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IRRATIONAL INVESTMENT STATEGIES AND DECISION MAKING BIASES OF NOVICE INVESTORS

IRACIONÁLNÍ INVESTIČNÍ STRATEGIE A CHYBY V ROZHODOVÁNÍ ZAČÍNAJÍCÍCH INVESTORŮ

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I declare that I have written this thesis by myself and listed all sources and literature used.

Prehlasujem, že som diplomovú prácu vypracoval samostatne a že som uviedol všetky použité pramene a literatúru.

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ABSTRACT

As stock market participation increases world-wide, more and more investors will be recruited from groups of inexperienced individuals who will be susceptible to cognitive biases and emotional, as well as social influence. The label "irrational" investor is used to describe an individual acting in deviation from the principles of efficient markets. A behavioral finance approach is used to examine the various psychological variables which influence irrational decision making in investment situations with particular emphasis on cognitive biases and the Prospect theory of Kahneman and Tversky, as well as the relationship of stock market trading and achievement motivation. A complex definition of what constitutes irrational investors is presented, which is used to construct a questionnaire method to assess the level of investor irrationality and achievement motivation in individuals. So far no significant differences are found in subjects between two groups of "inexperienced" and "experienced" investors; however, the questionnaire method developed shows satisfactory parameters. An additional research trial confirms the tendency to use irrational strategies in a modeled investment situation on a sample of college students.

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S celosvetovo rastúcim počtom ľudí, ktorí obchodujú na finančných trhoch pochádza čoraz viac investorov spomedzi ľudí neskúsených, ktorí sú náchylnejší ku kognitívnym omylom, vplyvu emócií a sociálnemu ovplyvneniu. Označenie "iracionálny" investor je použité pre tie osoby, ktoré konajú v rozpore s princípmi efektívnych trhov. Z hľadiska behaviorálnych financií sú preskúmané rôzne psychologické charakteristiky, ktoré ovplyvňujú iracionálne rozhodovanie v situáciách s investovaním, so zvláštnym dôrazom na kognitívne omyly a Prospect theory Kahnemana a Tverského, ako aj vzťah obchodovania na burze a motivácie k úspechu. Je predstavená komplexná definícia iracionálneho investora, na základe ktorej je vytvorená dotazníková metóda na vyhodnotenie úrovne iracionality a motivácie k úspechu u jedincov. Použitie tejto metódy zatiaľ u našich respondentov neviedlo k odhaleniu štatisticky významných rozdielov medzi "neskúsenými" a "skúsenými" investormi, vytvorený dotazník však vykazuje uspokojivé parametre. Dodatočný modelový laboratórny experiment na vzorke univerzitných študentov potvrdil tendenciu k iracionálnym stratégiám v modelovej situácií s investovaním.

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INTRODUCTION: PSYCHOLOGY AND ECONOMICS

Economy is a science of numbers, while psychology deals with unknown forces. A common view: while economy concerns itself with the real world, psychology deals with people's beliefs, motivations, and all those things we can't *really* quantify. However, for a long time, economics and psychology have had some very similar areas of interest. If we define economy using the often cited "science of human choices in the face of scarcity", we can see that its objective is not that different from that of psychology. There are however vast differences between the focus of economic and psychological research- differences that lie mostly in methodology, but also in the underlying assumptions. While economics mostly concentrates on questions starting with "How much?", psychology is concerned with questions starting with "Why?", or "When?". These are the topics of motivation, rationality, information processing that economists take for granted, but which have been shown to have a significant effect on individual economic behavior.

In general, one might say that economics has been focusing on the effects of human behavior, while ignoring actual reasons behind it. Economics has generally focused on developing macro-models of behavior, which leave little room for the understanding of individual motivations. Economic research focuses on numbers and statistics, and instead of individual motivations it assumes what early economist Thorstein Veblen (1900) has called a "hedonistic calculus". The characteristics of individuals and small groups are mostly eliminated in economic research, and outcomes are expressed in terms of probabilities.

What's more, economics and psychology derive their data from completely different approaches. Economists mostly conduct their research in the field, maintaining high external validity in the given context, but they have been criticized for low internal validity. On the other hand, psychological research, mostly carried out in laboratories and controlled environments, aims at increasing the internal validity of such research, while sometimes failing to take into account the varying external realities, such as institutional characteristics, which are typical for *homo economicus*.

Economic psychology combines these two trends. Recently, such combination has yielded interesting results. Out of many, let's mention the fairly recent analysis of Intel's business plan in the 1970s by L. Rook in the Journal of Economic Issues (2006). Rook analyzes Intel's departure from a particular field of business from both standpoints, and

comes to the conclusion that combining economic (focusing on rational consideration of costs and benefits) and psychological (analyzing processes such as groupthink and group polarization within the management) methods significantly increases the explanatory power of such a case study. When we add the “Why?” and “When?” questions to the “How much?” questions, we can find explanations that otherwise could have been lost to the one-sided economic approach.

In many cases, adding psychological analysis may be of critical importance. An integrative economic psychological approach can be used to supplement or validate macro level economic theories with data on individual motivation and decision making. Behind the science of graphs and equations, there are individuals and their motivations and it is their individual characteristics which are of key importance, rather than their sheer numbers.

PART ONE

1. FROM EFFICIENT MARKETS TO BEHAVIORAL FINANCE

1.1 A Growing Trend

Stock markets are places for those people who have decided to give up some of their immediate desires, risking some of their fortunes in hope of better returns in the future. Their motivations will be very different- some might be motivated by retirement saving, others are attracted to the stock market by the level of associated risk. The goals people set for themselves will also have different time horizons. However, in an area where one would only expect economic theory, psychology can play an important role. It's easy to see the multitude of psychological problems associated with investment behavior. People invest their money with different motives, they must decide how to do it and when to withdraw. Making decisions that concern money can be very complicated and difficult, with many personal characteristics affecting the process. While economy studies and labels phenomena on the aggregate level, psychology focuses on individuals and the qualities that play a role in their decision making.

When we look at the population or market as a whole in a given period of time, we can see movements, trends- growth or decline. But upon a closer look, there are the people that make up the anonymous populations and whose individual behavior and choices eventually contribute and give rise to the aggregate phenomena that economists talk about.

There are various personal characteristics which affect the way we deal with money. To look for and examine these characteristics is the job of *economic psychology*. As one of its branches, *financial psychology* focuses on financial affairs and financial management of the household, which also includes investing and related activities.

And today, the importance of financial psychology seems to be more pressing than ever. The number of people who participate in the stock market is rising at a greater pace than at any time in history. This is not true only for the so-called "emerging markets" which have to catch-up with the rest of the developed world, but also for countries with a long history of stock markets. According to Wärneryd (2001), the most notable increases in participation in the stock market in the last two decades have occurred in Australia, the USA and Sweden. In the USA, the percentage of stock- owning households rose from just 10% in 1987 to 50% in 1999 (Wärneryd, 2001)!

Is it then true that less and less people keep their savings in regular bank accounts and more people realize the potential benefits of investing? For decades, the stock market has been a place for professionals, but today that is less and less true. That could mean that the generally common picture of the professional, active, speculative and frequently trading investor could be quite incorrect. As investing in stocks becomes more widespread, the participants in the stock market will be less experienced and perhaps more susceptible to various outside influences. Wärneryd (2001, p. 5) reports on a research study of German investors by Müller-Peters (1991), who found that vast majority of his subjects- investors did not diversify their asset portfolio and held on to assets for long periods of time rather than be active traders.

Wärneryd (2001) states additional factors, which apparently lead to increased participation of the general public in the stock market today. The first and presumably most important reason is long- term retirement saving and expectations of decreasing retirement pensions rates from state pensions systems. While there were eight working people per each retiree in the USA in 1965, there are only three per each retiree today. And as of 2005 in the Czech republic, the hidden debt of the retirement pension system exceeds 330% (!) of GNP (Kohout, 2005). It then comes as no surprise that more and more people seek to secure their retirement in different ways. In addition, there is the shot-term possibility of getting rich (something everyone has heard about), and one mustn't forget the intensive advertising and marketing campaigns which investment firms and banks employ. As one in Slovakia recently claimed, "Me an investor? No problem".

1.2 Efficient Markets and Their Anomalies. Noise Traders and Inexperienced Investors

Let's consider we are in the 1970s, when a grand and elegant theory is thriving. According to the *efficient markets theory*, all stock market participants are completely rational in their actions and decisions. They have access to complete and relevant information which is efficiently and immediately incorporated into all prices. According to the efficient markets theory, information is optimally used and transformed into stock price changes. In other words, the efficient markets model asserts that the current price of any share equals the mathematical expectation, conditional on all information available at the time, of the present value of future dividends yielded by that share. Efficient markets say that share price basically equals its optimal forecast.

Some more assumptions of the theory: it deals with participants in the stock market, information flows and changes in stock prices. The basic function of the financial market is to ensure that financial resources are constantly allocated to their productive use in an optimal way. Information in an efficient market is available to all participants, all of whom consider probabilities and update them in the face of new information based on Bayes' theorem (i.e. they are rational, *Bayesian*) and all information is reflected into prices. The efficient market theory implies that absolutely no precise prediction of future prices can be made, because all available information has already been utilized and is already reflected in the present stock price as an optimal forecast based on available information. The stock price consequently follows what is referred to as a "random walk".

However, there is one glitch. Efficient markets theory only deals with perfectly rational participants (traders). Although regarded as a non-disputable in the 1970s, reports on many observed market anomalies which the theory couldn't account for began to appear soon. One example is that the theory failed to explain such existing phenomena as price bubbles or crashes. However, no alternative general theory has been offered, but the reported anomalies began to take form of a new set of theories. During the 1980s, first Robert Shiller (in Shiller, 2003) and later other economists began publishing research studies which suggested that stock prices had higher volatility than efficient markets could explain. According to Shiller (2003), by the end of the 1980s there was a clear sense that overall volatility of the stock market couldn't be well explained by any of the efficient

market models in which stock prices are formed by looking at present discounted value of future dividends.

Some authors like Shiller claim it is absurd to assume that all traders are rational optimizers and one way to reconcile the efficient markets theory with reality is the introduction of more than the rational type of investor. Markets could still be efficient, as long as one group of "smart money" investors or rational traders can offset the effect of the ones that are in any way non-Bayesian. According to Wärneryd (2001, p. 51), Black (1986) coined the term "noise trader" to refer to those, who do not act on information exactly how the efficient market theory would have us believe. "Noise traders", stemming from the "noise", i.e. disruption, they create in the market by their reactions to information actually disturb the efficiency of the market by their non-Bayesian reactions to information, i.e. consideration and updating of probabilities based on non-Bayesian principles. While the term "noise trader" refers to those market traders who are basically non-Bayesian in their actions, the term inexperienced or novice investors has been used to refer to those who are new to investing. So far, we cannot assume that these two groups in fact overlap.

The efficient markets theory posits that when irrational optimists buy, the smart investors sell and when irrational pessimists sell, the smart investors buy, thus eliminating any effect noise traders might have, and the markets remain efficient. However, it has never been shown that this is in fact true. There is now a general agreement that while they are not completely crazy, financial markets do in fact contain quite substantial noise, which dominates the movements on the aggregate market. Noise traders are considered to be those, who deviate from the efficient market theory in reacting to information and make continuous forecasting errors. Actual definitions of the "noise trader" vary, but they usually include different kinds of irrational behavior, such as emotional and immediate reactions to price changes, buying when prices rise and selling when they fall, etc.

As the reported anomalies to efficient markets grew, a different approach to explaining investor behavior has been developing. *Behavioral finance* stands in sharp contradiction to much of efficient markets theory. Some very recent research has suggested that while aggregate markets seem to be wildly inefficient, individual stock prices do show correspondence to efficient markets theory; however there's general agreement that one elegant theory can't account for all processes in financial markets and must be supplemented by what has been labeled behavioral finance.

All in all, the efficient market theory is no good at describing individual investor behavior. We can just never fully explain price movements such as bubbles from a macro-market level, considering all participants as rational agents. Behavioral finance basically refers to psychological thinking being applied to financial markets in trying to explain what from the point of view of economy appears as irrational, non-Bayesian behavior. The idea behind behavioral finance is that without descending to the individual level and examining individual investors, we can never fully understand such phenomena as price bubbles and herd movements. Individual investor behavior can be influenced by many different factors, which concern the motives for investing, information processing, emotional reactions, risk attitudes, and social influence. When we take such different personal features into consideration, the picture we get will be much closer to the actual situation. The forces which guide participants of financial markets will be much the same ones that psychology has been dealing with for a very long time.

1.3 Investment Decision Making as a Psychological Problem

As the numbers confirm, more and more people in the western world hold stocks and participation in the stock market has recently been on a rapid increase. In countries such as the Netherlands, UK, Germany, Sweden and Australia, about 20- 60% of households have their savings in stocks. In Germany, participation of households in the stock market has risen from 11% in 1988 to 20% in 2000 (Wärneryd, 2001). As the number of investors on the market grows, there is constantly more of those who are dealing with investing money for the first time. The group of inexperienced first-time investors is of especial interest, because they may the ones that are most prone to let their irrational thoughts and fears influence decision making in financial markets. Among these novice investors, the opportunities for various influences are abundant- it is the everyday talk, provoking the envy of financial successes of others, falling for herd behavior and the sense of infallibility that is effective in overcoming one's rational doubts and brings more and more such investors to the market.

Psychology has been studying human behavior for decades and indeed, social psychology has found its application in almost all conceivable areas of our lives. Money naturally involves and raises a lot of psychological issues. First, there is the area of motivation for investing. Second, people differ in their ways of decision making and

information processing when it comes to investing money. Investment planning must take many kinds of information into account, and ignoring it may prove disastrous. Another important area of interest when it comes to the behavior of individual investors is attitude towards risk. Some people may tolerate very little risk, while other may seek it. Risk attitudes will have a significant influence on the type and duration of investment. Personal savings will no doubt be associated with strong emotions. While some authors stress that investment planning must be completely free of all emotions, others acknowledge that emotions are a real influence on investors and must be studied in order to understand investor behavior. Yet another strong factor is social influence. This represents a wide psychological field with a long history of research and much of it can apply to how individual investors react to information and are influenced by others. Terms such as optimism, pessimism, rising trends, bubbles, crashes all involve mass behavior and are related to social influence.

