Emerging Markets Group

EMG Working Paper Series

WP-EMG-05-2022

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January 2022

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Do Investment Fund Managers Behave Rationally in the Light of Central Bank Communication? Survey Evidence from Poland

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ABSTRACT:

The objective of our investigation was to understand the fund managers' decisions in response to the announcements of key macroeconomic indicators in Poland, in particular the data revealed by the Polish central bank, the National Bank of Poland (NBP), and to assess the rationality in their investment processes. Interest rates were found to be the most important information from the NBP. We also conclude that the NBP communication matters for investors, but its impact on their decisions is moderate. The stock market was the most popular market segment where the investments were made. The ultra-short time horizon plays no, or only very small, role in the surveyed fund managers' decisions as most of them invest in a longer 1-5 years horizon. Last but not least, majority of the fund managers manifested limited rationality of their decisions as they were susceptible to 5 out of 10 behavioural biases tested in our survey. Chi-squared test was further applied to establish the relationship between two categories of answers provided by surveyed group members related to their decisions and behavioural inclinations. We found that the decisions and behavioural inclinations are independent and they, in most cases, do not influence each other.

Keywords: Investment Funds, Fund Managers, Central Bank, Decision Making Processes, Behavioral Finance, Rationality

JEL: E58; E44; G41

1. INTRODUCTION

Investment decisions on financial market often depend on the arrival of new information and fund managers, as well as other groups of investors, react accordingly to diferent types of news and, in particular, to the macroeconomic data revealed by key institutions. One of the most important categories of announcements originates from central banks, which inform the market about their current (and/or future) monetary policy actions based on the direct signalling mechanism and through changes in investors' expectations.

The decision-making processes of fund managers are complex by nature and their behavioural inclinations often play a critically important role, because they may directly influence the way they react to new information and, consequently, affect their transactions on financial market. The goal of presented paper is therefore related to the research question about the relation between individual manager's inclinations and the investment decisions made by the investment funds.

In this paper, we discuss the results of a unique survey conducted on a group of fund managers in Poland, which relies on a very comprehensive questionnaire covering questions about the nature of their reactions to the central bank's announcements, but at the same time also the questions evaluating the behavioural biases of the surveyed managers.

Our study contributes to the scarce international literature using qualitative methods to investigate investment managers' behaviour and decisions. Previous papers for other markets, based on questionnaire surveys or interviews, include Cheung and Chinn (1999), Freeman and Bartels (2000), Arnswald (2001), Drachter, Kempf and Wagner (2007) and Foster, Warren (2016), Przychodzen et al. (2016), Ahmad et al. (2017), Hartwig et al. (2017), Gomez-Bezarez

and Przychodzen (2018), Jansen and Tuijp (2019) and they are typically subject to many limitations, suc as the low response rate. As suggested by Azimi (2019) large scale surveys of professional investors with identified respondents do not exist and they would be expensive to be conduct. The existing literature also focuses either on the decisions or on the behavioural biases of managers. However, to the best of our knowledge, our survey is the first such study that combines in one questionnaire the questions about the decision-making processes of fund managers in response to new information published by central banks with evaluation of their behavioural biases. Even though the number of questionnaires is limited, the answers are valuable for understanding the decisions made by investment funds managers.

The Polish capital market was chosen as a subject of our investigation as an example of the market that went through a significant transformation from a centrally planned economy to a market economy and which has been developing faster than many other developed and emerging markets. It should also be noted that the Polish stock market became dominated over time by institutional investors, such as investment funds or pension funds etc., which contributed to reduction of stock price volatility and to stabilisation effects at the Warsaw Stock Exchange (WSE), but at the same time there exists also evidence that they are able to affect stock returns (see e.g. Bohl, Brzeszczyński and Wilfling (2009) and Brzeszczyński, Bohl and Serwa (2019)). Rapid growth of the Polish financial market, faster than the European Union (EU) average, combined with the intensity of activity of professional institutional investors in Poland, make it, therefore, particularly interesting to analyse the fund managers decisions and to understand the factors affecting their actions.

In the 1990s, the investment attractiveness of many emerging markets increased significantly as a result of political and economic changes. These processes increased the role of emerging market economies on the map of global capital investments. With a current number of 50 foreign companies, the WSE is now one of the largest and most developed equity markets

in Central and Eastern Europe (CEE)[1]. Focusing on the investigation of the managers of large investment institutions can also help other market participants and, more importantly, the policymakers to understand how they make decisions that also influence market development.[2]

The investment fund market in Poland has been operating for nearly 30 years. The first asset management company, which introduced investment funds to the Polish financial market, was the Pioneer First Polish Trust Fund Company that was launched 15 months after the WSE opened in April 1991. At the end of 2019, 57 investment fund companies were operating, managing a total of 813 investment funds.[3] Between 1992 and 2018, the investment fund companies (IFC) market in Poland was characterised by a moderate or relatively low level of concentration. The determinants of IFC market concentration in this period were mainly external factors, such as market-based changes and those related to legislation. Despite many new entrants and the constantly changing attractiveness of investment fund products, the funds industry remained stagnant, predominantly due to the dominant role of some large investment fund companies with extensive experience, mainly belonging to banking and insurance groups (Filip and Miziołek 2019).

According to data from the Polish Financial Supervision Authority, the total value of investment fund assets in Poland at the end of 2019 was 320.4 billion in domestic currecny, PLN, which translates to about 80 billion USD. The data from the Chamber of Funds and Assets also show that at the end of 2019 the debt funds had the largest market share (42%) together with non-public assets (33%), although this data does not cover the entire market (i.e. about 84% of assets), because not all companies report their investments. Stocks (about 10%) were

[1] Centre for Social and Economic Research https://www.case-research.eu/index/?id=6b5ee2d2c609f170779100c2c092bc2b [accessed: 17-02-2020]
[2] Dietl M., Warsaw Institute https://warsawinstitute.org/polish-capital-market-one-year-promotion-developed-markets-status/ [accessed: 4 December 2019]
[3] Report on the financial situation of investment fund companies in 2019, [2020], Office of the Polish Financial Supervision Authority, Warsaw, https://knf.gov.pl/ [accesed: 10-10-2020]

held by mixed funds and equity funds. On September 22, 2018, the FTSE Russell and STOXX index agencies upgraded the Polish capital market to the developed market status.

In this paper, we report the results of a comprehensive survey of investment fund managers in Poland. The typical problem in such case is obviously access to the qualified personnel in financial institutions, who make crucial decisions in their respective companies. The research was carried out as part of a project financed by the National Science Center in 2017-2020. During this period, we managed to gain access to 25 financial institutions in Poland, which in light of difficulties to convince fund managers to take part in a lengthy survey like ours (in particular in a relatively small market as in Poland) should be considered a success. Simillar circumstances are described in the existing literature in papers by Cheung and Chinn (1999), Farnsworth and Taylor (2006), Freeman and Bartels (2000) and Kubińska et al. (2016). Also in the more mature and much larger markets, a similar scale of surveyed large financial institutions, using the interviews as a reseach method, was reported by Cohen et al. (2010), who conducted semi-structured interviews with 30 respondents from just three of the, so called, Big 4 accounting firms, and by Foster and Warren (2016), who interviewed staff in 10 Australian superannuation funds and obtained a sample of 10 questionnaires, which was considered to be sufficient and representative for their study.

The aim of this paper is to understand the reactions of fund managers to the arrival of new market data, in particular the announcements made by the National Bank of Poland, and also to assess how rational they are in their investment decisions. To achieve this goal, the authors looked for the relationship between behavioural inclinations of individual managers and their impact on the way decisions are made in the investment funds, regarding strategies and instruments, time horizon of investments, expectations and reactions before or after the announcements.

The contribution of our study is related to a large degree to the comprehensive nature of our survey, which combines together different aspects of the investment activity: information about the funds as financial institutions, factors that affect investment decisions, the decision-making patterns among fund managers and the analysis of their behavioural biases. The results of our questionnaire are also robust with respect to the Cronbach's alpha assessment of the questions asked in this survey. In the last part of our study, the relationship between the decisions made by investment fund managers and their behavioural bises is analysed using the chi-squared test.

Finally, it needs to be emphasized that as an emerging market economy undergoing a transition to a developed market economy, the data Poland has not been widely covered or analysed yet in the existing literature, in particular focusing on the behaviour of the investment fund managers, which is another important contribution of our paper.

The paper is organized as follows. Section 2 provides a literature review about the reaction of investors to the information arriving on financial markets, with a focus on the announcements released by central banks, and investment fund managers' behaviour. Section 3 presents the data and methods. Section 4 reports results from the surveys regarding the factors affecting the decisions of investment fund manages and behavioural biases, which they are subject to. It concludes with the Cronbach's alpha analysis regarding the questionnaire and chi-squared test investigating the relationship between the provided answers. Section 5 offers a discussion, which is followed by tha last Section 6 with a summary and conclusions concerning the behaviour of investment fund managers on the Polish market.

2. LITERATURE REVIEW

The reactions of investors to information that arrives on the financial market, in particular the information released by central banks, have been extensively analysed in the exisiting literature using quantitative methods. However, qualitative surveys are far less common, especially those conducted among investment funds managers and advisors etc. The main reason is obviously very limited access to these financial institutons.

We discuss first the literature about market reactions to the new information. Bennani (2020) uses the media coverage of the Fed chairman's statement to establish the degree of confidence and optimism expressed by the Fed chairman. Bennani called this variable “the overconfidence indicator”. In the second step he related the overconfidence indicator to investor sentiment. He discovered that an overconfident Fed chair is significantly linked to higher investors sentiment. Rosa (2011) investigated the effects of the Federal Reserve’s decisions and statements on the US stock and volatility indices (Dow Jones Industrial Average, NASDAQ 100, S&P 500 and VIX) using high-frequency data and an event study analysis. It was found that both the surprise component of policy actions and official communications have statistically significant and economically relevant effects on equity indices. In particular, the reaction of stock prices to monetary policy was characterised by much greater explanatory power. Other studies regarding the market reactions to new information on developed markets include Cutler et al. (1989), Berry and Howe (1994), Mitchell and Mulherin (1994), Anderson et al. (2000), Melvin and Yin (2000), Edmonds and Kutan (2002), Ranaldo and Rossi (2010), Hayo and Neuenkirch (2012), Riordan et al. (2013) and Kubacki (2014).

