their actions. Finally, empathy is the ability to perceive and understand and react to others' emotions, and the ability to take on others' emotional perspectives [Eysenck, 1978]. The IVE is comprised of 54 items in the form of questions with yes/no answers. Final scores were calculated by adding up "yes" answers to the items (some are reverse-scored) on three subscales: impulsivity, venturesomeness, and empathy. Reliability coefficients for the three IVE subscales range from $\alpha = .76$ to $\alpha = .081$ [Eysenck, Eysenck, 2006]. Reliability coefficients for the subscales in this study were $\alpha = .79$ for impulsivity, $\alpha = .78$ for venturesomeness, and $\alpha = .72$ for empathy.

Results

In order to investigate our hypothesis, logistic regression analyses were conducted. Susceptibility to behavioral bias was the outcome variable. Personality traits (impulsivity, venturesomeness, and empathy) were predictor variables. Three analyses were conducted, one for each of the exercises in the questionnaire. Results are presented in Tables 1, 2, and 3.

TABLE 1. Logistic regression analysis with personality traits as predictors of overconfidence in the sample of investors (n = 90)

Personality traits	B	Exp (B)	Wald	df	<i>p</i>
Impulsivity	-0,11	0,90	2,62	1	0,106
Venturesomeness	0,15	1,16	4,13	1	0,042
Empathy	0,01	1,01	0,04	1	0,844

Note: B – unstandardized regression coefficient; Exp (B) – standardized regression coefficient; Wald – Wald's test; df – degrees of freedom; *p* – level of statistical significance.

Source: own elaboration.

Results in Table 1 indicate that there was no significant relationship between impulsivity or empathy and susceptibility the level of overconfidence in the sample [respectively, $p = .106$ and $p = .844$]. There was a significant relationship between venturesomeness and the level of overconfidence, however [$p < .05$]. Specifically, the more venturesome a participant was, the less likely one revealed overconfident behavior [Exp (B) > 1], that is, the lower his susceptibility to overconfidence was, as measured in the task 1. Rational answers rational answers in the certainty effect exercise can be predicated accurately based *f* venturesomeness in 67% of all cases.

TABLE 2. Logistic regression analysis with personality traits as predictors of susceptibility to mental accounting in the sample of investors (n = 90)

Personality traits	B	Exp (B)	Wald	df	<i>p</i>
Impulsivity	-0,06	0,94	0,86	1	0,355
Venturesomeness	0,231	1,26	7,92	1	0,005
Empathy	-0,03	0,97	0,14	1	0,709

Note: B – unstandardized regression coefficient; Exp (B) – standardized regression coefficient; Wald – Wald's test; df – degrees of freedom; *p* – level of statistical significance.

S o u r c e: own elaboration.

Results in Table 2 indicate that, again, there is no relationship between impulsivity or empathy and susceptibility to mental accounting in the sample (respectively, $p = .355$ and $p = .709$). There was, again, a significant relationship between venturesomeness [$p < .05$] and susceptibility to mental accounting. Specifically, the more venturesome a person was, the more likely to give a rational answer in the mental accounting exercise ($\text{Exp (B)} > 1$). Rational answers in the mental accounting exercise based on venturesomeness can be predicted accurately in 68% of cases.

TABLE 3. Logistic regression analysis with personality traits as predictors of susceptibility to the sunk cost fallacy in the sample of investors (n = 90)

Personality traits	B	Exp (B)	Wald	df	<i>p</i>
Impulsivity	-0,08	0,92	1,23	1	0,268
Venturesomeness	0,20	1,22	5,35	1	0,021
Empathy	-0,04	0,96	0,32	1	0,572

Note: B – unstandardized regression coefficient; Exp (B) – standardized regression coefficient; Wald – Wald's test; df – degrees of freedom; *p* – level of statistical significance.

S o u r c e: own elaboration.

Results in Table 3 show no relationship between impulsivity or empathy and tendency to the sunk cost fallacy in this sample (respectively, $p = .268$ and $p = .572$). There was, however, again, a relationship between venturesomeness [$p < .001$] and susceptibility to the sunk cost fallacy. Specifically, greater venturesomeness was linked to lower susceptibility to the sunk cost fallacy when making decisions ($\text{Exp (B)} > 1$). On the basis of venturesomeness levels rational answers in the sunk cost fallacy exercise can be accurately predicted in 73% of cases.