Although many authors have proposed more or less credible professional investment strategies, all these psychological influences result in different individual investment strategies that people choose. With the rising participation in stock markets around the world, the behavior of individual investors who are probably influenced by these forces much more than the professional stock brokers is of particular interest. This becomes a particularly impending area of interest, considering the hypothesis of Zeira (1999) as reported by Wärneryd (2001), who claimed that the crashes of 1929 and 1987 on the New York stock exchange were primarily caused by the entry of very large numbers of investors on the market, who used borrowed capital and were probably subject to many forces such as briefly described above. In the following chapters, we will look at them in more detail.

Investment behavior involves and is certainly influenced by various known and unknown psychological processes. The focus will be on uncovering irrational investment strategies, as these may be associated with various psychological characteristics and processes. Within economics and the efficient market theory, irrationality would simply mean non-Bayesian decision making, based on complete and accurate information, without taking into account situational and social factors. However, the psychological account of irrational investment behavior and strategies will cover a much wider area. “Irrational behavior” will include considering irrelevant or incomplete information, the processes of social influence and herd behavior, as well as biased cognitive processes which lead to

simplified and often incorrect outcomes. Financial markets have traditionally been studied by economists, but given the enormous and unprecedented growth in the number of novice investors, the psychological aspects of markets and investor behavior are becoming more and more urgent. The financial markets are a place where people meet and interact with each other and uncovering the influences which guide their interaction is a valuable supplement to the traditional "How much?" questions of economics research.

2. RISK, MOTIVATION AND EXPECTATIONS

"*If you want a guarantee, buy a toaster.*"
(Clint Eastwood)

2.1 Choice Under Uncertainty- Risk Attitudes, Decision Biases and the Prospect Theory

Unfortunately, investing our savings is a risky business. Various kinds of investment involve a varying degree and type of risk and the fact remains that we can't really be certain of anything. Let's just note that at this point, there will be no discussion concerning different types of securities and related financial risks and risk factors, but focus will be on the psychological aspects- the processes and phenomena relating to situations involving a risky choice.

The risk that investment decisions involve is demonstrated by the following picture. As we can see however, a risky choice can reward us with unimaginable returns.

People's proneness to risk is a major factor influencing investment behavior. From a psychological point of view, making investment decisions involves two kinds of choices. Because we don't know, if or how successful a particular investment will be, making investment decisions involves making *choices under uncertainty*, just like choosing which

movie to see at the theater- we don't know, which will be better. Decision making under uncertainty is characterized by risk preference: the person who prefers $10 now to a 50% chance of $20 in the future is characterized as *risk averse* and the person who prefers the opposite is characterized as *risk seeking*. In addition, making investment decisions involves *intertemporal choice*, which is characterized by time preferences- the preference for proximal or distal outcomes in time. For example, intertemporal choice involves choosing between various kinds of investments based on their recommended duration (asset A may promise to yield 10% return in one year, whole asset B promises 40% in 3 years). A preference for an outcome now over an equivalent later is called *positive time preference*.

According to economic theory, choice under uncertainty can be described by *expected utility theory* and intertemporal choice by *discounted utility theory*. Expected utility theory deals with subjective expected utility and refers to decision making based on weighing the subjective value of different outcomes and their probabilities and deciding on the most favorable option. Discounted utility theory deals with *discount rate*- which is similar to an interest rate, only it determines the present value of an amount of cash or other asset at some future date. For the purpose here, let's just say that discounted utility is a method for including the discounted value of a good into its present value. For example, according to discounted utility theory time preference can be quantified as the discount rate, or the percentage of increase in the magnitude of the reward needed to compensate for the delay. That means that according to expected utility theory, at a discount rate of 10% weekly, $100 now would be just as preferable as $110 in one week.

However, choice under uncertainty and intertemporal choice doesn't appear to be governed by just these two economic principles. Both show the presence of decision biases, which are deviations from expected utility and discounted utility theory. Chapman and Weber (2006) studied decision biases in choice under uncertainty and intertemporal choice. As they describe the underlying mechanisms, Chapman and Weber show how these biases deviate from expected and discounted utility and show that the assumption of completely rational Bayesian actors on the market isn't accurate.

The *common difference effect* in intertemporal choice shows that adding a constant delay to both choices shifts preference from the smaller and sooner to the larger and later outcome. In Chapman and Weber's example, the common difference effect is evident when receiving $10 in 2 weeks is preferable to receiving $20 in 2 weeks, however $10 in 12 weeks is less preferable than $20 in 14 weeks. Adding a constant to both choices resulted in

preference of the later outcome. In addition, intertemporal choice shows the *magnitude effect*, in which increasing the magnitudes of both alternatives by a constant also results in shifting preference from the smaller to the larger, later outcome. For example $10 now may be preferable to $20 in one week, but $100 now will be less preferable than $200 in one week. On the other hand, choice under uncertainty shows two biases labeled as the *common ratio effect* and the *peanuts effect*. Under the common ratio effect, reducing the probabilities for both choice options by a common ratio shifts preference from the smaller and more probable to the larger and less probable outcome. For example, a person might prefer a 50% chance of winning $100 to a 25% chance of winning $200, but when both probabilities are scaled down by a factor of 10, the same person is more likely to prefer a 2.5% chance of winning $200 to a 5% chance of winning $100. The peanuts effect refers to the effect that occurs when increasing the magnitude of the outcomes results in shifting preference to the smaller and more probable outcome. For example, a person might prefer a 50% chance to win $2 to a certainty of winning $1. However, when both outcomes are increased by a factor of 10, the same person is likely to prefer a certainty of winning $100 to a 50% chance of winning $200. In this case, people are willing to take more risks for smaller amounts ("peanuts").

Chapman and Weber (2006) confirmed the presence of these biases in their experiments and suggest a possible explanation which contradicts the assumption of completely rational Bayesian actors. According to Chapman and Weber, choice under uncertainty as well as intertemporal choice can be modeled across the three dimensions of value of outcome (in this case, money), probability, and time. All four mentioned biases can be explained by the fact that the function of the relationship of each domain to decision weight is not linear, but hyperbolic. Let's take the common difference effect- in our example from the previous paragraph, the difference between 2 and 4 weeks is more significant than the difference between 12 and 14 weeks and hence the function of the dimension of time against choice weight is much steeper at the beginning. As time increases, distal differences are less significant than proximal differences. Chapman and Weber explain the remaining three biases in the same manner. The magnitude effect in intertemporal choice is the result of the hyperbolical shape of the outcome against choice weight function, which is steeper for larger outcomes, hence we are willing to wait longer for larger outcomes. In other words, there is a smaller subjective difference between two smaller than between two larger outcomes. The common ratio effect in choice under uncertainty can be explained by

the dimension of probability, because the difference between 50% and 25% is more influential for decision making than the difference between 5% and 2.5%. In this case, the hyperbolic function is also steeper for larger than for smaller values, and differences in probabilities are seen as less significant for smaller probabilities. Lastly, the peanuts effect can be explained by the dimension of the outcome value. According to the peanuts effect, we are more likely to take more risks for smaller amounts and less likely to choose the riskier alternative in outcomes involving larger amounts. In this case just like the magnitude effect, the peanuts effect is the result of the function of outcome value against choice weight, which is steeper for larger amounts. In other words, people are more likely to perceive a difference between two smaller amounts as less significant than the difference between two larger amounts. For the larger of two large amounts, they are willing to wait longer (magnitude effect) and risk less (peanuts effect).

The existence of these biases and their underlying mechanisms proves that actors in situations involving risky choices indeed aren't as rational as economic theory would suggest. They are prone to biases, and don't consider time, outcomes and probabilities as linear variables. The differences between two smaller outcomes and probabilities are perceived as less significant than the differences between two larger outcomes or probabilities. In addition, the distance between two outcomes in time is seen as less significant for two proximal than for two distal time-related outcomes.

Apart from decision biases, several psychological variables have been examined in relation to risk attitudes. Economic psychology assumes that risk attitudes are influenced by such variables as age, gender, or certain personality characteristics. However, there are great differences in risk attitudes obtained using different psychological measures and tests. According to Wärneryd (2001), there are always very low correlations found between different psychological tests constructed for measuring risk aversion or risk seeking. Nevertheless, quite successful tests concerning proneness to risk have been devised for specific fields. Financial advisors often distinguish groups of clients according to different levels of acceptable risk with simple questionnaires. Clients are asked to consider the amount of decrease in value they would tolerate for a certain period of time, as well as the estimated duration of investment (although enduring for longer periods of time is connected with many difficulties).

Let's continue with the relationship of risk attitudes and age. In her research studies, Pålsson (1996) found that there was in fact such a relationship. Riskier investments were

negatively correlated with age- younger investors were found to have a tendency to invest in securities which carried a higher level of risk, but allowed for much higher possible returns. This finding is in line with the popular investment rule, which states that the percentage of any investor's portfolio consisting of shares should be equal to 100 minus the investor's age. Wärneryd (2001) analyzed a random sample of Swedish households in 1997 from a Swedish National Census database, and reports the following results concerning the relationship of various psychological and demographic characteristics and risk attitudes: according to his findings, socio-demographic variables such as household size, gender, university education or the lack thereof and age *weren't* related to risk taking. A surprising finding, as age is one of the variables usually thought to be associated with risk attitudes in some way. What was however found to influence risk attitudes were some variables such as perceived financial security (this is in line with the economists' view), saving towards a goal, level of self- control and level of interest in financial markets.

A valuable, though possibly expected finding is presented by Lupfer (1970), who found that the source of money invested had a profound effect on risk aversion. His subjects, who invested their own money requested more and more detailed information on investment options, held their assets for longer periods of time and traded less often, and ultimately accumulated a larger profit. Subjects not investing their own money requested less information for their investment decisions and traded more arbitrarily. The findings are in line with the theory of *mental accounts* by Shefrin and Thaler (1988). Mental accounting posits that people have a spontaneous tendency to group their income in different classes, each with different propensity to consume. It is well conceivable that own assets are grouped separately from "given-for-free" assets, and the latter are more likely to be invested in risky assets.

Extensive research of choice under uncertainty by Daniel Kahneman and Amos Tversky (Kahneman and Tversky, 1972; Tversky and Kahneman, 1992) lead to their formulation of the *prospect theory*. Their research was the first to suggest that the actual choices people make in situations of deciding among risky alternatives are considerably different from what economic theory with expected and discounted utility theory would suggest. According to Kahneman and Tversky, people are not so much influenced by the perceived risk of an alternative, but by the perceived possible ensuing loss. Hence, *loss aversion*, instead of risk aversion is the central concept of their theory and Kahneman and Tversky claim that loss aversion is the essential force guiding economic behavior.

In prospect theory, a "prospect" refers to an outcome with a given probability, basically a risky alternative, which is being considered in a given situation. Decision making then occurs in two steps, or phases: first, the given problem or situation is analyzed, and probabilities are assigned to possible outcomes (the "editing" phase); each of the edited prospects is subsequently evaluated, and the preferred prospect is selected among available alternatives. The first defining aspect of the prospect theory is that when evaluating alternatives, we consider the possible losses that different prospects could be associated with. The second is that we consider them in terms of *changes* in wealth, rather than *total* wealth.

This aspect of the prospect theory is referred to as "framing". It means that we consider losses or gains not in their total volume, but as deviations form a certain point of reference we have in mind. If applied to investment behavior, the various choices, or prospects, are framed as gains or losses not in terms of their total resulting change in wealth, but based on a reference point that the individual uses. This theory, and the effects of framing outcomes in particular, have many implications on financial behavior. For example, framing can help explain why individuals tend to be more risk seeking in certain situations. For example, Payne (Payne, 1980, as reported by Wärneryd, 2001, p. 107) gave groups of subjects different expected targets in an investment game. The subjects, whose targets were set higher made more risky choices, because even a moderate return which was below the target (point of reference) was considered as a loss (below the given reference point). Let's keep in mind, that when considering risky options, it seems that people put greater emphasis on the looming possible losses and consider them with a particular point of reference in mind, not in their total. After considering the prospect theory, we see that decision making in a risky situation won't be as simple as the expected utility theory would have us assume. Our decisions are influenced by more that the expected probabilities of various outcomes, but it is the individual and subjective value we compare the result to that seems to matter.

What follows, and is demonstrated by the abovementioned research of Payne (1980) is that using framing, it might be possible to influence investor's risk attitudes by providing an applicable reference point. It looks like providing people with inappropriately high reference points leads them to make more risky choices, i.e. to be more risk seeking, and setting lower reference points seemingly has the opposite effect (risk aversion). What's the situation like for the layman, who decides to invest his savings? Today, investment funds

and companies use marketing campaigns not different from other commercially available products, and presenting extremely high past earnings (as these campaigns usually do) could be creating a false reference point for the starting investor. It is quite understandable that only the "Nokia millionaires" in Finland, or the "Microsoft millionaires" in Seattle get all the media attention, and we never hear about the millions of people who receive average or moderate earnings, or who lose their money in stocks. In any case, framing seems like one of the key phenomena that could influence investor behavior, particularly in investors with little or no experience.

2.2 Risk Attitudes and Achievement Motivation

Active stock market trading has traditionally been associated with the concept of achievement motivation (Wärneryd, 2001). When conducting experiments with students, Atkinson (1957) noticed that the subjects reacted differently to being successful. There was a difference between those, who took pride in their success and placed high importance on being successful and other, who didn't experience success as strongly and who placed a higher emphasis on avoiding failure. *The need for achievement* is a concept first introduced by David McClelland (1958) and refers to an individual's desire for significant achievement, or high standards. The need for achievement is related to the difficulty of tasks which people prefer to undertake, and therefore has also been claimed to be associated with risk attitudes. Specifically, the degrees of achievement motivation and the preference for variously risky assets may be interrelated. Wärneryd (2001, p. 185) reports on research of Weiner (1972), who elaborated on the on the issue and presents a summary of characteristics of high achievers. Individuals with high achievement motivation make a greater effort for success, and take more pride in success so they can attribute it to their abilities. Weiner's research involved subjects with high and low achievement motivation in situations of failure or success. His results have implications both for investor motivation and risk attitudes. Weiner claims that overall motivation is dependant on how differently individuals with high or low achievement motivation experience success or failure and describes four situations. (1) In individuals with high achievement motivation, overall motivation is enhanced following a failure, because they have a underlying drive for success; (2) in individuals with low achievement motivation, overall motivation is decreased following a failure, because they feel discouraged; (3) individuals with high

achievement motivation who experience success have their motivation decreased, because they have reached their goal; and (4) in individuals with low achievement motivation who experience success have their overall motivation enhanced, because the unexpected accomplishment literally lifts their spirits.