Despite the existence of many studies on advanced markets, there is scant research in this area for emerging markets. Brzeszczyński, Gajdka and Kutan, (2015) presented a review of the literature on investors reactions and sentiment regarding public information in emerging

markets. They considered three types of public information (monetary policy announcements, International Monetary Fund-related news and other public and political news) as factors that influence the market responses.

Brzeszczyński and Kutan (2015) also investigated empirically the reactions of the foreign exchange market to the National Bank of Poland (NBP) announcements in the period 2000–2003. They found that NBP communication reduced uncertainty, stabilised the market and increased trading activity measured by the conditional variance of foreign exchange returns and trading volume. The reported findings suggest that central banks can play an important role in market development during the period of an institutional change. Therefore, it can be concluded that both developed and emerging markets react to the new announcements, however those findings can be complemented by the information from qualitative studies explaining in more details the nature of the decision-making processes. Some other related papers on emerging markets include Andrle (2009), Kubacki (2014) and Anufriieva and Skapoval (2019).

Another stream of research on market reactions concerns the asymmetry of the markets' responses to news. Prast and De Vor (2005) investigated whether the depreciation of the euro/US dollar exchange rate in 2000 can be attributed to asymmetric investor reactions with respect to economic and political news, which included central bank statements. Their results suggest the existence of an asymmetry in the investors' responses, depending on whether the news originates in the US or in the Euro area. Moreover, investors react differently to 'good' and 'bad' news, which suggests cognitive dissonance. Prast and De Vor (2005) argue that risk aversion may explain these findings and, moreover, the dissonance can be assessed with behavioural analysis based on the existing methodology.

Investment funds and their managers have also been the subject of studies related to the reactions of financial markets. Taking into consideration the investment process and the factors that determine it, Chevalier and Ellison (1995) examined whether mutual funds performance is

related to fund managers' characteristics, which may indicate ability, knowledge or effort. In particular, they analysed the relationship between performance and the manager's age, average composite Scholastic Assessment Test (SAT) score at the manager's undergraduate institution and whether the manager has an MBA. The results showed that managers who attended higher-SAT undergraduate institutions generated systematically higher risk-adjusted excess returns. In contrast, Menkfoff, Schmidt and Brozynski (2006) reported that inexperienced fund managers yield significantly higher returns than their more experienced colleagues. Inexperienced fund managers tend to take greater risks, which may be explained by a higher degree of overconfidence, less herding behaviour, or a lower degree of risk aversion. Herding decreased with experience, while the evidence concerning risk-taking and overconfidence was mixed.

On the other hand, Arnswald (2001) presented a questionnaire survey where fund managers were asked questions about practices, company performance and compensation incentives. While the results suggest that professional investors primarily recognise underlying economic information as a source of superior value, there are also strong indications for destabilising behavioural factors that arise from the choice of information sources and investment strategies and styles. This finding is very important for further exploration of the investment process. Fundamental arbitrage was found to be constrained significantly by time horizons and the fear of market movements.

Drachter, Kempf and Wagner (2007), based on telephone interviews with mutual fund managers, reported, among others, that behaviour of managers depends heavily on the characteristics of the funds. On the other hand, Beckman, Menkhoff and Suto (2008) presented comparative survey evidence on asset managers' views and behaviour in the United States, Germany, Japan and Thailand And they found that cultural differences are most helpful in understanding country differences, which cannot be explained by pure economic reasoning.

The culturally different importance of herding, age, experience, gender, tracking error and research effort clearly affected investment behaviour, although in a complex way.

Another stream of literature related to our study is focused on behavioural finance effects in the decisions of various investment managers. Menkhoff (2010) investigated technical analysts and he argues that they are experienced, educated and successful in their careers, but also largely overconfident in their decisions.

Puetz and Ruenzi (2011) examined overconfidence among equity mutual fund managers and found that they trade more after a period of good past performance. Using mutual fund annual reports filed in SEC Edgar database, Eshraghi (2011) investigated to what extent mutual fund managers are prone to behavioural biases and whether or not they differ from less sophisticated investors in their potential susceptibilities. The results suggest that excess fund manager overconfidence diminishes mutual fund returns and that it is stronger among growth-oriented funds.

Eshraghi and Taffler (2012) investigated to what extent mutual fund managers, as an important and representative group of professional investors, are prone to overconfidence and associated behavioural biases, such as self-serving attribution, and how these psychological attributes may affect investment performance. Managerial overconfidence was assessed by analysing the contents of reports that fund managers write to their investors. They found that superior past performance boosts managerial overconfidence. Moreover, excessive overconfidence is associated with diminished future investment returns in the 12 months following the publication of the annual report. This effect is robust across different investment styles, although it appears to be stronger also among funds that are growth-oriented.

Welch and Wang (2013) investigated whether there exist differences in the characteristics and performance of mutual funds caused by the manager's gender and they found some evidence, which suggests that female managers have a lower risk tolerance than

males. Moreover, the percentage of females managing a fund is negatively related to the fund's performance over time.

In direct relation to our study, Fieger (2017) argued that behavioural biases can be grouped into five major categories: heuristics, prospect theory, overconfidence, misperceiving randomness and herding, which can affect the efficiency of the market.

In summary, the research focused on the fund managers' investment behaviour has expanded from purely quantitative to qualitative approaches, which notably includes behavioural finance analyses that emphasize the importance of human factors, which naturally affect the investment decisions and influence also, more broadly, market efficiency. Capital flows generated by institutional investors can have positive effects on economic growth, as was evidenced by Slesman et al. (2015). Moreover, the evidence on the impact of institutional trading on stock prices was provided by Domowitz et al. (2001) and Chiyachantana et al. (2004), among others, and these findings are directly linked to the problem of investment fund managers' behaviour, which we investigate in this paper. Although nowadays the artificial intelligence machines are increasingly more involved in the trading processes, the overall investment management in financial institutions is still in the hands of real people. Therefore, we believe that our study is important, because it contributes to the exisiting literature by providing novel evidence about the behaviour of investment funds managers, the nature of their reactions to the new information arriving on markets in which they trade and also about their behavioural inclinations.

3. DATA AND METHODS

The data reported in this paper is derived from a survey, which was conducted on the Polish financial market and it relies on a total of 25 comprehensive survey questionnaires, which were completed by fund managers from different institutions.

There are 3 parts of the questionnaire related to the general information about the surveyed funds (Part I), factors affecting the decisions made by fund managers (Part II) and their behavioural biases (Part III). Part I is presented in this section and Parts II and III in the section with the results.

Part I of the questionnaire reports direct information about the respondents and the investment funds they manage. Of the 25 respondents who took part in the survey, there were 24 males and 1 female. 22 respondents answered the question about the investment horizon of the fund under their control, indicating 1 or more periods of investment perspective.

The vast majority of answers (72%) show dominance of the investment horizon of 1-5 years, whereas only 4% of respondents considered the long-term perspective of 10-20 years.

There was more than 1 answer to the question about the fund's investment strategy. Managers could choose between aggressive, conservative or moderate strategies or the "other" option. The answers in category "other" were related to equity portfolios and enhanced indexing management.

Another question was related to the currency of the investments. The investments of 23 funds were made in Polish zlotys, while 10 were made in a foreign currency. Regarding the foreign currencies, the USD, EUR and TRY (Turkish lira) were declared as the currencies in which investments are made. 1 respondent mentioned the Turkish lira, US dollar and euro, among other currencies. 3 respondents mentioned the euro and US dollar, while 1 respondent mentioned just the US dollar and 2 respondents mentioned only the euro. The results are presented in Table 1.

Table 1. Investment horizon of funds

Tested feature	Specification	No. of answers	Percentage
Investment perspective	less than 1 year	3	12.00%
	1-5 years	18	72.00%
	5-10 years	3	12.00%
	10-20 years	1	4.00%
Strategy related to fund risk:	Aggressive	10	26.32%
	Moderate	17	44.74%
	Conservative	9	23.68%
	Other	2	5.26%
Fund currency	National currency	23	53.49%
	Foreign currency	10	23.26%
Fund currency	PLN	23	65.71%
	EUR	6	17.14%
	USD	5	14.29%
	TRY	1	2.86%

Source: own study.

All the behavioural tasks designed in our survey to assess the participants' behavioural inclinations replicate original tasks used typically by behavioural finance experts. The issue investigated in this study is the rationality *versus* the lack of rationality of decisions among the respondents. This variable is nominal (categorical) and it is obtained based on the number of answers given in the research questionnaire. In each task, the answers are designed in such a way that one of them is rational (the person behaves according to various postulates of *homo oeconomicus*) and the other (or other responses) mean that someone does not behave rationally.

There are 10 questions in the behavioural part of the survey and they are presented in the Result section of this paper. The first 3 tasks measure 3 anomalies in the field of preferences resulting from prospect theory, i.e. the theory developed by Kahneman and Tversky (1979). It challenges the expected utility theory developed by von Neumann and Morgenstern (1944).

Task 1 is related to the effect of certainty. It measures whether a person chooses a guaranteed profit, but with a lower expected value (option B – susceptibility to the effect of

certainty), or chooses a more rational option, with a potentially higher expected value (option A). Kahneman and Tversky (1979) presented the results of their research and stated that the vast majority of people chose option B, meaning that they were susceptible to the effect of certainty.

Task 2, in turn, measures the reversal effect on condition that most people are characterised by risk aversion in the area of profits and risk tendency in the area of losses. In Kahneman and Tversky's case, most people chose option A (they preferred to risk in the area of losses than choose a certain loss – option B). A rational person would choose A in Task 1 and B in Task 2.