Discussion

This study demonstrated the relationship between personality traits and susceptibility to behavioral biases among stock market investors. Among the studied personality traits, only venturesomeness was related to the degree of susceptibility towards biases among participants. A negative correlation was observed between venturesomeness and susceptibility to all behavioral biases studied, that is, overconfidence, mental accounting and the sunk cost fallacy (see Tables 1, 2 and 3). In other words, a higher level of venturesomeness was linked with a lower probability of behavioral biases.

To explain this result, it is worth mentioning that venturesomeness consists of self-confidence, self-efficacy, perseverance in goal pursuit, and a readiness to undertake risky behaviors and seek out new challenges. Venturesomeness attempts to measure different aspects of risk-taking tendencies and is seen as a characteristic of people who are fully conscious of potential risk but also fully determined to take it [Eysenck, Eysenck, 1978]. Several authors indicated that a high level of risk aversion among stock market investors is positively correlated with various behavioral biases (e.g. the attachment effect, see: [Corter, Chen, 2006]) or may be associated with too slow diversification of an investment portfolio and too slow reactions to changes on the capital market [Weller, Tikir, 2011]. In addition, Sultana and Pardhasaradhi [2010] found that the higher the risk tolerance among market investors, the more optimal and profitable their investment decisions.

This study did not support the role of the other personality traits – impulsivity and empathy – on the susceptibility or resistance to behavioral bias among investors (see Tables 1, 2 and 3). This result may be related to the underrepresentation of these personalities in the population of stock market investors, which was also mentioned in the literature [Mayfield et al., 2008]. High impulsivity reflects a pathological aspect of risky behaviors, an inability to control one's reactions, disregard for social norms, and inability to maintain long-term efforts [cf. Eysenck, Eysenck, 2006] and is linked to various abnormal behaviors such as gambling addiction [Mishra et al., 2010] and psychoactive substance abuse [Hayaki, Stein, 2006]. It seems that people with this personality profile appear very seldom in stock market investors. On the other hand, people characterized by high empathy, as measured with the IVE, are sensitive value close relationships with others, and are also submissive, obedient, and conflict-avoidant [Eysenck, Eysenck, 2006]. Taking into consideration the high level of stress and competition in stock investing, it is expected that empathy will not be a representative personality trait among stock market investors [Benos, 1998].

This study is not free of limitations. First, the exercises used to measure susceptibility to the studied behavioral biases [see: Appendix] might appear somewhat artificial to market investors, who deal with much more complex investment problems in their everyday decisions. Second, including personality traits into investment decisions is difficult due

to problems with defining personality traits in financial terms. Despite these limitations, this paper sheds some new light on the psychological determinants of decision-making in the capital markets. In particular, this study indicates that a higher level of venture-someness is linked with a lower probability of behavioral biases.

Notes

- ¹ Author's e-mail address: marcin.rzeszutek@sgh.waw.pl

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Appendices

Appendix 1. Exercise measures susceptibility to overconfident behavior

EXERCISE 1

Please imagine the following two situations, A and B, and circle the behavior that you would choose (A or B).

- A. A stock is selected at random from the Wall Street Journal. You guess whether it will go up or down tomorrow. If you're right, you win \$ 5.
- B. A stock is selected at random from the Wall Street Journal. You guess whether it went up or down yesterday. You cannot check the paper. If you're right, you win \$ 5.

Appendix 2. Exercise measuring susceptibility to the mental accounting

EXERCISE 2

Please imagine the following two situations, A and B, and circle the behavior that you would choose in each:

- A. You have decided to go see a movie and you have bought a ticket for 20 PLN. After entering the cinema, it turns out you have lost the ticket. You do however have a 20 PLN bill in your pocket. Do you spend another 20 PLN to buy another ticket, or do you decide not to see the movie?
- B. Now please imagine that you have decided to go see a movie but you have not yet bought a ticket. As you leave your home, you take two 20 PLN bills with you. After entering the cinema, it turns out that you have lost 20 PLN. In this situation, do you spend the other 20 PLN to buy a ticket, or do you decide not to see the movie?

Appendix 3. Exercise measuring susceptibility to the sunk cost fallacy**EXERCISE 3**

As president of a large aviation company, you have invested 10 million dollars into a development project. Its goal was to build an airplane that would quickly cover the distance between Europe and the USA. When your project is 90% complete, a rival company announces that it is introducing an identical plane onto the market, which, as it turns out, is much more economical than yours is to use. In this situation, would you invest the final 10% of the costs to complete the project (option A), or would you instead decide to immediately abandon it (option B)? *(please circle the option you would choose).*