How is achievement motivation related to risk attitudes? Weiner (1972) claims that based on the previous statements, we can draw inferences about risk behavior of the individuals concerned. Experience of failure or success is said to have different effects on individuals with high or low achievement motivation. We know that securities differ in according to their degree of risk (again, at this point we will not discuss the methods of calculating the degree of risk of an asset in the economic sense, but focus on the psychological aspects which we refer to as risk attitudes). According to Weiner, the degree of risk of an investment- whether objectively calculated or subjectively perceived- is related to motivation to invest in such an asset. Individuals with high achievement motivation are said to be less likely to invest in stocks with extremely high or extremely low success probabilities, or extremely risky and extremely safe assets. The explanation here is that they don't view the success in investing in a low-risk stock as a real achievement and on the other hand, view success in a high-risk stock more as a matter of chance. That means that investing in stocks with extremely high or extremely low success probabilities doesn't provide the high achievers with an opportunity to prove their abilities. Individuals with high achievement motivation therefore prefer stocks with moderate chances of success. On the other hand, individuals with low achievement motivation are said to be more likely to invest in stocks with low success probabilities (for example technological firms), because failure at such a risky venture isn't considered a shame or a failure per se. It seems that motivation and risk attitudes are therefore related, and low risk aversion could be typical for investors with low achievement motivation, while investors with high achievement motivation seem less likely to be extremely risk averse or risk seeking, but more likely somewhere in the middle.

2.3 General Questions of Motivation

From the role of achievement motivation, let's move to investor motivation in general. Various psychological theories have been postulated to provide insight into motivational processes. The term "motivation" refers to the driving forces behind our

actions and different psychological theories of personality have ascribed varying degrees of importance to motivation. In some cognitive theories of personality (the theory of George A. Kelly), motivation is viewed as a redundant concept, because it would imply a fundamental static nature of the people, which does not reflect reality. Nevertheless, most psychologists agree that motivation is an important aspect human behavior.

Motivation deals with issues such as why is the individual active, or why is activity directed in a specific way. According to personality theory, the core of each individual personality- the building blocks of the integrity of personality- is formed by (1) character and temperament traits, (2) the structure of motivation, and (3) the structure of abilities (Mikšík, 1999). The primary roots of motivation for our actions are always different, depending on which author we consult. At the beginning of the previous century, Sigmund Freud shocked the world, when he claimed that we are driven by hidden forces, primarily of sexual nature. One of his students, Alfred Adler claimed that instead of searching for unconscious sources of all our actions, we should examine to what aim is behavior manifested. In this respect, Adler viewed the inferiority complex and related compensation mechanisms as the primary source of motivation. Radical behaviorist psychological theories dealt with motivation in terms of stimulus- response sequences. One way to look at motivation is through the prism of values. Motivation for actions can stem from what the individual values most in life. An example of such an approach is the theory of Viktor Frankl (e.g. Frankl, 1994), who stressed the need for a meaning in life as the primary motivation and a role of an individually characteristic set of values, which one holds important.

Motivation is an important concept in cognitive psychology, which employs the computer- mind anatomy in studying the human mind and focuses on information processing. A very well known theory of motivation was presented by Abraham Maslow, who stressed that people are primarily active and striving for self-realization. Primary motivation lies in the satisfaction of needs, from the most basic to the abstract. When primary biological needs are satisfied, higher needs are actualized up to the most advanced need of self-realization. Describing motivation by a set of needs is typical for other cognitive psychologists as well.

Most theories of motivation then focus on people's needs or interests. They usually differentiate between basic needs and secondary needs (e.g. Mikšík, 1999). (1) Basic needs usually include basic biological needs, but also cognitive needs and the need for social contact. Some authors include a sexual need as well, but in the author's view, the ability to

divorce sexuality from partnership is one of the aspects that differentiates us as a species and the reality of the lives of many shows that there is no such thing as a biological sexual need. (2) Secondary needs include intellectual functions, such as education and moral development. According to Mikšík (1999), these needs give rise to interests, which represent motivational forces, leading us to incline in certain directions in life. The set of needs and interest represents the basic components of motivational structure of an individual.

We must also not forget the issue of social motivation, which might play an important role in investment behavior. The assumption of social motivation theories is that our interpretation of the social environment influences motivation. Our species is characterized by social life and the processes which occur in our dealings with other people influence us in many ways. Socialization refers to the process in which human beings adapt to the behavioral patterns typical for the social environment in which they live. In the course of this process, first simple motivational processes are integrated into more complex ones, which take account of social phenomena. One of the aspects of the development of more complex motivational patters is the increasing ability of auto regulation of motivational forces, or the ability to delay gratification.

Based on what has been said about motivation so far, the motivation for investment behavior may be formed by needs of success and achievement, money and power, or simply future security. Such motivation may also stem from interests in the financial markets and stocks in general. The already mentioned ability to delay gratification will obviously play an important role. Investment motivation usually comes with the realization that higher profits can be achieved by investing money rather that spending it all at once or keeping it in a regular bank account.

The results of a study of investor motivation in Germany provide interesting results. The study was carried out in 1999 by Muller-Peters (reported by Wärneryd, 2001, p. 5) and showed that 85% of those questioned claimed they invested to gain higher profits, 64% enjoyed the risk-taking, while 47% stated proof of own competence as motivation to invest capital. Apart from the rather obvious motive of making profit and the risk-seeking (which we will discuss later in this chapter), is seems that almost half of people who invest money do so to prove their ability to be able do it successfully. The author of the study claims that a large portion of financial behavior and investment motivation can be explained by what is

called achievement motivation. The motivation to succeed and prove one's competence can be one of the strong forces behind motivation to invest.

Hand in hand with motivation comes another phenomenon that we must consider. Once the decision to invest savings is comes to mind, each person considers the possible gains and losses. Some might expect that investing savings is a recipe for getting rich fast, while other people may be more realistic about their guesses of the future. The formation of expectations about what will happen with our money is another important aspect that comes into consideration for novice investors. The formation of such expectations itself is also crucial: some might look at how a specific stock has performed in the previous year, and expect it to be as successful in the future. Others might take different factors into consideration, some more relevant than others. The formation of expectations based on different information significantly influences decision making in investment situations.

2.4 Formation of Goals and Expectations

Investing already implies some degree of confidence or optimism. If we were to oversimplify, we could say that all, even layman investors must always have at least some optimistic expectations about the future. In general, an expectation is an image of a future event, or relationship. Wärneryd (2001) differentiates between contingent and intentional expectations. The former concern outcomes which are beyond our control and cannot be influenced by the individual. The latter concern events that leave som room for influence. Apart from objective differences, such differentiation may also be related to external or internal locus of control. However, it is plausible to assume that novice investors will indeed consider the price of stocks and bonds and the development of markets in general to be beyond their control. It is probably only a privilege of the top high-volume investors to have any influence on the markets themselves as individuals (we are not yet speaking of herd behavior, the influence of which will be discussed in the chapter on social influence).

In the economists' view, investors' expectations are based objective factors. As we know, the theory of efficient markets postulates that information is available and effectively used by all participants in the market. How the markets reacted to different kinds of new information in the past could then be one of the sources of objective information for investors considering their chances in the future. One way or the other, information from past experience is undoubtedly an important factor in expectation formation.

If we were to sum up expectation theories in economics, there are those which stress the more or less sophisticated utilization of prior experience and prior developments, those which stress the adaptive element- learning from differences between earlier expectations and actual outcomes, and rational expectations, which assume that present and earlier information is rationally analyzed, in line with the principles of efficient markets theory. One of the models explaining expectation formation is *subjective utility theory*. It combines personal subjective utility value and probability theory based on Bayesian principles. According to this concept, expectations about future events are the key factor when making decisions about the future. People ponder the subjective value of each outcome and ascribe probabilities to future events, thus evaluating their expected utility. The decision maker estimates and considers different probabilities and weights the attractiveness of the outcome with corresponding probability. In the end actions which have the most attractive and probable set of outcomes are eventually taken. Some analogous psychological theories have been suggested. Wärneryd (2001) confirms that people do indeed form expectations about the future and differentiate them by probability. They just do not use precise probabilities like the abovementioned theory suggests, but rather rank possible outcomes in order of desirability and estimated probability and choose the most preferable one.

Expectations of investment outcomes indeed imply at least some degree of optimism. When people decide to invest their savings, they expect something in return. Expectations of a future event are then very similar to goals of what we plan to achieve. Such goal- oriented nature is one of the central aspects of theory of hope by C. R. Snyder (2001), which also provides implications for investment behavior. According to Snyder, hope is a cognitive concept, which reflects the internal representation of behavior in relation to achieving one's goals. Humans beings are always in the pursuit of something. Based on extensive personal research and interviews with a countless number of people, Snyder claims that he always witnessed a goal-oriented tendency in all human behavior. This is in line with many other psychological concepts: Viktor Frankl claims that human beings have an inner desire to always seek for meaning in their lives. Self-realization in the central concept of Abraham Maslow's theory and George Kelly, another representative of the humanistic approach in psychology, even dismisses the concept of motivation as a whole, claiming that people are already always active, and cannot be otherwise. So in this

light, can investment behavior really be regarded as a partial expression of this innate drive towards a goal of self-realization?

In describing goals, Snyder (2001) classifies them in order from simple to more complex, or short-term and long-term. The goals we set for ourselves are seldom isolated but rather form a structure, where simple goals form sequences and combine into more complex and long-term ones. The more distal goals logically require more time and effort to accomplish and therefore present more possibilities for withdrawal. They require sacrificing something in the present for later consumption and are therefore more demanding on self-control than proximal goals. A situation involving investment decision making is an example of a distal goal which requires refraining from consumption for the sake of possible future gains. Of course, there are also those who have heard of some of the phenomenal successes of some stock-owners, and expect to get rich quickly and easily. Investors with such expectations, if they aren't exceptionally lucky, will always be bitterly disappointed.

Proximal goals also allow greater motivation, because they are able to provide us with fast and frequent feedback. An investment situation, especially when one is saving for retirement, involves a great deal of self-restraint. The investor has to withstand long periods without being sure that his stocks or bonds are really successful. That is why it might prove sensible to have some check-points in place when planning long-term investment, for example, plan to transfer the savings to less risky assets some years before retirement, and even less riskier as retirement nears closer. On the other hand, too frequent checking on the status of one's stock might prove counterproductive. Many authors claim too much and too frequent feedback stimulates more trading, which in the end results in lower returns due to missing out on the best performing days of some stocks, and higher transaction fees (Siegel, 2005, Kohout, 2005).

So far we have said that expectations are to a varying degree usually formed based on earlier experience, they are close to goals, and it is the short-term expectations that we usually live up to better. It should also be noted that expectations based on earlier experience are usually stronger and more convincing than those based on what we have experienced recently. Hard and old beliefs cannot be easily shaken, and when a person has never trusted the stock market, chances are they won't be persuaded too easily.

However, an investor must always remember that expectations will remain only guesses of the future. Novice investors are usually very surprised that the bank employee

who they are consulting investing with really cannot predict any price movements even a few days in advance. All such predictions can only be made to a certain degree of probability and we should always be suspicious of the investment fund bragging with high past returns that are "guaranteed" in the future. Of course, there are some factors on which we can base our predictions of future earnings and decisions concerning portfolio composition. These would take us outside our area of interest, which is financial psychology, but let's just name a few: the price to earnings ratio of a share (tells us whether the stock isn't overpriced in relation to the dividends it yields), price volatility (as the standard deviation of the price of a stock within a specified time horizon), rating of the issuing company or investment firm, etc. According to Kohout (2005), professional investors are almost never successful at predicting positive future earnings, but they are quite good at predicting losses. In other words, we should usually disregard optimistic sentiments among investment advisors, but pay some attention to opposite warnings.

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Choice involving risky alternatives is influenced by various biases. The existence of these biases shows that market traders, who make risky choices every day, probably aren't able to make rational choices all the time. Moreover, risky financial choice seems to be influenced by individual proneness to risk (as risk aversion, or risk seeking), and the nature of assets involved. Kahneman and Tversky have suggested that in situations involving risky choice, people want to avoid losses more than they strive for gains and that perceived gains and losses are always derived from a subjective point of reference. Although people tend to form expectations based on expected utility, they do not necessarily judge the probabilities involved correctly. Expectations are related to motivation, proximal expected outcomes tending to be more motivating than distal outcomes. A strong possible motivating force for engaging in investing is achievement motivation, although it has also been suggested that such motivation may stem from a strong risk-seeking preference.

In this chapter, we have discussed risk attitudes, motivation, and expectation formation separately, but at this point it seems that they are quite interconnected and cannot really be considered as independent forces. In the discussion concerning risk, an example was given how investor risk attitudes can be related to at least one form of motivation (achievement motivation). Stemming from discussion on the prospect theory of Kahneman and Tversky, it seems that the "framing" phenomenon can explain how risk aversion or risk seeking can also be influenced by inappropriately high or inappropriately

low expectations. Various types of investor motivation (supported by the results of research carried out in this area) and theories of motivation have also been discussed. Further on we touched upon the subject of expectations on investment and the various theories of expectations. Whether we are looking at any of these three phenomena, it seems that they don't affect investor behavior as single independent forces, but work together unified.

The mosaic of factors which influence investor behavior, however concise, is far from complete. We have yet to discuss two very strong forces, which we are always subjected to- emotions and social influence.

3. EMOTIONALITY, CONFIDENCE AND INVESTMENT

"I know that most men, including those at ease with problems of the greatest complexity, can seldom accept the simplest and most obvious truth if it be such as would oblige them to admit the falsity of conclusions which they have proudly taught to others, and which they have woven, thread by thread, into the fabrics of their life."
(Count Leo Tolstoy)

3.1 Emotions- Good or Bad For Your Money?

Investors deal with a subject which understandably gives rise to many emotions- money. This is the primary question of interest: when are emotions and emotional reactions associated with inferior investment outcomes and when do they have a positive effect on investor decision making? Many emotional labels are often applied to the financial markets. These are concepts such as investor optimism, investor confidence, and so on. However, in the context of financial markets, these labels refer to the aggregate phenomena at the macro level, and not to individual characteristics of all concerned. The translation of individual characteristics to such aggregate phenomena is a complex process; right now, let's focus on the individual emotional characteristics which have been found to influence investment decision making.