Task 3 is an exercise to assess the framing effect, which means that different ways of presenting the same decision problem can affect the respondents' other decisions. In this task, there are 2 situations and in both of them the client will lose 20,000 PLN. The difference is that in the first case, the respondents are asked to "keep 20,000 PLN" while in the alternative one they are asked to "lose 20,000 PLN". In both situations, *homo oeconomicus* should be indifferent when choosing strategy A or B, because the expected value of both situations is identical. However, Kahneman and Tversky noted that in the first case, the vast majority of people choose strategy A ("will keep 20,000 PLN"), and in the second case, they choose option B (1/3 probability that the client will not lose anything and 2/3 probability that he will lose the whole sum). Generally, this task examines the effects of certainty and reversal and, at the same time, the framing effect. It can be verified whether the managers' behaviour changes as the same decision problem is presented slightly differently.

Task 4 represents Shefrin and Statman's (1985) disposition effect, i.e. investors' reluctance to sell stocks,, which have lost value. In this case, the only rational option is A, while the alternatives represent the disposition effect. However, task 4 can also examine the degree of severity of this effect, because some investors do not sell but buy more stocks, falling

increasingly more into irrational behaviour. As a result of this change, the way a particular decision problem is presented can affect the overall change in the individual's choices and preferences. This contradicts von Neumann and Morgenstern's (1944) theory of expected utility and axioms of preferences.

Task 5 is an exercise testing for overconfidence, i.e. the self-perceived effect of being better than average. It analyses whether the respondents, from various perspectives, will consistently indicate that they are characterised by the above average results.

Task 6 measures the illusion of the control effect, which is based on false belief that people can affect the course of future random events. Langer (1975) points out that many people choose lottery numbers themselves, instead of using the lottery machine, because they feel that they can influence the results. Similarly, a large proportion of casino visitors believe that clenching their fists, puffing their cheeks or other magical pre-game behaviours increase their chances of winning. The connection between the illusion of control and magical thinking is very strong. This aspect of the illusion of control specifically shapes individual beliefs about the world and limits the rationality of the decision-making process. In this task, answer A indicates that respondents are inclined towards the illusion of control.

Task 7 is a complex task regarding the Ellsberg paradox (Ellsberg, 1961), which analyses the phenomenon of ambiguity aversion. The respondents must draw a ball from one of two boxes with black and white balls. In one box, the proportion of white and black balls is known, while in the other box it is not known. In the first draw, the winning ball is white. Most people say that they would prefer to pull the ball out of the box where there are exactly 50 white balls and 50 black balls. In the second draw, when the black ball wins, the preferred box is also the one where the proportion of balls is known. The respondents choose not to draw from the box they know nothing about, so they cannot predict which balls dominate or how the probability of winning is shaped. When answers A and A are chosen, then the effect of

ambiguity is recognised. Furthermore, the ambiguity is related to experiencing anxiety and a sense of uncertainty.

Task 8 is a modified version of the task proposed by Tversky and Kahneman (1983), known as the, so called, Linda's problem. Originally, this task was formulated as follows:

Linda is a 31-year-old, open, intelligent and unmarried woman. She graduated from philosophy. As a student, she devoted much time to the problems of social justice and discrimination and participated in anti-nuclear demonstrations. Which is more likely?

A. Linda works at a bank

B. Linda works at a bank and is an active member of the feminist movement.

In the experiment described by Tversky and Kahneman, 85% of respondents indicated that Linda works in banking and, at the same time, she is an activist of the feminist movement. Meanwhile, the likelihood that Linda works only in a bank is much higher than being both a cashier and an active member of the feminist movement. Thus, the vast majority of respondents behaved irrationally, because they were affected by the heuristics of representativeness (the degree to which an event is similar in essential characteristics to its parent population and reflects the salient features of the process by which it is generated) and, in particular, the conjugation fallacy (which occurs when it is assumed that specific conditions are more probable than a single general one). In this task, option A is even less likely (see the heuristics of representativeness) than option B, which is more rational. Thus, this task measures the susceptibility to these heuristics even more. In our research, the task was modified so that answer A is related to the representativeness heuristics.

Task 9 measures susceptibility to the sunk cost effect, which describes the impact of past costs on future investment decisions (Arkes, Blumer, 1985). According to classical theory in finance, only the analysis of current and future profits and losses should influence the

investment decisions. However, investors all too often pay attention to past expenditure on a given investment and it is these past costs that significantly affect their current and future decisions.

Task 10 measures whether the subjects succumb to fast thinking. In Kahneman's (2011) study conducted on a group of Stanford University students, who were asked the following question:

A baseball bat and a ball cost 1 dollar and 10 cents. A bat costs one dollar more than a ball. How much does the ball cost?

as many as 70% of respondents answered that the ball costs 10 cents, which is illogical because, in fact, it costs 5 cents.

In summary, the questions in this part of our survey are based on an extensive questionnaire, relying on the classical problems known in the previous behavioural finance literature, which combines together different aspects of investing, decision-making processes and exploration of rationality of investment fund managers as a group that makes important financial decisions.

We further calculated Cronbach's alpha (Cronbach, 1951), which is the coefficient that measures the reliability, or internal consistency, of a questionnaire. "Reliability" is defined as how well a test measures what it should capture. Cronbach's alpha allows to verify whether multiple-questions Likert scale surveys are reliable. These questions measure latent variables (i.e. hidden or unobservable variables), such as a person's conscientiousness, neurosis or openness. Cronbach's alpha indicates if the test designed for the particular research problem accurately measures the variable of interest.

Finally, we assumed that the rational behaviour based on the objective data from the financial market should be expected. Possible relationship between the answers to the questions could indicate the impact of behavioral inclinations on the management of investment funds.

Consequently, the lack of such relationship can mean that the behavioral inclinations of individual managers are not crucial for the way the entire fund is managed. One should consider whether collectivism does lead to neutralization of the features of individual investors.

In our study, the following 13 potential relationships between the surveyed responses were analysed:

R1: There is a relationship between certainty effect examined in Task 1 and a strategy related to fund risk.

R2: There is a relationship between reversal effect examined in Tasks 1 and 2 and a strategy related to fund risk.

R3: There is a relationship between framing effect examined in Task 3 and NBP information taken into consideration by managers.

R4: There is a relationship between disposition effect examined in Task 4 and NBP information taken into consideration by managers.

R5: There is a relationship between disposition effect examined in Task 4 and investment perspective.

R6: There is a relationship between overconfidence effect examined in Task 5 and NBP information taken into consideration by managers.

R7: There is a relationship between overconfidence effect examined in Task 5 and investment perspective.

R8: There is a relationship between illusion of control effect examined in Task 6 and the timing of opening of market position.

R9: There is a relationship between illusion of control effect examined in Task 6 and investment perspective.

R10: There is a relationship between ambiguity aversion effect examined in Task 7 and NBP information taken into consideration by managers.

R11: There is a relationship between representativeness heuristic examined in Task 8 and markets where managers make investments.

R12: There is a relationship between sunk cost fallcay effect examined in Task 9 and the role of the ultra-short investment time horizon.

R13: There is a relationship between fast thinking effect examined in Task 9 and the role of the ultra-short investment time horizon.

Particularly strong inferences can be found using responses to those tasks that reveal specific behavioral effects. If a given behavioral effect does not occur, rationality in decision making by the fund manager is assumed. In the case of the behavioral inclination, a lack of rationality is assumed. Each time when the Chi-square test shows the independence of responses to the task testing the existence of behavioral inclinations and answers to questions about decisions made, it can be concluded that there is a support for the claim that the rationality of managers as separate personalities does not matter for the fund. It is worth emphasizing, however, that in those cases where a certain behavioral effect has been detected, inference is particularly strong. If it turns out that heuristics among managers do not affect the management of the fund, this opens a wide field for discussion and further research that may indicate what in such case has an impact on making investment decisions in the fund.

Bearing in mind the above considerations, we formulated the research hypothesis, which states that due to the team nature of fund management, the behavioral implications of individual managers have a limited impact on the way decisions are made in the investment funds, which is manifested by the lack of relation between questions regarding investment strategies and behavioral implications.

As mentioned earlier, our investigation relying on the analysis of cross tables with Chi-square tests further supported by Phi and Cramer's V coefficients. In the case of the Chi-Square test, the following hypotheses were formulated:

H0: There is no relation between the answers to questions

and an alternative:

H1: The relationship between the answers to questions exists.

The Phi and Cramer's V coefficients determine the strength of dependence. These coefficients take on a value from 0 to 1 (i.e. the higher the value, the stronger the relationship). If Cramer's V is higher than 0.25, the relationship is considered to be very strong. Phi factor gives reliable results only for 2x2 crosstabs, therefore in most cases only Cramer's V can be interpreted. Each time when the null hypothesis could not be rejected, the hypothesis was positively verified.

4. RESULTS

In this section, we present the results of our survey on the decision-making processes of fund managers (Part II of the questionnaire) and the factors that affect them, in particular those which are related to the NBP communication in the light of the behavioural finance biases (Part III of the questionnaire). At the end of this section, Cronbach's alpha is calculated for the questionnaire evaluation and Chi-squared test for the relationship of the answers analysis.

4.1. The decision-making processes of fund managers and the factors affecting them in light of the NBP communication (Part II of the questionnaire)

Below we present and discuss all questions from Part II of our questionnaire.

Question 1

Do you take into account the impact of information on macroeconomic data published by the National Bank of Poland (NBP) in your investment decisions, market analyzes and forecasts of financial instruments prices? If so, which of the following do you pay attention to: ……

(Please assign weights to each category on a scale from 0 to 10, where 0 is completely unimportant, and 10 is the most important).

The answers are presented in Table 2.

Table 2. The impact of NBP announcements on investment fund managers' decisions

NBP information	Average weighted value	Number of indications
Interest rates	7.67	22
Public debt	3.08	16
Money supply	2.79	15
Balance of payments	2.75	17
Official reserves	1.50	12
International investment position	1.42	14
Liquid assets and liabilities in foreign currency	1.17	9
Other	1.04	5
Money reserves	0.83	9

Source: own study.

Table 2 shows that interest rates are the most important factor for investment fund managers. 22 respondents chose this answer with the average weighted value of 7.67. Other answers, but with much lower values, are public debt (with a value of 3.08 and indicated by 16 respondents), money supply (2.79 and 15 respondents) and balance of payments (2.75 and 17 respondents). Managers assigned the lowest value to money reserves (0.83 and 9 respondents).