The efficient markets theory which was discussed in chapter 1 doesn't deal with emotions at all. If anything, they would be considered to have disruptive effects, interrupting Bayesian processing of information and causing prices to reflect not only relevant information, but also other disruptive influences. But at the individual level, can emotions play a positive role and have a desirable effect on investor decision making? Emotionality has traditionally been seen as a cause of irrational behavior, with emotions clouding rational judgment. The classical view would portrait disruptive effects of emotions and describe rational behavior as completely devoid of feeling. Certainly, the effect of emotions on information processing has been well documented (for example, the influence of emotions on memory processes).

Recently, there has been a shift from this classical view. It has been acknowledged, that emotions may also accompany rational behavior and irrationality can be caused by

many other factors, such as insufficient information. The positive role of emotions and mood has been recognized, and such phenomena as investor optimism and confidence have been studied. At this point, we will not discuss the different theories of emotions which psychology has produced, but focus on the various emotional phenomena which are supposed to influence investor behavior.

Almost everyone has heard the term "mood of the market…". Commentaries using vocabulary such as "investor optimism/pessimism" are also quite common in daily news. It would seem that not only investors themselves, but financial markets can be characterized by prevailing emotions. What exactly does "mood" mean? Compared to emotions, moods are generally longer lasting, have a generally lower intensity than emotions and need not be directly coupled with action (Nakonečný, 1998). However, mood is not considered long lasting to the extent that it would constitute a personality trait.

Can emotionality affect the way we process information? One example is the well known phenomenon (especially to marketing campaigns) called "mere exposure effect". It refers to the fact that we have a tendency to develop positive attitudes towards a stimulus that is presented to repeatedly. Merely being exposed to the given object stimulates positive thinking about it. This sounds like a perfect example how emotionality leads to irrational behavior.

However, when we consider emotional arousal in general, we get a different picture. According to the arousal theory, all organisms strive for the optimal levels of arousal. According to this theory, gambling behavior would be explained by simple boredom and an attempt to achieve appropriate arousal (let's remember the results of a study of German investors mentioned in chapter 2.3, where 64% of those questioned stated that they invest for the risk involved). According to the Yerkes-Dodson law (Yerkes and Dodson, 1908), there is a relationship between arousal level and performance. It states, that performance increases with cognitive arousal, but only to a certain point: where arousal becomes too high, performance will decrease. An increase in arousal from low levels is accompanied by increased autonomic activity and increased decision making quality up to the point of optimal arousal level. Different types of activity may have different levels of arousal, which correspond to the optimal arousal level. However, high levels of emotional arousal impair cognitive processes, most notably attention and block access to short-term memory.

Yerkes and Dodson proposed their law in 1908, but research in stress and decision making has brought a renewed interest in the question of optimal arousal levels. Making an

investment decision and considering all information usually represents a stressful situation, especially within a limited time-frame. Kaufman (1999), as reported by Wärneryd (2001, p. 181) argues that such decisions under stress are always impaired by very low levels of arousal which decrease decision making quality. When arousal is very low, there is little energy devoted to information gathering and problem solving. Kaufman argues that when arousal is low, an increase will cause a person to increase the effort level of information gathering and problem solving. These factors all increase decision making quality. Is seems that the optimal investment decisions might occur not at complete rest, but under an appropriate level of arousal. It also seems that the recommendation would be to consider investment choices during the day, when we are not too bored or too stressed out, but at our regular work pace.

Arousal theory represents one of the explanations how emotions influence decision making and information processing. In relation to investment behavior, the effects of mood, especially optimism/pessimism, are of great interest. One of the ways how optimism might influence information processing was demonstrated by Bagozzi (1999), as reported by Wärneryd (2001, p. 162). Bagozzi studied the effects of happy mood and found that it lead to less argument processing and higher proneness to being convinced, while neutral mood lead to more effortful and thorough information processing. True enough- the shopper in a happy and optimistic mood certainly seems more likely to spend more than the shopper who has no feelings about the given merchandise (a fact which retailers often make good use of). This provides even further evidence why banks and investment funds and companies today should use more traditional marketing strategies to promote their products to increase their popularity. According to this theory, investor optimism should therefore lead to higher sales of stocks, simply because individual investors would be more susceptible to marketing campaigns and advice on stock purchases given to then and consider available information less meticulously.

What are the effects of investor pessimism? First, pessimism may be present in the form of a common strategy known as defensive pessimism, which means keeping our expectations deliberately low, as to avoid potential failure and blows to self-esteem. Again, this seems to be related to the "framing" phenomenon mentioned in the previous chapter. Keeping the reference point low enough helps us view possible future failures in a better light, when judged against the low expectation. In addition, pessimism of individual investors will have predictable effects. On the whole, the effects of optimism/pessimism at

the individual level are very much comparable to the already discussed effects of high/low expectations. In any case, when individual investors make forecasts and form their expectations on the development of a given stock, they may be influenced by their current mood. Emotions can therefore also have positive effects on individual investor behavior, for example in the sense of optimal level of arousal. Watching out for unwarranted optimism based on distorted information can also help us make better investment decisions.

Professional investors and authorities in the field of financial markets also warn against the influence of emotions on investing. Jeremy J. Siegel (Siegel, 2005), a renown financial markets expert who warned against the crash of internet stocks in early 2000 provides advice to novice investors on how to avoid such a bubble in the future. One of his lessons is "never fall in love with your stocks". Siegel warns against emotional attachment and explains that such an attachment can play a significant role in reluctance to sell a declining or risky stock. This is in line with the prospect theory and disposition effect, which states that we fear losses more than we desire gains and that we are very reluctant to realize these losses, even then there is no relief in sight.

In the end, we have found very little positive influence which emotions may have on investment behavior. Emotionality represents a redundant factor in the efficient markets theory, and could only disrupt the efficient flow, distribution and processing of information. The positive effects of mood have been studied by some, but it has also been suggested that optimism leads to inferior information processing and poorer decision making. The positive role of emotions can be seen in the sense of arousal in general, where it was suggested that different activities require different levels of arousal for optimal performance. Making investment decisions represents a fairly difficult task, which shouldn't be performed under very low or very high arousal levels.

To sum up, there are warnings against emotional attachment to one's investments (and the disposition effect), we have discussed the role of arousal in general in relation to making investment decisions, and there has also been evidence to suggest that mood has an effect on information processing, especially argument consideration and forecasting. However, there are other sources of irrational investment behavior besides emotional influence- irrationality may also be caused by having insufficient information, or the emphasis on irrelevant or misguiding data. One of the phenomena which is thought to be associated with irrational information processing and is thought to be spreading among investors today is their unjustifiable overconfidence.

3.2 Investor Confidence

Even with many social pressures and other influences, in the end, we are always alone in making investment decisions. In general, individuals differ in the level of confidence in their own decisions, but overall we tend to overestimate our abilities. This is consistent with repeated findings in cognitive psychology, where subjects have been found to be overconfident in their own judgments, regardless of the amount of available information. Wärneryd (2001, p. 170) reports interesting findings of a study by Weinstein (1980). Weinstein had his subjects rate probabilities with which they could experience 42 different positive or negative events or outcomes. It turned out that the subjects rated their chances to be significantly above average for positive outcomes and significantly below average for negative outcomes. Overconfidence also seems to be negatively correlated with risk aversion. In other words, overconfident people tend to be risk seekers.

What does this mean applied to behavior in the financial markets? It would mean that investors are generally overconfident about their own judgment of financial markets and generally put more weight on what they have learned on their own compared to expert advice. One of the factors which may increase confidence is the phenomenon known as hindsight bias, or the "knew-it-all-along effect", meaning that we tend to believe we could have predicted past outcomes. Having all the facts about past outcomes leads us to believe we actually did see them coming. Hindsight bias is a strong reinforcer of overconfidence. One characteristic of overconfident investors is that they tend to make more transactions on the market, as they see new opportunities arise. However, various authors warn against frequent trading (Siegel, 2005, as well as Kohout, 2005) as it leads to lower returns because of the increased transactions costs. In addition, Siegel (2005) warns against an even larger risk of frequent trading- according to his research, missing out on only a few of the best performing days of a given stock can have a great impact on total returns and provides extensive evidence in support of the buy-and-hold strategy.

We can assume that overconfidence will decrease with increasing experience, once the individual has had a chance to reflect on the results of own decisions. At this point, we can assume that novice investors will generally be more overconfident than experienced investors; however, there may be a problem with the correct assessment of our own abilities. This problem concerns another aspect of typical investor behavior, which is

derived from the well known theory cognitive dissonance (Festinger, 1957). One of the implications of cognitive dissonance theory is that once people have made their investment decision, they seek for information which confirms their actions and try to avoid disconfirming information to achieve cognitive harmony. Avoiding disconfirming information in investment situations could prove to have very serious consequences, if it lead to holding on to low-return or falling stocks for too long.

According to various research carried out by Odean (Odean, 1999, Odean and Barber, 2001a, 2001b), overconfidence represents a significant obstacle to rational information processing. Odean (1999) suggests that trading volume on the world's markets is much higher can be explained by efficient market theory. He claims that trading is especially high among those investors, who hold discount brokerage accounts, i.e. those who trade on their own, independent of expert advice and hypothesizes that due to overconfidence, investors trade too much. As we said before, psychological research has long ago shown that people tend to be overconfident about their abilities in general (e.g. Frank, 1935). Making investment choices is a difficult task, and according to Odean, it is at such tasks that overconfidence tends to be very strong. Odean claims that overconfident investors have unrealistic beliefs about their expected trading profits, the stocks they buy underperform the ones they sell, and they systematically misinterpret information available to them.

Odean (1999) supports his claims by analyzing trading patterns of ten thousand customers accounts of a discount brokerage firm in the USA during 1987. He found that post transaction returns on the stocks that investors purchased were lower that returns on the ones that they sold. He also found that this underperformance was caused solely by poor security selection and not simply by bad timing of the market. What kind of information were investors misinterpreting? Odean claims investors put too much emphasis on past returns and sold or purchased those securities which have been on a steep rise or fall during the year prior to transaction. Investors tended to misinterpret historical returns as the single most important piece of information when making a purchase or sale decision. Furthermore, on average, the subjects in Odean's set tended to both purchase and sell securities which have outperformed the market over the previous two years.

Odean (1999) claims that we can find explanation for these findings in the so-called disposition effect- the reluctance of investors to realize their losses. Investors tent to purchase those securities, which have received attention due to their good performance in

the past, and are reluctant to sell those securities which have performed poorly for them- they are reluctant to realize their loss. This is in line with the basic principles of the prospect theory, that people tend to put greater emphasis on possible losses than gains. As a result, investors show a strong preference to sell their winning investments and hold on their losing investments. All investors consider information available from historical returns, but tend to misuse this information, so in aggregate, investors in Odean's study set made trading choices which lead to below- market returns. In general, Odean claims that individual investors seem to be overconfident, let their attention be directed by sources such as the media, are significantly influenced by the disposition effect and systematically misinterpret information. In another research (Odean and Barber, 2001), it was found that overconfidence is even stronger in males, who made 45% more trades in the given time period.

The are opinions that claim that overconfidence is the single most significant irrational phenomenon on the stock markets today, and it is growing due to increased participation of individual (and inexperienced) investors. In an article written in the fall of 2001 (following the bursting of the internet bubble- collapse of internet stocks- in April of the previous year), Odean and Barber (2001b) provide a sober look at how the internet has changed investor behavior and mainly the participation in the stock market (at least in the US).

3.3 On-line Investing, Information Processing and Overconfidence

As was mentioned in the introduction, stock market participation is presently increasing at unprecedented levels: from 10 to 50 percent between 1987 and 2000 in the USA and from 11 to 20 percent between 1988 and 2000 in Germany, according to Wärneryd (2001). Moreover, Odean and Barber (2001b, p. 49) report figures by Kennickell, Starr-McCluer and Surette (2000), that the number of households directly investing in stocks in the USA grew by 30% between 1995 and 1998. Undeniably, the internet has played a significant, if not the key role in such an increase. In order to invest, people no longer have to meet or talk to their broker or deal with other formalities, but simply trade from their home, using a computer. Access to the stock market is easier than ever before and possible to literally anyone, but Odean and Barber (2001b, p. 42) claim that "*the new investment environment may also have a dark side*".

First of all, investors are now able to place trades directly, without the assistance of a broker, which may be giving them an exaggerated sense of control over the outcome of trades. Moreover, the internet provides vast amounts of information on stocks, which used to be much more difficult to access. Great amounts of information are available to the investor at almost no cost. We already mentioned that the cognitive dissonance theory would suggest people tend to avoid disconfirming information. If this were true, the possibility to choose only confirming data from vast amounts of information could make investors inappropriately overconfident in their abilities to pick stocks.

Not only the way people trade on the stock market, but the functioning of almost all businesses has changed due to the spread of the internet. Companies need to adjust and offer more services on-line. This has lead to great savings for some companies- banks save on manpower when their clients use on-line banking services, just like on-line brokers save, when people no longer require the assistance of a broker in person, or even over the telephone when making a trade. However, Odean and Barber (2001b) warn against the possible disadvantages of these changes, particularly in relation to stock trading. The first of these disadvantages involves the availability and processing of information.

Investors today have unprecedented amounts of information readily available at almost no cost. In the past, such information was much more difficult to obtain and much of it wasn't available for free. Financial information is usually no longer provided by a personal broker, but the investor seeks out his own information in the sea of internet knowledge, on-line chat rooms, journals and gossip. This situation creates a whole new environment in which investors make investment decisions. The two most important characteristics of this environment- that Odean and Barber show influences decision making- are the quantity of available information, and the fact that only the individual picks what is important.

At first, it might seem that more information must lead to better decision making. However, Wärneryd (2001, p. 67) reports findings by Magnusson and Ekehammar (1972) and various other psychological experiments, which demonstrate that people actually use only a small fragment of available information to base their decisions. According to research by Magnusson and Ekehammar, the quality of diagnosing patients decreased after a certain point, when physicians were provided with too much patient data. This would imply a strong argument against the efficient market theory, specifically the assumption that all relevant information is immediately and automatically reflected into prices. In fact, it seems

more likely that investors do not use all available information to base their decisions, which wouldn't even be possible, or productive.

Odean and Barber (2001b) claim that the internet has brought changes to investing, which may cause an increase in investor confidence, because on-line investing and the availability of vast amounts of information fosters an inappropriate illusion of control. They report research carried out by Peterson and Blitz (1988, in Odean and Barber, 2001b, p. 46), who found that when people are given more information to base their forecasts on , their confidence tends to increase, but the quality of these forecasts decreases. This phenomenon is known as information overload- what it actually refers to is that at some point, more information leads to poorer decision making and forecasting. Such an illusion of knowledge may be typical for on-line investors today. Apart from an information overload, people tend to actively seek out confirming evidence. We mentioned the tendency to avoid disconfirming evidence, which may be explained by cognitive dissonance theory. Given that investors really tend to disregard disconfirming information in the sea of info available to them today, we see why an illusion of control could be very wide-spread.

The constant availability of stock information on the internet has another implication for the individual investor. The most readily available and easy to access information concerns the prices of stocks. On-line services provide people with the possibility to check the price of a stock a at any time, which investors usually never did before (one of the features of the Microsoft Windows Vista released in 2007 is a small program- "gadget"- to follow stock prices in real-time on the windows desktop screen). We already mentioned that top financial experts warn against frequent trading and stress the financial advantages of long-term investment (Siegel, 2005, Kohout, 2005), yet brokers and asset management funds seem to be fostering exactly the opposite kind of frequent trading strategy (and we can't really blame them, given that they partly live on transaction costs). Given the conditions in which most of today's individual investors make their decisions, we can assume that short-term trends may increasingly influence their behavior.

All these factors- the illusions of knowledge and control- have lead investors to be overconfident, which can have a strong effect on financial markets as a whole. Large numbers of overconfident inexperienced investors, being influenced to trade more and often create a rapidly changing environment. The number of investors is increasing worldwide, these investors make more and more of their trades on-line, and increased trading on the markets has been confirmed (Odean and Barber, 1999). We already

mentioned that some authors claim that the stock market crashes of 1929 and 1987 in the USA were caused by precisely these kinds of phenomena: the entry of large numbers of new investors into the market, who behaved in a way very different from the experienced investors. Could it be that we are in the middle of another speculative bubble that is about to pop? The situation may not be as serious, but the need to take on additional tools to study market processes is very urgent. Understanding the psychological forces which influence investors again reappears as a critical task.

4. SOCIAL INFLUENCE, SOCIAL FEEDBACK AND HERD BEHAVIOR

"It could be argued that most, if not all, behavior ultimately depends on other people and that a psychology which focuses only on individual behavior takes the individuals out of their natural habitats and studies them in artificial isolation."
(Wärneryd, 2001, p. 207)

4.1 Social Influence in the Financial Markets and Price Bubbles

People are social animals, and whatever they do, they're always in interaction with other people. Participation in financial markets is no exception. Various theories of social psychology can therefore provide insights into the way markets function and can help explain why traders act as they do. What do we mean by "participation in the market"? Today, the market has become institutionalized, and its complex rules, ranging from prescribed currency to consumer protection apply without limitation based on local legislation. We don't have to go to the nearest town or town square and look at or present our goods there, but we still do (most of) our shopping in traditional stores where social interaction is involved.

However, trading on the financial markets has always been a little different. In fact, trading of financial assets has quickly become a business for banks and brokerage firms, and since stock market participation began to grow at the beginning of the 20th century, stocks were always traded through various proxies. Perhaps only with the exception of big company mergers or takeovers, the transacting parties almost never meet in person. Recently, stock trading has transformed again, and possibly even more drastically. When it comes to trading stocks, today all transactions can be made conveniently over the telephone or using a computer, without even having to meet the broker in person. The financial market is still a place where individuals meet under certain supervision to make trades, however, there is not only no personal contact of the buyer and seller, but also almost no personal contact of the buyer with anyone.

The consequences of these changes were discussed in the previous chapter on overconfidence. Contrary to the traditional market, where people met in interaction to buy or sell their goods (as is still true today, to a certain extent), in the financial markets sales and purchases are being carried out through proxies who we don't even have to meet or

talk to in person. The traditional market was a place for the meeting of individuals, today's financial markets are a place for the meeting of their money. Can we then really talk about financial market processes in terms of social interaction and group behavior?

The stock market is composed of individual people carrying out their individual trades, but they are nevertheless influenced by the behavior of others. As studies confirm, past performance of a given stock is the single most important factor investors consider when making an investment decision, yet stock price is to a large extent dependent on whether most investors are buying or selling. In the early months of the new millennium, the hype for internet-based companies such as Yahoo! or Amazon.com and investor demand for their shares brought the price to unbelievable highs. Social influence therefore seems to play an important role in financial markets and investor behavior.

The fact is that the development of prices on financial markets cannot be explained simply by the assumptions of the efficient markets theory. We are witnesses of various deviations, which purely financial theory cannot account for. As early as in the 1970s, economists have suggested that this is in fact true, and that other factors must be considered when modeling the stock market and investor behavior. For example, it has been suggested by Shiller in the 1980s (Shiller, 2003), that the overall volatility of the stock market was much higher than could be explained by the efficient market theory. What's more, the stock market shows various mass phenomena, which researchers have been attempting to explain in terms of social influence. One such phenomenon is the occurrence of stock "bubbles".

A stock bubble is the term coined for the event in which the prices of certain stocks are rising to record numbers, without any actual hard data, such as company results to support the rising prices. One such occurrence of a "bubble" was the development of prices of stocks of internet companies on US markets at the turn of the millennium. Usage of the internet was spreading fast and it was seen as a revolutionary phenomenon, which would completely transform businesses. In a way it did, but the share prices of companies like the internet bookstore Amazon.com were reaching unprecedented highs. At one point, the market capitalization, i.e. the combined worth of all shares of Amazon.com was $600 million, one of the highest in the US, and yet the company had never made a profit. According to Siegel (2005), we know that we're in a price bubble when all the experts are praising the stocks and there is no one left who doubts that the rising trend will continue (as was the case before April 2000, when internet stocks finally collapsed).

There seems to be evidence for the fact that investors really do put too much weight on what they hear from other people or what they see them do. Robert Shiller (2003) claims that social influence is a very powerful factor affecting the development of prices on the market. According to Shiller, mouth-to-mouth spreading of financial successes among investors is an extremely strong force, and "*such talk*, *provoking a sense of relative futility of one's day-to-day work and envy of the financial successes of others… is effective in overcoming rational doubts among some substantial number of people.*" (Shiller, 2003, p. 93). Shiller claims such *feedback* between investors is very common and responsible for large-scale price movements (such as the internet stock bubble of 2000), as well as for small-scale day-to-day movements of speculative prices.

In a bubble, one of the chief reasons for constantly increasing stock prices is very high demand. That's why Siegel (2005) claims that *herd behavior* is one of the most important factors which cause stock price bubbles. Siegel claims that initial role is played by the media, but as the public catches on, spreading of personal information is the critical factor. If everyone is buying, prices seem to go up without any data to support the higher price, and the result is the eventual popping of a price "bubble", in which everyone looses.

The fact that price bubbles exist seems to be proof that investors do indeed act on feedback from other investors and copy behavior from each other, which results in herd movements on the market. In fact, herd behavior may also help to explain why a bubble "pops"- it starts with a couple of people who want to get out before it's too late and they start a selling frenzy, which lowers the price of stock. Wärneryd (2001) favors such an explanation and provides evidence: a study of newspaper articles from the period before the NYSE crash of 1987 did not show that the crash was preceded by any important news or information being released. The reasons for massive selling must have come from somewhere else.

Financial market phenomena such as massive selling or buying have been attributed to herd behavior. The term originally refers to following a crowd by a given person or group and was one of the first topics to be studied in social psychology. However, when discussing herd behavior in financial markets, we must note on the differences between the economic and psychological approach to herd behavior and possibly reconcile them to a common approach, which can help understand investor decision making.

4.2 Feedback Theory and More Notes on Confidence

One of the oldest theories of financial markets, which was expressed long before any purely economic theories, is the feedback theory. As summarized by Shiller (2003), the basic principle is that when prices in one speculative area rise and create a massive success for the first investors, their success spreads by mouth-to-mouth accounts and attracts more and more enthusiasts. Increasing demand sends prices soaring, and speculative models are created to justify the unjustifiable price increases. Eventually, investors realize that the price has been rising based purely on increasing demand without any foundation in the value of the actual commodity, and prices eventually have to fall (the bubble "pops"). Shiller claims that feedback between investors is still the single most important factor behind the development of price bubbles.

Shiller (2003) claims that feedback that investors receive form other investors through personal interaction as well as through the media is a very powerful factor in individual decision making. He calls it "word-of-mouth enthusiasm", and uses historic examples to show that such enthusiasm, passed on through social networks was present during the famous tulipomania in Holland the 1630s, just like it was present during the internet stock bubble at the turn of the millennia. Feedback between investors may be one of the most important factors influencing information processing in making investment decisions and the source of much of the deviations from efficient markets theory that stock prices show.

Shiller (2003) also attempts to explain why feedback between investors is so significant. He suggests that feedback among investors may be fuelled by a well known phenomenon identified by D. Bem (1965). The *fundamental attribution error* refers to a tendency of people to simply attribute success to own ability, while attributing failure to outside forces, such as bad luck. Shiller argues that people who are in fact successful in the stock market tend to present their success as an easy result of their own financial abilities, making others believe in the simplicity and ease of successful investment. As a result of such presentation, people may be less willing to consider other pieces of information when making an investment decision, letting themselves be fooled that "anyone can do it". Shiller claims that such mouth-to-mouth spreading of information, which promotes distortion of relevant information is the essential cause of speculative price bubbles.

In addition, Shiller presents more evidence for the existence of such feedback between investors, and its significant role in market processes. Such evidence is said to come directly from the natural environment and not even experimental settings, and is represented by the reality of pyramid schemes, or Ponzi schemes. The principle of a Ponzi scheme is simple- people are promised sky-high returns by way of a superficially plausible, but unverifiable method, and convinced to invest their money in the scheme. Initial investors usually receive promised returns, which are fraudulently presented as the result of the vague enterprise, but in reality only represent money invested by more willing participants. The initial success spreads by word of mouth, and as more and more people join, paying out such high returns becomes unsustainable, and the scheme collapses with most of the participants loosing everything. According to Shiller, the fact that Ponzi schemes are in fact successful for those who run them (a recent example includes Slovakia, where a large-scale Ponzi scheme collapsed in 2002 before it managed to trick more than 200,000 people) and have efficiently robbed many people around the world of their savings is a good example of the efficiency word-of-mouth enthusiasm and the magnitude of its influence on people.

In chapter 3.2, it has been suggested based on the research by Odean (Odean, 1999, Odean and Barber, 2001a, 2001b), that overconfident investors tend to put too much weight on certain single pieces of information (in Odean's example, on past returns), while disregarding other important information about a given stock. If the feedback model by Shiller were accurate, it would be more proof that people do in fact have a tendency to place more weight on single pieces of information, rather than considering all available information. In Odean's research, people tended to consider mostly past returns, which they viewed as a good predictor of high future returns. In case of the feedback model, people tend to place more weight on positive information received form others. In both cases, there is a strong preference for *confirming* information.

4.3 Herd Behavior Research in Economy and Social Psychology

The feedback theory has been around for a long time, and doesn't provide any explanations about why people copy other's behavior, or mention any factors which might influence the willingness to conform to passed on information or observed behavior.

From an economic standpoint, herd behavior is viewed in terms of the value and benefits of such behavior, mostly without regard to individual motivations and the nature of social relations to others. On the other hand, the psychological approach to herd behavior considers the "why"- personal motivations for herd behavior and its mechanisms. The focus on herd behavior in economics was introduced in the 1950s by Harvey Leibenstein (1950) in what he named the *bandwagon effect*, and which referred to "*the extent to which demand for a commodity is increased due to the fact that others are also consuming the same commodity*". Granovetter (1978) later introduced a *threshold model* to the bandwagon effect: he suggested that the decision to conform depended on (1) perceived costs and benefits, as well as on (2) the number or proportion of others who have already conformed to the given behavior. Research on herd behavior in economics later showed that instead of perceived costs and benefits of conforming, the individual may also choose to conform contrary to personal information when he believes that others hold more valuable information than himself. However, all economic theories of herd behavior hold a common assumption, which is the complete rationality of actors when considering options. Herd behavior in economics is also understood as motivated by the sheer number of others that the individual is conforming to. Actors are also considered to have complete information in the given situation and be able to rationally consider their costs and benefits. Economic theories are therefore leaving out many important psychological factors of herd behavior.

The first attempts to explain herd behavior in social psychology viewed it as unconscious and irrational. F. H. Allport found that people have a tendency to modify their views on certain topics in the presence of others and suggested that this was caused by an instinct towards submission to a larger group. An important aspect was introduced into the study of herd behavior by M. Sherif (1966), who highlighted the role of "frames of reference". Sherif claimed that when a group of people faced a new situation, the result would be the formation of common social norms, which served as a frame of reference for that particular situation. In this sense, herd behavior means that people's judgments tend to converge to the social norms of others in the group.

The term of "reference groups" became very important in psychological research on group behavior, and it was shown that important reference groups really do influence individuals. Bur herd behavior was still viewed as irrational and mostly unconscious and it was Solomon Asch (as reported by Rook, 2006) who suggested a different explanation with his famous line experiments. Asch claimed that conformity to the group norm was the result

of a rational attempt to make sense of social reality. Individuals assumed that majority opinions would have to be correct. According to Rook (2006), one important aspect of conformity shown by Asch was that the unanimity of group members was more important than the size of the majority, e.g. a unanimity of three was more convincing than a majority of eight with one fellow dissenter. This finding can be tied back to what we know about the occurrence of price bubbles, which are characterized by absolutely no dissenting information, thus making it more likely for individuals to be caught in them. Another notable attempt to explaining herd behavior was done by Festinger and his *social comparison theory*, who claimed that the most important reference groups are made up of people who are slightly more better-off than us. According to Festinger, herd behavior is caused by copying the behavior of slightly more successful models- we seek to engage in actions that are similar to those in our reference group.

Apart form the influence of larger groups on individuals which was called the *bandwagon effect*, psychological theories of social influence and herd behavior also deal with the influence of minorities on larger groups. Moscovici (1976) claimed that all theories of herd behavior in social psychology have been based on "top-down" processes, and that they couldn't account for the influence of individuals or smaller groups on large populations (for example, as is the case in political campaigns). Moscovici claimed that while top-down conformity was based on the individual assuming that the majority must have better information, conforming to a minority was based on a "social conflict" arising from the conflicting views and the attempt by a member of the majority to carefully consider, understand and partly become contaminated with the minority's arguments.