Question 2

What other macroeconomic data published in Poland by institutions other than the NBP do you consider important in your decision-making processes regarding investments on the financial market in Poland?

This is an open question and respondents could answer spontaneously. The respondents' statements identified a number of indicators that are presented in a synthetic form in Table 3. The number of indications is given for each factor mentioned in the answers to the question. Some responses have been standardised to simplify the analysis. For example, the "macroeconomic forecasts of banks" category was included in the "banking sector data" category.

Industrial production and the Consumer Price Index (CPI) were mentioned most often as other factors that affect the decision-making process of investment fund managers. Retail sales and GDP are mentioned by many respondents too. Overall economic activity measured by industrial production, GDP and sales and inflation measured by CPI were the key factors that investment fund managers pointed out in the decision making.

Question 3

What other macroeconomic data published on foreign markets do you consider important in your decision-making processes regarding investing on the financial market in Poland?

Question 3 is also an open question. Respondents were asked to indicate other macroeconomic factors that affect their decisions. The answers are grouped according to the frequency and type of indicators and they are presented in Table 4. Most respondents (11) pointed out GDP in different countries, while 10 managers indicated interest rates, 6 selected inflation, 5 chose PMI and 4 opted for the Chicago PMI.

Table 3. Other factors influencing the decisions of investment funds managers published in Poland

Number of indications	Factors
10	• Industrial production • CPI (consumer price index)/inflation
9	• GDP
8	• Retail sales
6	• Unemployment level
4	• Salaries • PMI (purchasing managers index) • Nothing • Budget deficit and Publications of the Ministry of Finance regarding the implementation of the deficit
3	• Data on the banking sector (from the PFSA/KNF)
2	• Wage dynamics • Internal demand • PPI (Producer Price Index)
1	• Flows between asset classes • Inflation expectations • Employment • Industry-specific indicators (sales of apartments, cars, etc.) • Data on the housing sector • Construction production • Investment internal demand • Individual moods • Investment dynamics • Planned supply of government bonds • Planned changes in tax law • Information related to tax collection • Information related to the functioning of state organs • Central Statistical Office (GUS) data • Investor mood index • PLN/EUR rate

Source: own study.

Table 4. Economic data published on foreign markets that influence the decisions of investment fund managers

Number of indications	Indicator
11	GDP (the US, European countries, Japan, China,)
10	Interest rates (including the FED, ECB)/interest rate trends, prospects
6	CPI
5	PMI
4	Chicago PMI, Data from the USA
3	PMI for euro area countries, PMI in the USA, PMI in China, Unemployment The scale and dynamics of QE (Quantitative Easing) in various countries (including the USA - Fed, ECB,BoE
2	Bond yields in EUR, US yield curve, Germany PMI, US unemployment Jobs (including in the US), Labour market report ()/labour market data Labour force participation, Industrial production, Industrial production of the USA Payrolls/Non-farm payrolls, Leading indicators, Data from the given country ZEW Germany current situation indicator (The Economic Sentiment published by the Zentrum für Europäische Wirtschaftsforschung), Where are the investments? Current balance, Beige book, Business sentiment indicators, Voucher profitability Purchase of assets and reduction of balance sheets in Europe, Housing starts ECB and FED macroeconomic projections, ZEW, Money supply, Wage increase Building permits, Sale of houses on the primary market, Retail sales, US retail US salaries, US internal demand, US internal investment demand
1	US CPI, EUR CPI, Core inflation, Inflation expectations, QE programs Home sales, House sales on the secondary market, Construction production ISM (Institute for Supply Managers), ISM in the USA, PPI, PPI in the USA Allocations, Positions of the largest investors, Monetary stimulation by central banks CESI (Citi Economic Surprise Index), US and EU macroeconomic data, Aggregated macroeconomic forecasts per region, Good Orders, Individual moods Ifo Indexes - Institut für Wirtschaftsforschung - investment climate indicator Demand data, Supply data, Data on energy resources (e.g. US EIA) Confidence indicators, Business Climate Indicators, Activities of central banks Statements by heads of central banks, LTRO (Long-term refinancing operations) Commodity prices, Stocks of raw materials, Dependencies in the Target2 system

Source: own study.

Other factors were indicated by 3 or fewer respondents. In order to present the results on a structured way, the answers are grouped and ordered in Table 5.

Table 5. Grouped answers related to the economic data

Number of indications	Indicator
20	• PMIs
14	• Interest rate-related indices
11	• Employment indices • GDP
10	• Inflation related indices
9	• Real Estate Indices

Source: own study.

The Purchasing Managers' Indexes (PMIs) were indicated in the survey 20 times, factors related to the level of return were mentioned 14 times, indicators based on labour market data were indicated 11 times as was the GDP in different countries. Indicators built based on inflation were mentioned 10 times and indexes related to the real estate market were indicated 9 times. As PMIs are useful to assess current and future business conditions by firm managers, financial analysts and investors, it is not surprising that the fund managers watch this variable closely. Interest rate representing the cost of borrowing is another key variable. The fund managers also closely follow economic activity variables (employment and GDP) and inflation. Real estate markets capture wealth effects, i.e. as investor wealth increases more real estate business takes place.

Question 4

Do you also consider information about market expectations published in the media in your market analyses and investment decisions, taking into account the announcements of the NBP?

The respondents in Question 4 could answer “yes” or “no”. 18 respondents answered "yes" and 7 of them "no" indicating that most managers take into account information on market expectations published in the media.

Question 5

If so, which categories does the information on expectations relate to?

If the respondents responded affirmatively in Question 4, then in Question 5 they were asked to specify which categories the information relates to. 12 categories were specified and they are presented in Table 6.

Table 6. Factors that investment fund managers consider

No. of answers	Indicator
15	• Interest rates
5	• Balance of payments
4	• Money Supply
3	• Inflation • Foreign debt • International investment position
2	• GDP
1	• Consumption • QE • Official reserves • Liquid assets and liabilities in foreign currency • Exchange rate

Source: own study.

Interest rates were the most frequently indicated category, which was selected by 15 respondents.

Question 6

Where does your information about market expectations come from?

The results for Question 6 are presented in Table 7. Various forms of information obtained from Bloomberg meant that the answers were divided into 3 categories. Bloomberg was mentioned 13 times, PAP (Polish Press Agency) 5 times and Reuters four times.

Table 7. Information sources mentioned by investment funds managers

No. of answers	Source
10	• Bloomberg
5	• PAP (Polish Press Agency)
4	• Reuters
2	• Bloomberg – consensus • Industry portals • Information agencies/services (in the sense of agencies, mainly PAP)
1	• Bloomberg – surveys • Broker reports • Financial services • Consensuses • Own analysis • Banks – market analysis • Banks – reports of economic departments • Press – aggregated surveys (e.g. Parkiet, Puls Biznesu) • Press • Sentiment indicators • Analysts • Internet

Source: own study.

Question 7

In your decisions on the financial market, do you use the information on deviations between market expectations and the macroeconomic data announced by the NBP?

The respondents in Question 7 could answer 'yes' or 'no'. 10 of the respondents replied that they did not use information about deviations relative to market expectations in their decisions. 15 respondents stated that they use such information noting also that they take into account the degree of divergence between expectations and announcements.

From Question 7 it can be concluded that most investors consciously use the expectations created by the National Bank of Poland.

Question 8

If you make investments on the financial market based on the announcement of new macroeconomic data by the NBP, for how long in advance do you observe information on market expectations regarding the relevant macroeconomic categories?

This is also an open question, which was allowing the respondents to specify the period freely. The answers are summarised in Table 8.

Table 8. Expectation horizons of investment fund managers

No. of answers	Answer
5	• No answer
3	• I do not have expectations • 1 week
2	• As soon as it appears • From several months to several minutes • Several days • 1 month
1	• As long as possible, even over a year. • From 1 to 12 months • 3 days • I compare it to the current consensus • Shortly before the expected publication of the data • Up to 1 month

Source: own study

If managers consider the information about market expectations, it is usually fairly far in advance. Seven answers evidence a period of more than a week, while nine responses indicate a period in which managers respond immediately.

Question 9

If you make an investment on the financial market based on the publication of new macroeconomic data by the NBP, when do you open the relevant market positions?

a) Before new information is announced by the NBP

b) After the announcement of new information by the NBP

10 respondents chose option "a", while 16 respondents chose option "b". This means that most of the positions are opened after the NBP makes announcements of new information.

Question 10

Specify the type of information you take into consideration regarding Question 9.

The results are presented in Table 9.

Table 9. Specification of information taken into consideration in Question 9

No. of answers	Answer
8	• No answer
2	• As in question 9 • Depends on the situation and further expectations • I do not use NBP announcements, only the result of companies
3	• Interest rates
1	• Balance of payments • Basically, before, with the proviso that macroeconomic data have the function of supporting long-term investments and their use after publication occurs only when they are radically different from the previously observed trend. • I don’t have a rigid rule. Most positions are taken before the NBP releases new information in an attempt to anticipate the market reaction to the given information - the earlier the analysis is carried out and the earlier the position is taken, the more likely it is to “overtake” other market participants. In a few cases, we take positions after the announcement of new information – most often when the data significantly affect our perception of the market or/and it was strongly detached from the consensus of market predictions. • Published decisions are an argument to rethink investment theses; I do not make decisions solely based on NBP publications • I attempt to predict turnover at % rates based on MPC forward guidance and recent macroeconomic readings (IP, RS) • Positions in PLN before the decision on interest rates • Fixing

Source: own study.

Question 11

In relation to Question 9, specify whether decisions are spontaneous or whether a decision support system is applied.

The answers are presented in Table 10.

Table 10. Reaction to expectations versus information appearing

No. of answers	Answer
15	• Spontaneously
6	• Decision support system
4	• No answer

Source: own study.

According to the results from Question 11, most reactions appear to be spontaneous.

Question 12

How long, usually, is the time horizon of your investments on the financial market after new information is announced by the NBP?

This question is a refinement of Question 14 and it is an open question. The results are presented in Table 11.

Nine respondents did not specify the length of the investment. Only one of the managers indicated a period of several minutes in his response. Four responses indicated investments over a period of one or several days. Other managers pointed to long periods, even longer than a year.

Table 11. Time horizon of investments after the NBP announcement

No. of answers	Answer
9	• No/no answer/difficult to determine
2	• From 1 day to 1 month • From several days to several months
1	• Long-term • There is no rule • A couple of months • A few weeks • More than a year • From several minutes to several months • One month • Several weeks to several months • Up to 2 weeks • Until new information appears • One year • One day

Source: own study.

Question 13

If you make investments on the financial market based on announcements of new macroeconomic data by the NBP, in which markets are these investments made?

a) Stock market

b) Bond market

c) Foreign exchange market

d) Money market

e) Other markets (please specify): ……..

This question allowed the respondents to choose more than one answer. 1 of the answers in the "other" category pointed to the futures market.

Table 12. Markets that managers invest in

No. of answers	Answer
14	• Stock market
11	• Currency market • Bond market
8	• Money market
4	• No answer
1	• Futures market

Source: own study.

In 14 cases the stock market was selected, in 11 cases the currency market and the bond market were chosen, in 8 cases the investments were made on the money market and in 1 case on the futures market. Overall, the fund managers are active in all major markets only except for the futures market.

Question 14

Does the impact of information on the publication of new macroeconomic data by the NBP in your investment decisions affect your investment results?

a) Yes, it has a very big influence

b) Yes, but the impact is moderate

c) No

12 respondents replied that the impact was moderate, providing the "b" answer. 11 respondents answered "no", thus selecting point "c". Only 2 respondents gave the answer "a" saying that the influence is very strong. It can be concluded from the results that NBP communication has a moderate impact on decisions made by investors.

Question 15

What role does the ultra-short time horizon play in your investment decisions?

a) Big

b) Medium

c) Small

d) It does not play any role

The results are presented in Table 13.

Table 13. The significance of the ultra-short time horizon

No. of answers	Answer
10	• Does not play any role
8	• Medium
7	• Small
0	• Big

Source: own study.

For 17 respondents the ultra-short time horizon plays no role or only a small one. For 8 respondents, it plays medium role and it does not play a big role for anyone. This finding means that the fund managers do not consider very short-term horizon (which would reflect a focus on speculative decisions) as important in their investment decisions.

4.2. Behavioural inclinations (Part III of the questionnaire)

In this section, we present the results of our survey focused on behavioural inclinations.

Task 1

Imagine that you must make the following choice between options A and B:

Participation in a lottery in which:

A:

Ø there is an 80% probability you could win 4000 PLN

Ø there is a 20% probability you would not win anything

or

B: There is a guaranteed win of 3000 PLN

Task 1 measures susceptibility to the effect of certainty, which constitutes one of the behavioural inclinations described by Kahneman and Tversky. The majority of respondents in this survey, i.e. 18 out of 25 fund managers, selected answer A, and, therefore, they did not succumb to the behavioural inclination of certainty. Thus, it can be cautiously concluded that in this behavioural task most respondents behaved rationally according to the classical finance theory (see Fama (1970 and 1990)).

Task 2

Imagine that this time you have to make the following selection between options A and B:

Participation in a lottery in which:

A:

Ø there is a 20% probability you would not lose anything

Ø there is an 80% probability you would lose 4000 PLN

B:

There is a certain loss of 3000 PLN

Task 2 measures another anomaly in the process of shaping individual preferences that Kahneman and Tversky (1979) discovered, i.e., the reversion effect. 9 respondents chose answer A and 16 answer B, so most do not undergo a reversal effect. Just as the majority of respondents in this research project did not succumb to the effect of certainty in Task 1, there is also no evidence of the reversal effect in Task 2. 14 managers did not succumb to the certainty effect or the reversal effect, i.e. they chose answer A in Task 1 and answer B in Task 2, so they can be considered more rational.

Task 3

Imagine that you are an investment adviser. Your client has invested 60,000 PLN in a portfolio of stocs. Shortly thereafter, there was a huge stock market crash. Select how you would behave in this difficult situation for you and your client:

A. Strategy A means that your client will definitely keep 20,000 PLN

B. Strategy B means that there is a 1/3 probability that your client will save the entire amount (60,000 PLN) and a 2/3 probability that he will not save anything

C. I don't care which strategy (A or B) to choose, because my client will lose anywayAnd now imagine the following situation.

Your client has reinvested 60,000 PLN in a portfolio of stocks. Shortly afterwards, there was a great stock market crash. Select how you would behave in this difficult situation for you and your client:

A. Strategy A will mean your client loses 40,000 PLN

B. Strategy B means that there is a 1/3 probability that your client will not lose anything and a 2/3 probability that he will lose the entire sum

C. I don't care which strategy (A or B) to choose, because my client will lose anyway

Task 3 measures the framing effect. Out of the 25 managers surveyed in this research project, only 7 behaved rationally, i.e., they chose in both parts of the task the answer indicating that they are indifferent (answers C and C). In other words, one can cautiously conclude that the narrow frame effect occurred among respondents. Moreover, when the answers A and B were chosen, it was relevant in 4 cases only, the prospect theory was verified.

Task 4

After analysing the financial situation of a certain company, you decide to invest in the stocks of this company. Unfortunately, the stocks that you bought lose 10% in value in the following days. How will you behave:

A. I find that I made a mistake in assessing the company and I sell stocks quickly at a loss to protect myself against any further fall in the exchange rate and deepening of the loss

B. I find that I did not make a mistake, but after I bought the stocks, new negative information appeared which I could not have foreseen and which badly affects the company's assessment. I am not sure what will happen next. I will not sell stocks, and I will wait

C. I find that I have not made a mistake and the declines are temporary, and soon the stock price will start rising; therefore, I do not sell stocks

D. I find that I did not make a mistake and the declines are temporary, and soon the stock price will start to rise, so I not only do not sell stocks, but I buy more and I take advantage of the opportunity that they are cheaper

Task 4 measures susceptibility to the disposition effect, one of the most commonly described inclinations of irrationality in investors' behaviour, according to prospect theory.

Only 6 respondents behaved rationally, i.e. they chose to sell losing stocks quickly (option A). It can be concluded that the disposition effect occurred among the respondents who chose answer B.

Task 5

Please select the statements, which best reflect your your beliefs (choose 'YES' or 'NO'):

1. I know the economy better than the average person in my surrounding (YES/NO)
2. I have more insight into politics than the average person in my surrounding (YES/NO)
3. I have more cultural knowledge than the average person in my surrounding (YES/NO)
4. I am a better observerwhile watching movies than the average viewer (YES/NO)
5. I have a better sense of humour than the average Polish person (YES/NO)
6. I have more luck in games of chance than the average Polish person (YES/NO)

Task 5 measures the respondents' susceptibility to the belief that they are better than average, which represents the inclination to be overconfident. 18 managers marked "yes" in at least 3 questions in this task, suggesting that they are overconfident.

Task 6

You have a choice of 2 tasks to perform related to the ability to predict stock prices. Please specify which would be easier to perform: A or B?

A. Stocks of a certain company were selected by lot. Try to predict whether these stocks will rise or fall tomorrow? If your answer is correct, you will win 1000 PLN

B. The stocks of a company were selected by lot. Try to answer without looking in the newspapers: did the stock price rise or fall yesterday? If your answer is correct, you will also win 1000 PLN

Task 6 measures a component of overconfidence, i.e. the illusion of control. Only 8 managers chose answer A, which indicates that they are inclined to believe they are in control. In other words, it can be cautiously assumed that most of the respondents were not susceptible to this component of overconfidence.

Task 7

Imagine you are playing a two-stage game in which you must make a choice.

Game 1:

There are 50 white balls and 50 black balls in box A. There are also 100 balls in box B – they may also be black or white, but it is not known in what proportion. Therefore, there may be 100 white balls and 0 black, or 0 white and 100 black. If you draw a white ball, you will win 1000 PLN. Which box you would like to draw from, A or B?

Game 2:

Now imagine that you throw the previously drawn ball back into the box from which it was taken. Then you draw again, but this time, to win 1000 PLN, you must draw a black ball. Which box you would like to draw from, A or B?

Task 7 is related to the Ellsberg paradox, which analyses the phenomenon of ambiguity aversion. 20 managers chose box A in both cases. In other words, a strong aversion to ambiguity was detected among the surveyed fund managers.

Task 8

Imagine a woman named Anna. Anna is a calm person who loves to learn and is interested in social issues. During her studies, she excelled in humanities and natural sciences. Based on this information, select the most likely variant of the following responses by choosing option A or B:

A. Anna is probably a librarian and also a member of the Green Planet nature protection society

B. Anna most likely works in banking

Task 8 is related to a modified version of the decision-making task known as the Linda's problem, which was originally proposed by Tversky and Kahneman (1983). 17 respondents chose option A, indicating that they are characterised by the representativeness heuristic.

Task 9

Imagine that you are the manager of a company called Omega. Omega is working on a project worth 10 million PLN out of which 5 million PLN has already been invested. The outcome is to be a modern hybrid engine for electric vehicles. The prototype model is undergoing the first tests. At the same time, the project manager discovers, to his surprise, that company Alfa is now ready to launch a similar product on the market. Alfa's competitive design is lighter and smaller - predestined for commercial success. As Omega's manager, you must make a decision:

A. Interrupt the investment and invest the remaining 5 million PLN in another project

B. Continue the project

Task 9 measures susceptibility to sunk cost, which captures the impact of past costs on future investment decisions. Only 7 respondents chose the answer that indicated they succumbed to this inclination (answer B).

Task 10

Solve the following mathematical problem:

A baseball bat and a ball cost 1 dollar and 10 cents. A bat costs one dollar more than a ball. How much does the ball cost?

Task 10 measures whether the managers succumb to the fast-thinking effect. Only 3 respondents provided an answer that indicates that they succumb to the fast-thinking error.

The summary of the results of our survey regarding the behavioural inclinations is presented in Table 14.