Herd behavior in social psychology thus went from being viewed as an irrational and unconscious process to a rational attempt by the individual to understand social reality. In this process, reference groups are of great importance. Apart from the classic bandwagon effect, it was also suggested how a minority may influence a majority. Compared with the economic theories of herd behavior, psychology clearly focuses on the reasons and processes behind such behavior. While economists assume that all actors are rational, psychologists suggest that people aren't always able to make optimal choices, either because of incomplete information or due to cognitive limitations. Moreover, Fiske and Taylor (1991) called human beings "cognitive misers"; while they maintain that human beings are rational in their choices, people also prefer less effort, generally meaning they prefer simple situations over complex ones. One of such simple solutions can be the usage of

simple heuristics, such as accepting that the majority probably has the right information, and should be followed.

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This summary of economic and social-psychological findings on herd behavior can provide some insights into modeling herd behavior on the stock market. We know that contrary to the efficient market theory, participants don't always have all the necessary information available and tend to prefer simple solutions to complex ones. In complex situations, people have a tendency to conform to the views and actions of their significant reference groups, who are expected to share their beliefs.

For long, it has been suggested that investors perceive feedback from others, and are influenced by information passed mouth-to-mouth, which was one of the first explanations for speculative bubbles. Such passing of information may be fuelled by the self-attribution bias, by which people tend to attribute success in the market to their own ability. The existence and strength of such a force seems to be supported by the real-world existence of Ponzi schemes, which rely to a great extent on word-of-mouth enthusiasm passed on by initial successful participants.

A purely economic approach would suggest that influence in investment decisions would depend on the sheer numbers of other individuals we observe, and our calculated costs and benefits to following their behavior. Unfortunately, stock trading is always a risky game and we have seen that having and being able to rationally consider all relevant information is practically impossible. Therefore, other forces of social influence come into play. Reference groups play a key role in social influence. The reference group may be our family, group of friends, school environment or specific social strata (e.g., people slightly more successful than us, as was suggested by Festinger). When we choose a reference group, we are more likely to move towards it than away form it. When we decide to act according to a minority, we usually do so after careful and rational consideration of arguments. For example, when considering investing in a new and unknown company recommended by a financial advisor, a person will probably take greater care to consider the alternative and its risks and benefits, than he would have taken when investing in a large and well know company. Then again, when we choose to follow a larger group, it is not only the sheer number of models to follow which influences our decision, but more so the unanimity of such a group.

5. COGNITIVE ASPECTS OF IRRATIONAL STRATEGIES

Spend at least as much time researching a stock as you would choosing a refrigerator.
(Unknown)

5.1 Information Processing and Cognitive Biases

One of the most significant characteristics of noise traders will be their method of information processing. As was mentioned before, noise traders are thought to incorrectly evaluate risk, be emotional and overconfident, and are overly susceptible to social influence. It remains to discuss the actual information processing mechanisms which may lead to constant errors in judgment in situations with investment decision making.

As was mentioned in 4.2, Fiske and Taylor (1991) claim that people are in fact "cognitive misers", who prefer simple situations and simple problems over complex ones. It seems that we have a tendency to simplify the situations we find ourselves in, in order to make sense of them more easily. Similarly, people also have a tendency to simplify their decision making processes by using simple mind tools or shortcuts we call *heuristics*. Therefore, noise traders may be the unconscious victims of the various heuristics they use to make sense of the multitude of available information. A *heuristic* is a procedure for problem solving which reduces the number of possible alternatives to choose from using simple methods. Heuristics can sometimes be useful in problem solving, but when applied incorrectly in investment decision making they may also lead to disregarding important information. They may also be called cognitive biases- tendencies to think in a certain way, regardless of other available information. Cognitive biases represent a wide range of effects identified in social psychology that also include attribution and memory errors that are typical for human beings (such as the *hindsight bias*, or *fundamental attribution error*). Cognitive biases were studied by Daniel Kahneman and Amos Tversky, who claimed they are the result of simplified problem solving using common heuristics. Simply put, such heuristics help people make simplified decisions in situations involving probabilities.

Research in economic psychology has focused on the study of various heuristics and errors used in investment decision making. One of the most common cognitive errors is the *base-rate fallacy*. It refers to a logical error that occurs when making a judgment about the probability of a certain event. Base-rate fallacy means using irrelevant information to make

the judgment even though empirical data about the prior probability ("base- rate") is available. For example, when estimating the probability of P ($Q \mid R$), subjects tend to base their prediction on the similarity of *R* and a stereotype for the given group, disregarding the prior probability (base-rate) of *Q*. The role of this heuristic in investment behavior is that investors often pick stocks based on irrelevant information, while ignoring that stock price movements are subject to other more significant pressures, and that (as some claim) stock price movement is indistinguishable from chance movement (random walk).

Tversky and Kahneman (1982) tried to explain the base-rate fallacy in terms of the *representativeness heuristic*, which is used to judge samples from a given population on the basis of a similarity with stereotypical information about the given information. In other words, using the representativeness heuristic people assume commonality between objects of similar appearance. While using this heuristic may by useful in everyday life, in can lead to significant errors when used in investment decision making due to neglect of relevant prior probabilities, or base-rates. Base-rate fallacy would then mean forming expectations and investing in a stock or fund based on its advertising or past performance, instead of taking into account other factors, which are more limiting to its development, such as volatility (while keeping in mind its random walk movement). When individuals are to make a judgment about the stock of a given company, they may base their probabilities on similarity to other companies while ignoring relevant distinguishing information.

Another heuristic first identified by Amos Tversky and Daniel Kahneman was the *availability heuristic*. It refers to the tendency of people to base their predictions on the intensity or emotional impact of a particular informational experience, rather that actual probability. Wärneryd (2001, p. 127) presents the findings of Stephan (1999), who differentiates between (1) evidence-based availability, (2) memory-based availability, and (3) imagination-based availability. The first refers to the tendency of people to rely on what they themselves have seen or heard, which is given greater importance due to being experienced first-hand. Memory-based availability refers to the aggravation of what is most vividly memorized and basing predictions on such pieces of information. Lastly, predictions in decision making can also be based on what is the most likely imagined result. For example, a group that was asked to imagine an outcome immediately viewed it as more likely than a group which was not asked to imagine an outcome (Tversky and Kahneman, 1982). Again using this heuristic in investment decisions focuses people's attention on irrelevant information. Many people have heard of someone who has gotten rich on the

stock market, and combined with imagining personal success, it can lead to unrealistic appreciation of one's chances. Again, the availability heuristic takes our focus away from prior probabilities and relevant information and is another manifestation of the base-rate fallacy.

The *conjunction fallacy* is another variation of the representativeness heuristic, in which the addition of a familiar element into an uncertain event is seen as increasing its probability. It occurs when it is assumed that specific conditions are more probable than general ones. Although a detailed, specific scenario may seem more likely because of being more representative, each added detail actually decreases its probability, because the combined probability of two events is always lesser than the probability of one of them occurring by itself, according to the rule $P(Q \,\&\, R) \leq P(R)$. The conjunction fallacy can also lead to unrealistic estimation of success probabilities in investment decision making. The company Cisco, which yielded extremely good returns for investors in the 1990s had a market value of about $500 billion in 2000, being the largest companies in the world at the time in terms of market capitalization. In the same year, before the popping of the internet bubble in April, analysts on Wall Street estimated that the company would reach a market value of $1 trillion within the next few years. While it was less probable that the company would continue to be successful for investors and reach the astronomical market capitalization at the same time, this fact might have made it look even more desirable for investors (as of 2007, Cisco has a market value of about $165 billion, still being one of the largest companies in the world) (Siegel, 2005).

Another widely used cognitive bias is the *anchoring* heuristic. It refers to a common tendency to rely too heavily, or to "anchor" on one factor or piece of information when making a decision. Anchoring is another method people use to intuitively assess probabilities. There is a common tendency to estimate probabilities with a predetermined reference point in mind, which strongly influences our assessment. According to Wärneryd (2001), various experiments have shown that when given different starting points, subjects would give different estimates that are biased towards the starting value. That way, if a person expects a particular stock to yield a return of 15% after one year (based on last year's results), they would probably view an annual return of 9% as an insufficient return, or a loss. That's why having different frames of reference may have significant influence on stock trading. It may also be associated with the imagination-availability heuristic- if a person imagines the possibility of an annual return of 10%, it becomes a real estimation and

anything below this value will be viewed as an insufficient return. The effects of the *anchoring* heuristic are very similar to the effects of *framing*, mentioned in chapter 2.1.

Stock market trading often involves making quick decisions based on available information- for example, whether to remain in an investment after decreasing share price, or whether to realize one's profits after share prices have risen. Decision making in such situations may be impaired by the cognitive bias labeled as *conservatism*. According to Wärneryd (2001), this cognitive bias refers to a tendency of slow updating of mental models in face of new information. Conservatism may be associated with any of the abovementioned heuristics. For example, once a reference point has been anchored to, it may be very difficult to let it go, even if new and more accurate information is presented. The unwillingness to let go anchored reference points may also be associated with the already mention tendency to disregard contradicting information. In any case, this cognitive bias represents another impairment to investment decision-making.

Cognitive errors such as the base-rate fallacy, and representativeness and availability heuristics have been tested and demonstrated in many experiments. In relation to stock-market behavior and investment decision making however, such experiments have been criticized (Wärneryd, 2001) for low ecological validity. It can be assumed that people in investment situations know more about the market process than naïve subjects in experimental surroundings, who are given limited information to base their judgments on. Nevertheless, uncovering the role of heuristics and cognitive biases can help understand individual behavior on the market and provide insight into the motivations behind individual behavior.

However, it has also been suggested that using simple heuristics may actually *improve* decision-making quality. Examples of successful use of heuristics include the *recognition heuristic* and *mental accounting*. Goldstein and Gigerenzer (2002) have studied the recognition heuristic in relation to successful investment decisions. The recognition heuristic refers a tendency to infer higher value of an object which is recognized among other unfamiliar elements. Goldstein and Gigerenzer have shown that stocks of those US companies, which are recognized by more than 90% of the population do in fact perform above the market average. *Mental accounting* is analogous to the psychological *categorization theory*, and refers to a tendency to categorize different economic outcomes, an example of which is different treatment of personal revenues from different sources. The term was coined by Richard Thaler, who claims that such grouping is spontaneous and in

fact improves cognitive efficiency. Shefrin and Thaler (1988) have found that income coming from different sources is framed into different mental accounts, each with a different propensity to consume. Using this spontaneous tendency of grouping assets, one can differentiate between different kinds of savings, which can eventually lead to more efficient investment portfolio distribution.

The existence of cognitive biases is undisputable and has been confirmed by extensive research, mainly by Amos Tversky and Daniel Kahneman. They even seem familiar to the layman, and we probably all use them one way or another. Simple heuristics usually involve some modification of the base-rate fallacy, which means over- or under-estimating the probability of an event while disregarding prior probability (or base-rate). Using simple heuristics can be helpful in everyday situations, but probably leads to serious errors in making investment decisions. The probability of return is a key element in planning portfolio composition, and cognitive biases which distort rational assessment of future returns are probably a significant component of an irrational investment strategy. However, it has been argued whether novice investors can really be assumed to be as ignorant of other information as naïve subjects in research studies, and whether they are very likely to make such errors of judgment. Moreover, it has also been suggested that the usage of some heuristics, such as the recognition heuristic or mental accounting may actually improve investment decision-making and increase decision-making quality.

In chapter 4 we discussed social influence and herd behavior. If some investors are susceptible to cognitive biases in making investment decisions, the behavior resulting from a faulty decision may spread among market traders through precisely these processes of social influence. “Noise traders” could then be those, who either themselves make judgmental errors in terms of cognitive biases, or are influenced by those who do and choose to follow their suit. The term *irrational investment behavior* is therefore becoming clearer- it is the kind of behavior, which is motivated by influence from others without considering relevant facts, or by unrealistic appreciation of success probabilities, often the result of using simple heuristics, which lead to judgmental errors.

5.2 “Smart Money” and “Noise Traders”, Experts and Novices

So far, there has been discussion about risk and the effect of uncertainty on decision making and motivation (chapter 2), the role of emotions and confidence (chapter 3), and

social influence (chapter 4). In order to understand the behavior of individual investors, we also had to look at the actual cognitive processes which govern investment decision making, i.e. examine the real psychological substance of financial psychology. There has already been a difference outlined between those investors, who are rational in the economic sense and those, whose decision making in investment situations is impaired by incorrectly evaluating risk, relying on emotions, or insignificant information. Some have called them "noise" traders, however the term still needs closer examination and clarification.

Individual investors tend to make incorrect estimations of probabilities, they are influenced by emotions, and suffer from overconfidence. What's more, they are subject to influence from other people around them, whom they may choose to follow or ignore for a number of reasons. In addition, they do not have access to complete information, and even if they did, they are confused as to which information to use, and simplify their decision making processes with simple heuristics. That's why according to Wärneryd (2001, p. 113) Black (1986) coined the term "noise" which refers to the multiple arrays of information and influences which any individual investor is exposed to, and which make it difficult to act rationally in the economic and Bayesian sense. "Noise" represents the disruptions in market efficiency which occur when larger groups of market participants act on their impulses rather than Bayesian evaluation of economic data, and anomalies from efficient markets are created. Various authors have expressed a theory that there are two kinds of investors on the market, and various differences between these two groups have been presented in the previous chapters. It is usually accepted that there is a group of individual investors, who are guided by other than strictly economic, Bayesian forces, and the term "noise" traders has been used to refer to this group. Wärneryd (2001, p. 114) reports multiple definitions of noise traders: according to Delong et al. (1990a, 1990b), noise traders form incorrect expectations about the variance of future distribution of returns. In other words, they are overly optimistic, or overly pessimistic and cannot correctly judge the probabilities of future returns (this could be interpreted as a proneness to a base-rate fallacy, in line with what was said in the previous chapter on cognitive biases). Wärneryd (2001, p. 116) also reports a definition by Thaler (1992), who claims that noise traders primarily base their predictions on past development of the price of a given asset. In addition, Thaler claims noise traders form an emotional attachment to their stocks. Emotions can change quickly, which can give rise to unexpected and rapid price changes, which are not founded on real indicators.