Table 14. The results of the survey on behavioural inclinations

Tasks	Name of effect	Heuristic/ Inclination			No heuristic/Inclination		
		Answer	No of ans.	% of ans.	Answer	No of ans.	% of ans.
1	certainty	B	8	30.77%	A	18	69.23%
2	reversal	A	9	36.00%	B	16	64.00%
1,2	prospect	Other combinations	11	44.00%	AB	14	56.00%
3	framing	Other combinations	18	72.00%	CC	7	28.00%
3	prospect	AB	4	16.00%	Other combinations	21	84.00%
4	disposition	Other	19	76.00%	A	6	24.00%
5	overconfidence	Over 3, yes	18	72.00%	Up to 3, yes	7	28.00%
6	illusion of control	A	8	32.00%	B	17	68.00%
7	ambiguity	AA	20	80.00%	AB	5	20.00%
8	representative and conjunction error	A	17	68.00%	B	8	32.00%
9	sunk costs	B	7	28.00%	A	18	72.00%
10	Fast thinking	10c	3	12.00%	5c	22	88.00%

Source: own study.

Finally, we carried out the analysis focused on the distribution of the percentages of respondents answering in the way that prevents the occurrence of subsequent effects. In 4 tests, the study failed to reject the hypothesis that there is a lack of normality of the distributions, which provides evidence about robustness of our findings. The results are shown in Table 15.

Table 15. Test for normality of answers when the effect does not occur

Test	statistic	p-value	H0: distribution is normal, a=0.05
Doornik-Hansen	3.34	0.19	fail to reject H0
Shapiro-Wilk	0.89	0.11	fail to reject H0
Lilliefors	0.21	0.12	fail to reject H0
Jarque-Bera	1.21	0.55	fail to reject H0

Source: own study.

In all tests, the p-values are higher than the level of significance at 0.05, which means that the H0 null hypothesis, about the lack of normality of the distribution, was rejected in favour of the alternative hypothesis. Descriptive statistics are presented in Table 16.

Table 16. Descriptive statistics of the percentage of respondents confirming the lack of successive effects.

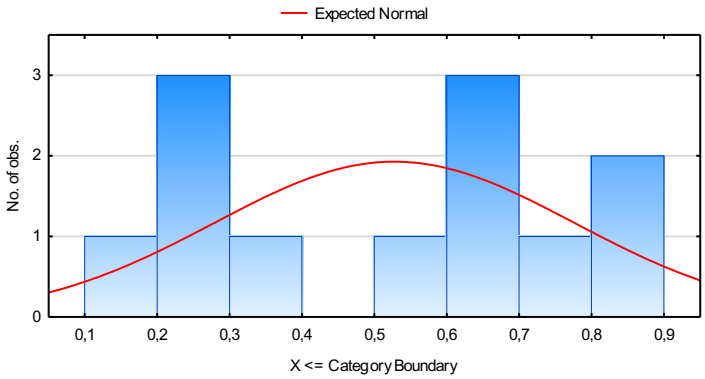
N	12	Variance	0.06
Mean	52.77%	Standard deviation	24.84%
Median	60.00%	Skewness	-0.05
Minimum	20.00%	Kurtosis	-1.74
Maximum	88.00%		

Source: own study.

In most cases, the respondents provided answers suggesting no behavioural biases. Skewness is negative and equals -0.05. Negative kurtosis indicates a platykurtic distribution. The mean of 52.77% and the median of 60% suggests that the majority of answers provided by the respondents show that they are not subject to the behavioural biases.

The distribution is illustrated in Graph 1.

Graph 1. The distribution of answers confirming the lack of successive effects.



Source: own study.

4.3. Cronbach's alpha test for the questionnaire regarding behavioural bises

Cronbach's alpha as a test allows to evaluate how many questions are able to identify the occurrence of certain behavioural effects. For the sensitivity analysis, the output data is presented in the form of a matrix in Table 17.

Table 17. Number of responses in subsequent variants of the analysis

variant	task and number of answers																
I	**1**	**2**	**3a**	**3b**	**4**	**5a**	**5b**	**5c**	**5d**	**5e**	**5f**	**6**	**7a**	**7b**	**8**	**9**	**10**
A	18	9	15	12	6	22	17	11	14	15	1	8	20	19	17	18	22
B	8	16	2	6	4	3	8	14	10	9	24	15	2	4	8	7	3
C	0	0	7	7	4	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0
II	**1**	**2**	**5a**	**5b**	**5c**	**5d**	**5e**	**5f**	**6**	**7a**	**7b**	**8**	**9**	**10**	**x**	**x**	**x**
A	18	9	22	17	11	14	15	1	8	20	19	17	18	22	x	x	x
B	8	16	3	8	14	10	9	24	15	2	4	8	7	3	x	x	x
III	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7a**	**7b**	**8**	**9**	**10**	**x**	**x**	**x**	**x**	**x**
A	18	9	15	19	6	80	8	20	19	17	18	22	x	x	x	x	x
B	8	16	7	6	16	68	15	2	4	8	7	3	x	x	x	x	x

Source: own study

The behavioural survey is composed of 10 questions. Question 3 is characterised by two sub-tasks in which the respondents could choose answers A, B or C. In addition, the fourth question is characterised by 4 possible answers. This situation made it necessary to equate the number of possible answers for all questions in the test. In place of additional answers, 0 was always entered. The matrix prepared in this way was tested and the results are presented in Table 18.

Table 18. Cronbach's alpha test results in option 1

Average	103.25	Sum	413
Standard deviation	112.15	Variance	12576.92
Bias	0.65	Kurtosis	-2.64
Minimum	8	Maximum	160
Cronbach's Alpha	0.96	Standardised alpha	0.96
Average correlation between positions	0.85		

Source: own study.

As Table 18 shows, Cronbach's alpha takes on a high value of 0.96 and we can, therefore, conclude that the internal consistency of the questionnaire is very high.

4.4. The relationship between decisions and behavioural biases in the group of fund managers

For the relationship analysis, in the first step the cross tables were created. The matrix depicts the answers to the questions related to the mangement of investment funds and results of the task regarding the particular behavioral effect. This compilation allows to trace the respondents' answers depending on whether a given effect occurred or not in relation to the decisions of the fund management.

The results are presented in Table 19.

Table 19. Relationship crosstabulation

R1	Effect does not occurs	Effect occurs	Total	R2	effect does not occurs	effect occus	Total
aggressive	3	7	10	aggressive	3	7	10
conservative	4	5	9	conservative	4	5	9
other	2	0	2	other	2	0	2
sustainable	6	12	18	sustainable	9	8	17
Total	15	24	39	Total	18	20	38
R3	**effect does not occur**	**effect occus**	**Total**	**R4**	**Effect does not occurs**	**Effect occurs**	**Total**
balance of payments	55	11	66	balance of payments	12	54	66
foreign debt	61	13	74	foreign debt	25	47	72
interest rates	147	37	184	interest rates	53	126	179
international investment position	23	10	33	international investment position	12	21	33
liquid assets and liabilities in foreign currency	19	8	27	liquid assets and liabilities in foreign currency	10	17	27
money supply	53	14	67	money supply	10	57	67
official reserves	22	14	36	official reserves	7	29	36
other	34	0	34	other	0	34	34
reserve money	17	3	20	reserve money	4	16	20
Total	431	110	541	Total	133	401	534
R5	**Effect does not occurs**	**Effect occurs**	**Total**	**R6**	**Effect does not occurs**	**Effect occurs**	**Total**
< 1 year	1	1	2	balance of payments	48	18	66
1-5 years	4	13	17	foreign debt	49	25	74
5-10 years	1	2	3	interest rates	118	66	184
Total	6	16	22	international investment position	21	12	33
				liquid assets and liabilities in foreign currency	18	9	27
				money supply	41	26	67
				official reserves	25	11	36
				other	16	18	34
				reserve money	16	4	20
				Total	352	189	541

(continued on next page)

Table 19. (continued)

R7	Effect does not occurs	Effect occurs	Total	R8	Effect does not occurs	Effect occurs	Total
< 1 year	2	1	3	After the announcement of new information by the NBP	9	5	14
1-5 years	11	7	18	Before new information is announced by the NBP	5	4	9
5-10 years	3	0	3	Total	14	9	23
10-20 years	1	0	1				
Total	17	8	25				
R9	**Effect does not occurs**	**Effect occurs**	**Total**	**R10**	**Effect does not occurs**	**Effect occurs**	**Total**
< 1 year	2	0	2	After the announcement of new information by the NBP	2	14	16
1-5 years	11	5	16	Before new information is announced by the NBP	4	6	10
5-10 years	3	0	3	Total	6	20	26
10-20 years	1	0	1				
Total	17	5	22				
R11	**Effect does not occurs**	**Effect occurs**	**Total**	**R12**	**Effect does not occurs**	**Effect occurs**	**Total**
balance of payments	11	55	66	bond market	7	4	11
foreign debt	21	53	74	foreign exchange market	7	4	11
interest rates	58	126	184	money market	5	3	8
international investment position	5	28	33	other markets	2	0	2
liquid assets and liabilities in foreign currency	5	22	27	stock market	10	4	14
money supply	13	54	67	Total	31	15	46
official reserves	4	32	36				
other	20	14	34				
reserve money	4	16	20				
Total	141	400	541				
R13	**Effect does not occurs**	**Effect occurs**	**Total**				
average	5	2	7				
does not play any role	8	0	8				
small	8	0	8				
Total	21	2	23				

Source: own study.

The crosstabs themselves, although presenting the answers, do not allow for verification of the research hypothesis and they are only the starting point for further analysis. Subsequently, the Chi-square tests and symmetric measures were calculated and they are presented in Table 20.