Shiller (2003) also differentiates between two kinds of investors, whom he calls "smart money", and "feedback traders". The latter act primarily according to the feedback theory discussed in 4.2; they are strongly susceptible to influence from others, and treat word-of-mouth reports of the success or failure of others as an important source of information. The self-attribution bias seems to play an important role in the power of such mouth-to-mouth gossip. On the other hand "smart money" investors are thought to behave in accordance with expected utility theory, i.e. they are presumed to be able to assess the correct probabilities of various outcomes and make decisions based on weighing the respective subjective values of different outcomes and their probabilities and decide on the most favorable option.

There is another significant distinction within the group of market traders, which differentiates between professionals with expert knowledge, and inexperienced novice investors. As was mentioned before, various authors claim that previous stock market crashes (1929 and 1987 in the USA) have come after the entry of large number of inexperienced investors into the market. Is then safe to say that experts are those "smart money" expected utility maximizers, and novices are the noise trades? Given that stock market crashes really have been preceded by a growing number of inexperienced traders, we can assume that these traders, being susceptible to the various influences which have been discussed in chapters 2- 4, have fuelled price bubbles and were the cause of deviations, which inevitably had to be corrected.

The important question is, can we really generalize that the group of "smart money" investors corresponds to expert financiers, and that noise traders are mostly novice, and inexperienced investors? We can get some hints by comparing the characteristics of experts and novices at performing tasks. According to Wärneryd (2001), the significance of expert knowledge is that experts have superior memory for relevant information, meaning that they are trained to recognize relevant information and use it when necessary. What's more, experts in a particular area have been shown to be better than novices at recognizing patterns within task-related information. However, as far as returns are concerned, various authors like Wärneryd (2001), Siegel (2005) and Kohout (2005) provide research evidence that expert investors do not in fact outperform ordinary or novice investors in the long- run. Perhaps frequent trading, which expert investors are prone to (Kohout, 2005) and which increases their transaction costs in fact offsets their advantage in comparison to novices in terms of better evaluation of investment opportunities.

All people have a tendency to look for patterns in data and information. Even in the random walk of stock prices, people have a tendency to convince themselves that they can spot patterns with predictive value (and we already that mentioned most individual investors claim that the past performance of a stock is the single most important cue when making an investment decision). In that case, it could be that experts are better than ordinary investors to recognize shot-term patterns and trends within stock price movements. Indeed, quick pattern recognition and instant short-term scenario building are or great interest in financial markets, and here expert knowledge proves to play a significant role. However, it seems that in long-term investment plans, expert knowledge doesn't play a role in making successful investment decisions.

Kohout (2005) and Siegel (2005) are in agreement as to why expert and ordinary investors perform similarly in the long-run. According to Siegel (2005), a long-term investment strategy is more likely to yield better returns due to lower transaction costs and the better chance of owning the stock on it's top-performing days. On the other hand, frequent trading leads to inferior returns in the long run, due to increased transaction costs and lower probability of owning a given stock in it's top-performing period.

In the long-run, it seem that novice investors can even outperform experts, if they don't fall for any of the reasoning errors which noise traders susceptible to. If they do, they become what Black calls "noise traders". They are convinced they see definite patterns in the random walk of stocks. They trade in such a way, that when all the abovementioned processes of social influence come into play, their behavior creates mass movements and disturbances in the market, that may eventually look as an actual trend or pattern.

5.3 Some Notes on Expert strategies

Professional investment strategies are based on the assumption that while the development of stock prices follows a random walk, some short- term trends can in fact be identified and such information used by investors. For example, it is thought that individual stocks, as well as markets in general deviate from random walk of prices in that rises and falls seem to be the manifestation of a more or less significant trend, which can be exploited to one's advantage.

Jegadeesh and Titman (1993) have found that winnings stocks (stocks, which have had exceptionally high returns in the past 6 months) performed better by 12% in the

following year than losing stocks (stocks, which have had exceptionally bad returns for the past 6 months). However, when they chose to examine a period of more than one year, the trend seemed to reverse itself, i.e. stocks with poor returns for the past 12 months or longer performed better in the following year than those, who have been successful during this period. This is the basic assumption behind the *contrarian* and *momentum* strategies. According to the contrarian strategy, if a particular stock has performed poorly over a longer period in the past, it can be assumed that a subsequent price rise is more probable than a further decrease, therefore it is advisable to invest in stocks which have had bad returns for a longer period in the past (Wärneryd, 2001, suggests 2- 5 years). On the other hand, a momentum strategy intends for the investor to ride on the current momentum of the rising stock, which can reasonably be believed to continue for a short period of time.

The logic behind the contrarian and momentum strategies is derived from the concept of over- and under-reactions in the market. According to Barberis (1998) as reported by Wärneryd (2001), prices are assumed to under-react to news in a horizon of 1-12 months, during which time they tend to be underpriced and therefore it is advisable to invest in stocks which have been on the rise in the recent past (momentum). On the other hand, in a horizon of 3- 5 years, stock prices tend to over-react to news, that's why it is advisable to invest in stocks, which have performed poorly during the past 3- 5 years (contrarian). In other words, according to the contrarian strategy, prices tend to under-react or over-react to news only for a given period of time, after which prices more or less come into alignment with reality.

Judging from the occurrence of price bubbles, investors aren't always the best experts as to which information to use when trading with stocks. According to DeBondt and Thaler (1985, in Wärneryd, 2001, p. 158), investors put much too weight on the most recent information and ignore or cannot identify long-term trends. This finding would be in line with Siegel's explanation of bubbles by herd behavior- everyone is buying just because everyone else is buying at the moment. That is why DeBondt and Thaler recommend using contrarian strategies that go against momentary short-term market trends.

Investment strategies are the subject of many popular books, as the subject becomes popular and the number of individual investors rises. Such publications usually seek to make investment decision making available to the layman, which means explaining the basic differences between different kinds of assets, related risks and expected returns, basic principles of diversification, terms such as volatility, and the effects of different economic

processes and characteristics, such as inflation, on different investments. Based on each individual's characteristics such as risk attitudes, expected duration of investment and available capital the reader can get fairly good knowledge of how to choose an optimal investment strategy and how to diversify.

Let's continue with discussing some of the most common investment strategies used by individual investors as reported by Wärneryd (2001). The following strategies are based on Bayesian principles of rational choice. Wärneryd (2001) mentions them as the primary guidelines investors can follow to improve the quality of their decisions. The aim of employing various strategies is to minimize risk or maximize returns as compared to making investment decisions without such strategic guidelines.

Diversification is one of the most important investment strategies used to minimalize risk. Spreading one's investment over assets with various levels of risk and probabilities of return, one can significantly and effectively increase future returns. The basic principle is simple- by spreading one's investment over multiple assets such as bonds or shares, one can offset the possible loss in one asset by higher return in another asset. According to Kohout (2005), mutual funds are a very easy and cheap way diversify one's portfolio. Mutual funds allow the kind of diversification that would be too expensive for individual investors due to high transaction costs associated with purchasing each stock separately. On the other hand, Wärneryd (2001) views investing in mutual funds as deviant from Bayesian economic principles. He argues that the kind of diversification offered by mutual funds is always inferior to a hand-picked portfolio of stocks, which can be better suited to an individual's preferences, and that the returns of such a personalized portfolio can offset the slightly higher transaction costs associated with such a portfolio. According to Wärneryd (2001), spreading investment among available mutual funds is in fact false diversification, because people usually don't even take the trouble to inspect the composition of various funds. Simple diversification using various available mutual funds is what he calls the *diversification bias*, and seems to be associated with various phenomena mentioned in previous chapters, such as the preference of single simple pieces of information, and the tendency to avoid disconfirming information.

For those who wish choose to avoid mutual funds and the diversification bias, Kohout (2005) provides different models of portfolio composition, prepared according to acceptable risk and expected duration of investment. Although future returns always remain uncertain, it is possible to assess the range and median value of future returns to a

certain probability, based on past volatility of an asset. Kohout differentiates between investors based on their commitment (expected duration of investment) and recommends low-risk assets for those who plan to commit for a short period and high-risk investments for those, who are willing to commit to long-term investment. Choosing multiple bonds and shares with various past volatilities significantly reduces the risk associated with the entire portfolio. Using simple mathematical models accessible to the layman, Kohout shows that the median of expected return of a portfolio of even very risky assets with high past volatility is relatively high for investments with long-term duration (over 10 years).

Another expert strategy used is called *indexing*. Indexing refers to a method of hand-picking a portfolio of stocks, which are to follow the development of a given market index over a given period of time. With the presumption of a continuous growth of the overall market index, stocks are picked that most closely match the past development of the index and can be assumed to follow a development similar to the index in the future. Indexing represents a purely economic strategy, employed by many professionals. Last but not least, we have to mention *technical analysis* as an expert investment strategy, which refers to the identification of trends at an early stage using complex methods and models, and exploiting the knowledge of such trends. Recently, powerful computing programs have started to appear which are designed to carry out technical analysis of stocks. The author has recently been told by the employee of a large investment bank that such computer programs are indeed in use and regularly used to spot stock-market trends.

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This chapter has discussed the various cognitive biases people are susceptible to, and which are responsible for poor decision making quality in investment situations. There was discussion about various characteristics of "smart money" and noise traders and the analogies with expert and novice investors. The question was raised whether "smart money" investors can in fact be described as experienced experts, and noise traders as inexperienced novices. Some expert and purely economic strategies were described, which serve as an opposite to the cognitive heuristics introduced at the beginning of the chapter.

6. QUESTIONS OUTSTANDING

Let's sum up the information that has been presented on noise traders and inexperienced traders so far and use it to identify the most commonly used *irrational* strategies employed in decision making in investment situations. Any decision making process which deviates from strictly Bayesian principles or expected utility theory can simply be labeled irrational from an economic point of view. Upon closer examination, we have identified the characteristics of such behavior, in psychological terms. The influences on individual investors, which cause them to deviate from Bayesian principles have been divided into four groups. In chapter 2, we discussed risk and uncertainty and presented decision making biases, which people tend to fall for in situations involving risky or intertemporal choice, such as the *common difference* or *magnitude effect*. We touched upon the subject of motivation, and suggested that achievement motivation may play an important role in investment behavior. Motivation is closely interlinked with goals and formation of expectations about the future, which people tend to evaluate according to assessed probability. Chapter 3 discussed the issue of emotions- while experts warn about associating investment with emotions, there seems to be agreement in that there are optimal levels of arousal for various activities, such as decision making involving our money. On the other hand, a heightened mood may impair argument processing and cause a higher proneness to being convinced. Poor decision making in investment situations also seems to be correlated with overconfidence, which leads to less information processing and disregarding disconfirming information. Chapter 4 presented the traditional view that prices are influenced by feedback between traders and herd behavior was said to be induced not only by the sheer numbers of individuals to be followed. Various researchers have shown that people are more likely to follow those in their reference group. Finally, chapter 5 was concerned with heuristics which people tend to use in complex problem solving situations. Heuristics which lead to ignoring base-rate probabilities have a significant effect on our ability to correctly asses various alternatives. On the other hand, some authors have shown the advantageous effects of the recognition heuristic and mental accounting. Various characteristics of "smart money" and "noise" traders were presented, as well as some characteristics of experts and novices. Chapter 5 also offered a summary of some of the most commonly used expert investment strategies.

Theoretical assumptions of the financial markets that take all market participants as rational optimizers can only serve as a simplified model. When describing behavior in the financial markets, we must take into consideration multiple *psychological* factors, which have traditionally been ignored by economics as too abstract, or unscientific. However, as Robert Shiller puts it, "*nothing could be more absurd than to claim that* everyone *knows how to solve complex rationalization problems*" (Shiller, 2003, p. 96). As we now know, people tend to be susceptible to cognitive errors and biases, as well as social influence which causes them to make more or less irrational decisions. Ignoring these factors and maneuvering strictly within the confines of the efficient markets theory will inevitably lead to incorrect assessment of not only individual behavior but also mass market phenomena, such as stock market bubbles.

The cooperation between finance and other social sciences, especially psychology, has become known as behavioral finance and it has lead to a profound deepening of our understanding of financial market processes. In other words, behavior finance is a discipline that asserts that markets cannot be truly efficient because investors are not truly rational. That's why one-sided interpretations of economic behavior can provide only partial understanding and lead to drastically incorrect interpretations of what is going on in the world's financial markets. There is now general agreement that the weaknesses of efficient markets theory are so strong and apparent that an eclectic approach is absolutely necessary to provide satisfactory explanations to financial market phenomena and the functioning of the market as a whole.

It is now generally accepted that there are two more or less well defined groups of investors on the market. We have referred to the first as "smart money", meaning the Bayesian, expected-utility maximizing individuals. On the other hand, we have had "noise", or "feedback" traders, who tend to fall for all the errors in rational judgment that were mentioned in previous chapters- they tend to be influenced by emotions, current gossip and make all kinds of errors in judgment. As reported by Robert Shiller (2003), Goetzmann and Massa (1999) have studied the behavior of more than 91,000 investors in the United States for more than two years and upon evaluating the massive acquired data were able to conclude that investors could indeed be divided into two categories based on how they reacted to price changes. What's more important, Goetzmann and Massa were also able to determine that both classes of investors remained relatively stable throughout the studied period of two years, which would suggest that the labels of "smart-money" or "noise trader"

refer to relatively stable characteristics. They found that while one group tended to sell after prices rose (smart-money), the second group tended to buy when prices rose- in line with the feedback theory that noise traders fuel bubbles by basing their investment decisions on word-of-mouth gossip of success. Goetzmann and Massa therefore suggested that while smart money traders tend to use contrarian strategies, noise traders ride the current momentum of the market, simply with a get-rich-fast, if-they-can-do-it-so-can-I approach.

Upon having presented the various psychological factors influencing investor behavior and describing some of the underlying mechanisms which are responsible for decision making biases, some questions remain. First, the important subject of motivation, notably achievement motivation, introduced in Chapter 2, needs to be developed. The findings regarding noise traders have been presented without explicitly determining, whether such a group corresponds to novice and inexperienced investors on the market, whereas smart money traders would correspond to experienced, or professional investors. One of the chief objectives of further research will be to set out in the direction of attempting to answer this question by identifying aspects of irrational errors in the observed behavior of inexperienced investors.