Tableble 20. Chi-Square Tests and Symmetric Measures

R1	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R2**	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	3.839	3	.279	Pearson Chi-Square	3.675	3	.299
Likelihood Ratio	4.473	3	.215	Likelihood Ratio	4.483	3	.214
Phi	.314	n/a	.279	Phi	.311	n/a	.299
Cramer's V	.314	n/a	.279	Cramer's V	.311	n/a	.299
N of Valid Cases	39			N of Valid Cases	38		
R3	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R4**	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	21.063	8	.007***	Pearson Chi-Square	27.539	8	.001***
Likelihood Ratio	26.420	8	.001***	Likelihood Ratio	35.605	8	.000***
Phi	.197	n/a	.007***	Phi	.227	n/a	.001***
Cramer's V	.197	n/a	.007***	Cramer's V	.227	n/a	.001***
N of Valid Cases	541			N of Valid Cases		534	
R5	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R6**	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	.696	2	.706	Pearson Chi-Square	9.436	8	.307
Likelihood Ratio	.640	2	.726	Likelihood Ratio	9.441	8	.306
Phi	.178	n/a	.706	Phi	.132	n/a	.307
Cramer's V	.178	n/a	.706	Cramer's V	.132	n/a	.307
N of Valid Cases	22			N of Valid Cases	541		
R7	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R8**	**Value**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	2.277	3	.517	Pearson Chi-Square	.175	1	.675
Likelihood Ratio	3.467	3	.325	Likelihood Ratio	.175	1	.676
Phi	.302	n/a	.517	Phi	.087	n/a	.675
Cramer's V	.302	n/a	.517	Cramer's V	.087	n/a	.675
N of Valid Cases	25			N of Valid Cases	23		

(continued on next page)

Table 20. (continued)

R9	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R10**	**Valu e**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	2.426	3	.489	Pearson Chi-Square	2.622	1	.105
Likelihood Ratio	3.707	3	.295	Likelihood Ratio	2.574	1	.109
Phi	.332	n/a	.489	Phi	-.318	n/a	.105
Cramer's V	.332	n/a	.489	Cramer's V	.318	n/a	.105
N of Valid Cases	22			N of Valid Cases	26		
R11	**Value**	**df**	**Asymptotic Significance (2-sided)**	**R12**	**Valu e**	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	33.948	8	.000***	Pearson Chi-Square	1.300	4	.861
Likelihood Ratio	32.583	8	.000***	Likelihood Ratio	1.909	4	.753
Phi	.251	n/a	.000***	Phi	.168	n/a	.861
Cramer's V	.251	n/a	.000***	Cramer's V	.168	n/a	.861
N of Valid Cases	541			N of Valid Cases	46		
R13	**Value**	**df**	**Asymptotic Significance (2-sided)**				
Pearson Chi-Square	5.007	2	.082*				
Likelihood Ratio	5.214	2	.074*				
Phi	.467	n/a	.082*				
Cramer's V	.467	n/a	.082*				
N of Valid Cases	23						

*** significant at level 0,01 both sided,

* significant at level 0,1 both sided.

Source: own study.

According to the results in Table 20, out of 13 analyzed relationships the alternative hypothesis was accepted in 4 cases, which is less than a third of all cases. The alternative hypothesis was accepted for relations R3, R4 and R11 with a 0.01 level of two-sided significance. However, in the case of R13, this hypothesis was accepted with a 0.1 level of two-sided significance. Where the alternative hypothesis was accepted and the existence of dependence was demonstrated, the Cramer's V coefficient was analyzed. For the relationship R3 and R4, this coefficient is about 0.2,

for R11 0.25 and for R13 0.47. This means that the relationship can be considered strong for those 3 cases. In case of relationship R13, it is however rather weak.

In the case of R3, R4 and R11, the relationship was found, which confirms the existence of a behavioral effect. In R13, the relationship with the task, which did not show the existence of behavioral effect was analysed. It is worth mentioning here that for relationships R5, R6, R7 and R10, which demonstrated the existence of a behavioral effect, the null hypothesis could not be rejected in favor of the alternative, and the Cramer's V coefficient is statistically insignificant. In the remaining analysed relationships the alternative hypothesis is rejected, so we can conclude that there is no relation between the answers to questions.

If the variables tested by the Chi-square test are independent, it means that especially in those cases where the existence of an effect has been demonstrated, it can be concluded that the characteristics of the individual fund manager do not have a significant impact on the decisions made in this fund. As mentioned earlier, the explanation of this finding may be related to a collective fund management. Due to the teamwork nature of fund management, the behavioral implications of individual managers have a limited impact on the way the decisions are made and on the functioning of investment funds, which is manifested through the lack of relation between questions regarding investment decisions and behavioral implications.

5. DISCUSSION

Most fund managers in the survey presented in this study are males who typically invest in a 1-5 years investment horizon and who implement a moderate strategy of investments in domestic currency, i.e. the Polish zloty (PLN). The NBP announcements about the interest rates are the most important pieces of news, followed by public debt, money supply, the balance of payments and money reserves. On the other hand, economic activity indicators, such as industrial production, retail sales and GDP, and CPI inflation index, were mentioned most often

as other indicators that affect investment fund managers' decision-making process. Taking into consideration the data from foreign markets, most respondents considered GDP in different countries, interest rates, inflation, and PMI (including Chicago PMI) as important factors.

Majority of fund managers take into account information on market expectations published in the media. Interest rates were the most frequently cited category in the decision-making process, together with information obtained from Bloomberg, PAP and Reuters. Most fund managers consciously pay attention to the expectations arising from the National Bank of Poland decisions and its public announcements. If they also exploit the information about market expectations, it is usually for a fairly long period. Most positions are opened after the announcements of the new information made by the NBP and most reactions appear to be spontaneous. As a result, it can be concluded that the NBP's communications have a moderate impact on investors' decisions.

The results of this survey show that, in general, the majority of respondents manifested limited rationality of their decisions as the respondents were susceptible to the 5 of 10 tested behavioural inclinations. It should be taken into consideration that they are well-educated managers of investment funds, with relevant economic and financial knowledge and the experience that should make them behave rationally in each of these tasks. However, the opposite effect proved to be true, which is in line with recent research that indicates limited rationality of decisions among people who professionally operate on the financial market (cf. e.g. Glaser, Lange, Weber, 2003, 2005; Rzeszutek, Szyszka and Czerwonka, 2015).

Even though the Cronbach's alpha result indicates that the survey questions were appropriate, some limitations of our study should be mentioned here. First of all, the behavioural tasks may always seem somewhat artificial (or too "academic") for fund managers who in their daily work faced much more complex investment problems. Moreover, these tasks

replicated original decision-making scenarios known in the previous literature in economics and behavioural finance, which have been proposed quite a long time ago (in the 1970s and 1980s) in a different socio-economic reality, although on the other hand Kahneman (2011) argues that such decision-making tasks allow for the universal predictions of behavioural inclinations among respondents.

Nevertheless, the results of the research focused on the relationship between the investment strategies and the method of fund management and behavioral inclinations indicate that the behavioral effects are not transmitted to fund management style. We further conducted the analysis with the use of cross tables, Chi-squared test and Phi and Cramer's V coefficients. In case of 13 possible relationships taken into consideration, their existence was found in only 4 instances. This result allowed for a positive verification of the main research hypothesis investigated in our study saying that due to the team nature of fund management, the behavioral implications of individual managers have a limited impact on the way the decisions are made and on the functioning of investment funds.

Despite the above limitations, it should be emphasised that our results, in addition to strictly cognitive academic value, can also be used in practice to help fund managers make more rational investment decisions. In fact, as it has been argued by Kahneman (2011), the best way to avoid succumbing to behavioural errors is to become aware of their existence.

6. CONCLUSIONS

The aim of this paper was to understand the reactions of fund managers in Poland to the arrival of new market data, in particular the announcements revealed by the National Bank of Poland, and also to assess how rational they are in their investment decisions. We found that Polish fund managers react to diferent news, especially to the data revealed by the NBP and

different other institutions. Interest rates are found to be the most important type of information for their decision-making processes.

The decision processes of fund managers are complex and their behavioural inclinations play a role. Their decisions seem to be semi-rational when Polish market is considered. Most of answers in the survey were unbiased but the fund managers were subject to half of the analysed heuristics, so we must conclude that the rationality of the surveyed group is limited.

Our survey in itself was not easy to conduct, especially because the Polish investment funds market is relatively young and the fund managers are not very willing to share their experience. Hence, the number of institutions accessed and analysed through the survey in our paper should be seen as a success. The questionnaire covered questions about the nature of reactions to the public information announcements, but at the same time also the questions evaluating the behavioural biases of the surveyed managers. We used many channels to gain access to respondents (direct requests, mailing, phone calls etc.) and our results may constitue an opening of a new research avenue in this stream of literature on emerging markets.

A weak relationship between the decisions made by investment fund managers and behavioural effects was detected. The reasons behind this finding may be related to the collective nature of fund management business. We presume that the particular decisions are not made only by specific managers and, therefore, the responsibility in the decision-making processes is spread. In consequence, such management systems tend to eliminate the irrationality of decisions made by the individuals.

In summary, the novelty of this study is related to a large degree to the very comprehensive nature of our survey, which combines different aspects of the investment activity: information about the funds as financial institutions, factors that affect investment decisions, the decision-making patterns among fund managers and the analysis of their behavioural biases etc.

Future work in this research area may attempt to focus on larger numbers of surveyed institutions as well as explore other methods of gathering data about the investment decision-making processes among fund managers.

References

Ahmad, Z., Ibrahim, H., & Tuyon, J. 2017. Behavior of fund managers in Malaysian investment management industry. Qualitative Research in Financial Markets, 9 (3), 205-239.

Andersen, T., Bollerslev, T., Cai, J. 2000. Intraday and interday volatility in the Japanese stock market. Journal of International Financial Markets, Institutions and Money 10, 107–130.

Andrle, M., Hlédik, T., Kameník, O., & Vlcek, J. 2009. Implementing the new structural model of the Czech National Bank. *CNB WP*, *2*.

Anufriieva, K., & Shapoval, Y. 2019. Verbal interventions of the National Bank of Ukraine: The impact of exchange rate. Journal of International Studies, 12(3).

Arkes, H., Blumer, C. 1985. The Psychology of Sunk Cost. Organisational Behavior and Human Decision Processes, 35, 124-140.

Arnswald, T. 2001. Investment behaviour of German equity fund managers-an exploratory analysis of survey data. Bundesbank Series 1 Discussion Paper No. 2001,08, Available at SSRN: https://ssrn.com/abstract=2785124

Azimi, M., 2019. Are Professional Investors Prone to Behavioral Biases? Evidence from Mutual Fund Managers. Available at SSRN: https://ssrn.com/abstract=3462776 or http://dx.doi.org/10.2139/ssrn.3462776.

Bennani, H. 2020. Central bank communication in the media and investor sentiment. Journal of Economic Behavior & Organization, 176, 431-444.

Beckmann, D., Menkhoff, L., & Suto, M. 2008. Does culture influence asset managers' views and behavior?. Journal of Economic Behavior & Organization, 67(3-4), 624-643.

Berry, T., Howe, K. 1994. Public information arrival. Journal of Finance 49, 1331–1346.

Bohl, M. T., Brzeszczyński, J., & Wilfling, B. 2009. Institutional investors and stock returns volatility: Empirical evidence from a natural experiment. Journal of Financial Stability, 5(2), 170-182.

Brzeszczyński, Bohl & Serwa 2019. Pension Funds, Large Capital Inflows and Stock Returns in a Thin Market. Journal of Pension Economics and Finance, 18(3), 347–387.

Brzeszczyński, J., Gajdka, J., & Kutan, A. M. 2015. Investor response to public news, sentiment and institutional trading in emerging markets: A review. International Review of Economics & Finance, 40, 338-352.

Brzeszczyński, J., & Kutan, A. M. 2015. Public information arrival and investor reaction during a period of institutional change: An episode of early years of a newly independent central bank. Journal of Comparative Economics, 43(3), 727-753.

Cheung, Y. W., & Chinn, M. D. 1999. Macroeconomic implications of the beliefs and behavior of foreign exchange traders (No. w7417). National Bureau of Economic Research.

Cheung, Y. W., & Wong, C. Y. P. 2000. A survey of market practitioners' views on exchange rate dynamics. Journal of international economics, 51(2), 401-419.

Chevalier, J., & Ellison, G. 1999. Are some mutual fund managers better than others? Cross-sectional patterns in behavior and performance. Journal of Finance, 54(3), 875-899.

Chiyachantana, C. N., Jain, P. K., Jiang, C., and Wood, R. A. 2004. International evidence on institutional trading behavior and price impact. Journal of Finance, 59: 869–898.

Cohen, J., Krishnamoorthy, G., & Wright, A. 2010. Corporate Governance in the Post-Sarbanes-Oxley Era: Auditors' Experiences. Contemporary Accounting Research, 27(3), 751–786. https://doi.org/10.1111/j.1911-3846.2010.01026.x

Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), 297-334.

Cutler, D. Poterba, J., Summers, L 1989. What moves stock prices? Journal of Finance 15, 4–12.

Domowitz, I., Glen, J., and Madhavan, A. 2001. Liquidity, volatility and equity trading costs across countries and over time. International Finance, 4: 221–255.

Drachter, K., Kempf, A., & Wagner, M. 2007. Decision processes in German mutual fund companies: evidence from a telephone survey. International Journal of Managerial Finance, 3(1), 49-69.

Edmonds, R., Kutan, A. 2002. Is the public information really irrelevant in asset markets? Economics Letters 76, 223–229.

Ellsberg, D. 1961. Risk, Ambiguity, and the Savage Axioms. Quarterly Journal of Economics. 75 (4): 643–669. doi:10.2307/1884324

Eshraghi, A., & Taffler, R. 2012. Fund manager overconfidence and investment performance: evidence from mutual funds. Available at SSRN 2146864.

Eshraghi, A. 2011. How does mutual fund manager overconfidence impact mutual fund investment performance. Retrieved July 27, 2020.

https://www.cass.city.ac.uk/__data/assets/pdf_file/0005/79466/Eshraghi.pdf

Farnsworth, H. and Taylor, J. 2006. Evidence on the Compensation of Portfolio Managers, Journal of Financial Research, Vol. 29 No. 3, pp. 305-324.

Fieger, J. 2017. Behavioral Finance and Its Impact on Investing. A Senior Thesis submitted in partial fulfilment of the requirements for graduation in the Honors Program Liberty University.

Filip, D., & Miziołek, T. 2019. Market Concentration in the Polish Investment Fund Industry. Gospodarka Narodowa, (4), 53-78.

Freeman, N. J., & Bartels, F. L. 2000. Portfolio Investment in Southeast Asia's Stock Markets: A Survey of Institutional Investors' Current Perceptions and Practices. Institute of Southeast Asian Studies.

Foster, F. D., & Warren, G. J. 2016. Interviews with Institutional Investors: The How and Why of Active Investing. Journal of Behavioral Finance, 17(1), 60–84. https://doi.org/10.1080/15427560.2015.1095754

Glaser, M., Langer, T., Weber, M. 2003. On the Trend Recognition and Forecasting Ability of Professional Traders. Working Paper of University of Mannheim.

Glaser, M., Langer, T., Weber, M. 2005. Overconfidence of Professionals and Lay Men: Individual Differences Within and Between Tasks? Working Paper of University of Mannheim.

Gómez-Bezares, F., & Przychodzen, W. 2018. Bank-Affiliated Mutual Fund Managers' Trading Patterns of Parent Banks' Stocks: International Evidence. Journal of Behavioral Finance, 19(2), 199-208.

Hartwig, M., Voss, J. A., Brimbal, L., & Wallace, D. B. 2017. Investment Professionals' Ability to Detect Deception: Accuracy, Bias and Metacognitive Realism. Journal of Behavioral Finance, 18(1), 1-13.

Hayo, B., & Neuenkirch, M. 2012. Bank of Canada communication, media coverage, and financial market reactions. Economics Letters, 115(3), 369-372.

Jansen, K., and Tuijp, P., 2019, A Survey of Institutional Investors' Investment and Management Decisions on Illiquid Assets. Netspar Survey Paper 56, Available at SSRN: https://ssrn.com/abstract=3467770 or http://dx.doi.org/10.2139/ssrn.3467770

Kahneman, D. 2011. Thinking, fast and slow. Macmillan.

Kahneman, Daniel. 2003, Maps of Bounded Rationality: Psychology for Behavioral Economics. American Economic Review, 93:5, 1449-75.

Kahneman, D., Tversky, A. 1979. Prospect Theory, an Analysis of Decisions under Risk. Econometerica, 47, 263-292.

Kubacki, D. 2014. Comparison of the information efficiency of the financial markets in selected European Union countries on the event Central Bank information about changing or not changing the level of the reference rate. Journal of Management and Financial Sciences, 7(16), 75-92.

Kubińska, E., Czupryna, M., Markiewicz, Ł., & Czekaj, J. 2016. Technical analysis as a rational tool of decision making for professional traders. Emerging Markets Finance and Trade, 52(12), 2756-2771.

Langer, E. J. 1975. The Illusion of Control. Journal of Personality and Social Psychology, 32, 311-328.

Melvin, M. , Yin, X. 2000. Public information arrival, exchange rate volatility and quote frequency. Economic Journal 110, 44–61.

Menkhoff, L., Schmidt, U., & Brozynski, T. 2006. The impact of experience on risk taking, overconfidence, and herding of fund managers: Complementary survey evidence. European Economic Review, 50(7), 1753-1766.

Menkhoff, L. 2010. The use of technical analysis by fund managers: International evidence. Journal of Banking & Finance, 34(11), 2573-2586.

Mitchell, M., Mulherin, J. 1994. The impact of public information on the stock market. Journal of Finance 49, 923–950.

Miziołek, T., & Trzebiński, A. A. 2017. Efektywność polskich funduszy inwestycyjnych-przegląd metod i literatury. Finanse, 10(1).

Pound, J., & Shiller, R. J. 1987. Are institutional investors speculators?: Not in the strict sense of the word. The Journal of Portfolio Management, 13(3), 46-52.

Prast, H. M., & De Vor, M. P. 2005. Investor reactions to news: a cognitive dissonance analysis of the euro–dollar exchange rate. European Journal of Political Economy, 21(1), 115-141.

Przychodzen, J., Gómez-Bezares, F., Przychodzen, W., & Larreina, M. 2016. ESG Issues among fund managers—Factors and motives. Sustainability, 8(10), 1078.

Puetz, A., & Ruenzi, S. 2011. Overconfidence among professional investors: Evidence from mutual fund managers. Journal of Business Finance & Accounting, 38(5-6), 684-712.

Ranaldo, A., & Rossi, E. 2010. The reaction of asset markets to Swiss National Bank communication. Journal of International Money and Finance, 29(3), 486-503.

Riordan, R., Storkenmaier, A., Wagener, M., & Zhang, S. S. 2013. Public information arrival: Price discovery and liquidity in electronic limit order markets. Journal of Banking & Finance, 37(4), 1148-1159.

Rosa, C. 2011. Words that shake traders: The stock market's reaction to central bank communication in real time. Journal of Empirical Finance, 18(5), 915-934.

Rzeszutek, M., Szyszka, A., Czerwonka, M. 2015. Investor's expertise, personality traits and susceptibility to behavioral biases in the decision making process. Contemporary Economics, 9, 337-352

Shefrin, H., Statman, M. 1985. The Disposition to Sell Winners too Early and Ride Losers too Long: Theory and Evidence. Journal of Finance, 11, 777 – 791.

Shiller, R. J. 2000. Measuring bubble expectations and investor confidence. Journal of Psychology and Financial Markets, 1(1), 49-60.

Slesman, L., Baharumshah, A. Z., and Wohar, M. E. 2015. Capital inflows and economic growth: does the role of institutions matter? International Journal of Finance and Economics, 20: 253–275.

Taylor, M. P., & Allen, H. 1992. The use of technical analysis in the foreign exchange market. Journal of international Money and Finance, 11(3), 304-314.

Tversky, A., Kahneman, D. 1983. Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment. Psychological Review, 90, 239-315.

Von Neumann, J., & Morgenstern, O. 1944. Theory of Games and Economic Behavior. Ewing, NJ: Princeton University Press.

Welch, S. and Wang, Y., 2013. Is Manager Gender Important in the Performance of Mutual Funds?. Accounting and Finance Faculty Publications. 6. https://digitalcommons.csbsju.edu/acct_pubs/6

Reports

Report on the financial situation of investment fund companies in 2019, 2020. Office of the Polish Financial Supervision Authority, Warsaw, https://knf.gov.pl/ [accesed: 10-10-2020]

Acknowledgements

This work was supported by the research funding from the Narodowe Centrum Nauki (NCN) / National Science Centre (NSC) in Poland (project number: 2015/19/B/HS4/03238).