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PART TWO

7. THE SCOPE AND RATIONALE OF FURTHER RESEARCH

Making decisions about personal investment involves risky choice among probabilities, which is prone to various cognitive errors. In addition, such decisions will also be influenced by our emotions, or the actions of others. Findings have been presented that show that market participants are indeed irrational. For example, investors don't like realizing losses, overconfidence tends to cloud their judgment and they fall for irrational, herd-like behavior.

However, after having discussed the characteristics of various cognitive errors and other instances of irrationality in individual investment decisions, there is no evidence that such characteristics are typical for inexperienced investors on the market. The question of motivation has also been left largely unresolved, only hinting upon the role of achievement motivation, which has been suggested to play a significant role in motivating investing in stocks.

By the end of Part one, four groups of market participants have been discussed: experts and novices, as well as irrational, or "noise traders" and Bayesian traders, or "smart money". Two rough unresolved areas of interest were outlined: the question of irrationality of inexperienced, or novice investors, and the question of the role of achievement motivation in stock market participation. To clarify the issue of irrationality, it will first be necessary to define the characteristics of the noise trader, or an irrational strategy, in a concise and straightforward manner that would allow for the creation of a diagnostic tool. The most significant elements will have to be chosen among what has been discussed to be typical of irrational behavior in relation to investment decision making; preferably such, that will put a roof over the concept of irrational investing strategies. Secondly, there will need to be a brief discussion about the concept of achievement motivation, and the clarification of the concept with identification its key elements, which could be incorporated into a combined diagnostic tool. The aim is then to use such a diagnostic tool on a group of novice and experienced investors to determine whether a significant difference in terms of susceptibility to irrational approach or achievement motivation can be established.

The purpose of present research is shed some light into the question whether inexperienced, or novice investors can be considered as irrational "noise traders". As was mentioned in chapter 1, we are witnessing an unprecedented increase in participation in stock markets around the world. This increase isn't typical only for Western Europe and the USA, but for other parts of the world as well (especially China, South-east Asia, and Eastern Europe). Historically, stock market trading has only been the privilege (or indulgence) of the wealthy, but began to spread during the second half of the 20th century. Since the 1990s, we've witnessed a truly unprecedented growth, as stock trading becomes accessible to almost everyone.

The reasons can be many-fold, however, the one of the most significant and influential is the spread of the internet, which through on-line banking services allows literally everyone with a computer, an internet connection and a bank account to start investing in stocks. This fact also creates an environment for stock-market traders which we have not seen before. Individual participants have, through the internet and various news sources, access to an almost unlimited amount of information concerning stocks and their prices and only they themselves choose which information they find relevant. Instead of being completely rational agents, who evaluate all relevant information and are able to objectively assess probabilities, it seems that individual traders are subject to many different forces which affect their judgment. These include social influence, decision biases, and errors in information processing.

The world's financial markets are not only an instrument for people to make money, but they are the indicators of prosperity and stability in each country and the entire world; stock market crashes have had very far-reaching effects (the crash of the New York Stock Exchange of 1929 and the subsequent Great Depression). It has been suggested that both large crashes of the New York Stock Exchange in the 20th century (1929 and 1987) were preceded by growing participation in the market and great numbers of new investors joining in. It is then plausible to assume that inexperienced investors, who were acting more on their impulses and desires rather than on appropriate information and data have caused a distortion in the development of prices on the market. Today, as the popularity of investing in stocks increases at an extreme rate, the need to evaluate the possible effects of such a development is an important task.

This is the rationale which has inspired the present research. The task to examine the effects of the changing market environment is an important one, and one that will

require more research than is possible to be gathered in the present study. However, it is necessary to set out in this direction and outline the possible ways which can be further explored by others. The scope of the present research is therefore wide, but nevertheless very timely and relevant. Can a solid method be developed which could identify irrational trading tendencies as they were discussed herein? Are the novice investors that are entering the worlds financial markets at such a pace today more susceptible to irrational decision making than their more experienced and expert peers?

So far, we have presented a mosaic of factors and forces which cause people to deviate form rational decision making and make the various errors which were discussed in Part one. This mosaic now needs to be organized and reduced to a concise system of the most important elements which impair rational decision making and constitute what we have labeled as “irrational” investment behavior. The manifestation of achievement motivation in the context of the stock-market must be dealt with similarly. The task then is to describe the development of a method that incorporates these characteristics and allows for their assessment in individual subjects.

8. DEFINING SPECIFIC NOISE TRADER CHARACTERISTICS AND ACHIEVEMENT MOTIVATION

The task now is to present a concise definition of the noise trader, one we could use to create a diagnostic tool. Multiple noise trader characteristics have been discussed in Part one, which must now be reorganized and presented as an orderly system of coherently arranged groups of characteristics, attributes, and manifest behavior. The purpose is to obtain the partial characteristics which must be incorporated into a diagnostic tool which would allow to spot individuals whose patterns of decision making resemble what has been said to be characteristic of noise traders in previous chapters.

Discussion on instances and characteristics of irrational decision making in investment situations has been divided into chapters on risk and motivation (chapter 2), emotional attachment and arousal (chapter 3), social influence (chapter 4), and actual cognitive errors in judgment (chapter 5). Biases which influence decision making in situations involving uncertainty were presented through the quite recent research and summary findings of Chapman and Weber (2006). Their study was conducted without regard to stock-market behavior, and describes risky choice biases as common traits. Although risk attitudes and the preference for high or low risks is indeed a strong determinant of investment decision making, it is not necessarily specifically related to noise trader characteristics in the sense that a specific risk preference or risky choice bias would be typical for this group. In fact, none of the authors who have come up with some definitions of the noise trader (Black, 1986, Shiller, 2003, etc.) have named any specific risk-related characteristics of this group. On the other hand, the occurrence of risky choice biases and risk attitudes seem to be somehow related to motivation, as was suggested by Weiner (1972) and reported by Wärneryd (2001). This relationship will be elaborated on in chapter 8.6, when we return to achievement motivation.

8.1 Emotional Attachment and Emotional Arousal

As far as emotionality is concerned, most authors, whose views were discussed, saw emotions as an impairing factor in making decisions concerning investment. Optimal arousal theory suggests that there is an optimal level of emotional arousal for any activity

(including making decisions concerning our finances) and therefore hints at the limited, but still noticeable positive role of emotionality in the sense of emotional arousal. However, we can probably trust renowned financial experts such as Siegel (2005), or Kohout (2005) that emotional attachment to one's investments (i.e., the actual stocks owned) is undesirable and may impair judgment when making decisions about one's investments. Both authors are financial experts rather than social scientists, and so they present such an explanation at face value, without describing such emotional attachment in any detail. This may be manifested in a number of ways- for example, the unwarranted preference of stocks based purely on the subjective attractiveness of a given company, or investment fund.

Or, as a reluctance to part with (sell) owned stocks. Daniel Kahneman and Amos Tversky, who formulated the prospect theory (discussed in chapter 2.1), claim that such a reluctance is a very common phenomenon. Kahneman and Tversky (e.g. Kahneman and Tversky, 1973) claim that a reluctance to realize losses is in fact stronger than a preference for any gains. In other words, we seem to want to avoid losses even more that we prefer to get returns. Kahneman and Tversky also stress the importance of the reference point which people use to judge potential gains or losses. This aspect of the prospect theory, called "framing", refers to the fact that gains or losses are not calculated objectively, but "framed" in relation to various subjectively considered figures. Let's consider the example: a person has purchased the stock of company ABC for a price of 100 USD apiece. If the value of the stock continues to gradually decrease over the next couple of weeks, the reluctance to realize the loss will probably cause our hypothetical person not to sell it. Moreover, for example if the value of the stock decreased to 80 USD only after having a brief peak at 120 USD, the person would probably view the situation as having lost 40 USD instead of 20, due to the effect of framing.

Jeremy Siegel (2005) warns that emotional attachment to one's stocks can be a serious obstacle to making optimal decisions on when to buy or sell stocks, when people consider their personal feelings and preferences instead of more important objective fundamental data. The reluctance to realize losses, which has been identified by Kahneman and Tversky and also labeled as the "disposition effect" describes the same phenomenon, adding only another element- the effects of framing. In this light, emotional attachment may be viewed as one of the explanations behind the disposition effect. As mentioned, Siegel (2005) takes this explanation for granted when he claims that emotional attachment to

one's stocks is directly responsible for a reluctance to sell. In any case, the existence of the disposition effect seems to be quite firmly established.

Emotional arousal also plays a role- according to the Yerkes and Dodson law of arousal (Yerkes, Dodson, 1909), cognitive performance increases with arousal, but only to a certain point. Related to financial decision making, we can infer that investment decisions will be impaired by very high or very low levels of arousal and making such decisions under extreme tension or relaxation (the effects of happy mood on argument processing were also mentioned in chapter 3) would impair decision making quality.

8.2 Illusion of Control

In relation to emotionality, chapter 3 also discussed the issue of confidence, which has been shown to be a strong determinant of investment decision making. Research in psychology indicates that in general people tend to be somewhat more confident than is warranted (Weinstein, 1980, as reported by Wärneryd, 2001, p. 170). Powering up such overconfidence may be the well-known phenomenon called the hindsight bias, or the tendency to believe that events around us were inevitable, and could have been and were foreseen. Strong overconfidence can be a very undesirable characteristic when it comes to managing one's investments and making financial decisions.

Financial markets produce, react to and depend on a vast amounts of information. The efficient markets theory posits, that market participants are rational Bayesian agents, who are able to process all relevant information and respond accordingly. Over the past couple of decades, financial psychology and behavioral finance has shown, that such a picture is far from accurate. The individual trader finds himself in the midst of all information which does, could or is thought to influence the market, and is faced with the uneasy task of finding sense among the multitudes of information. As Odean and Barber show (Odean and Barber, 2001b), the situation is even more complicated today with the spread of on-line investment services and a person considering his financial options is much more likely to see an on-line advertisement for an investment opportunity than to talk to a financial advisor at his bank. Even in Eastern Europe today but even more so in the West and the USA, it is easy to find oneself immersed in a world of finances, made to appear very attractive and simple by advertising and marketing campaigns. Such a development is certainly not unfavorable per se, and it is quite natural for companies such as investment

brokers to exploit the internet as a very effective sales channel. At this point, the only intention is to bring attention to the specifics such a situation has for the individual investor.

Odean and Barber (2001b) present the results of their study concerning information processing related to the quantity of available information. Their results indicate that the quality of decision making increases with increasing amount of available information only to a certain point, after which too much information becomes an obstacle. Moreover, Odean and Barber also claim people have a tendency to actively seek out only confirming information, and avoid information which disconfirms a set mind frame (a preference for confirming information may also be a manifestation of the need to resolve cognitive dissonance).

In addition to providing a virtually unlimited supply of information, the internet also provides information almost instantly, and mostly free of charge. The availability of easily-accessible unlimited information and the tendency to seek confirming evidence among such information may power up the already inherent human overconfidence to an unprecedented level. Individuals who decide to become investors on their own may therefore suffer from strong overconfidence, which might be manifested as "being picky" among the available information. A strong disregard for some important information combined with the hindsight bias has the potential to severely distort the assessment of one's information processing abilities when it comes to investment decision making.

What's more, when we look at today's investment market environment, we see that very large numbers of people may be susceptible to this kind of influence. The optimists of the late 90s of the last century were hyped on the internet, claiming it will drastically change all businesses beyond recognition, and this idea sparked and fed the internet-stock bubble that popped in 2001. However, the internet enthusiasts were right about something- the internet did indeed bring powerful new marketing and sales possibilities, which seem to have strongly influenced the way market traders access and process information. Our interest is novice investors on financial markets, and it seems that there are more of them than ever, and they are exposed to forces which might seriously impair and distort their information processing into making decisions which are based purely on single and random pieces of information, rather than actual relevant data. Overconfidence, manifested as a preference for own internet-based data mining and an illusion of predictability and control is therefore a significant factor in an irrational approach to personal finance planning.

8.3 Susceptibility to Social Influence

The financial market is a social environment, where traders interact with other people, observe their behavior see what the majority of them is doing. Herd behavior is a prominent topic of psychology, one that has been the subject of psychological research from the very beginnings of psychology as an independent discipline. Chapter 4 in Part one summarized the findings on how the behavior of others influences decision making on the financial markets. First of all, there is evidence for some feedback between investors, which refers to mouth-to-mouth gossip about successful investments which seems to drive the expansion of price bubbles and might be partly caused by the self-attribution bias, by which people attribute own success to own ability. Feedback among investors creates the false illusion that anyone can get rich quick in the world of investment and that just sticking with a certain current trend is more important than evaluating base data (as was the case with the internet stock bubble). Paying undue attention to such large-scale movements and following massive trends without the consideration of the important fundamentals creates disturbances in the market.

When is behavior likely to be copied? Economists used to claim that the sheer numbers of those to be followed play a role, as well as an objective evaluation of gains and losses associated with joining the trend (or "hopping on the wagon", hence the "bandwagon effect"). Here also, psychological research has yielded significant explanatory value by investigating and describing the processes of social influence. For example, by taking into account the findings from famous experiments by M. Sherif (1966) and S. Asch (as reported by Rook, 2006), one can significantly expand the classic economic "bandwagon effect" theory and prove that it is not only the sheer number of others who are member to a given trend that causes us to hop on the wagon, but that other elements like the perceived dissent or unanimity of the group, or the group's position as a reference group play an important role.

In any case, being influenced by others without considering other more important data is viewed as an irrational strategy, because it causes people to neglect what is actually important when considering an investment (actual fundamental economic data, that will not be discussed here). Hence, assuming that "inside" information received from a member of an important reference group is more important when making an investment decision than other economic data is a clear example of an irrational approach. Irrational investment

strategies will strongly rely on following only the observed trends without questioning what's behind them.

However, we mustn't disregard the positive role of social influence altogether either, and a successful strategy doesn't advise us to go head against the wall against all current trends. The rational investor simply looks at mass trends and "inside information" with an open and critical frame of mind, while a general susceptibility to social influence is generally regarded as a impairment to decision making quality when it comes to investment behavior.

8.4 Riding the Short-Term Trend: A Preference of Momentum Investing

According to the efficient markets theory, stock prices always follow a random walk. However, as various deviations form the assumptions of efficient markets were observed, it was also shown that some trends can be identified in price movements. Recognizing trends on the market is indeed an important aspect of investment decision making. Although experts agree that prices do indeed follow a random walk, they also assume it is possible to identify and exploit some short-term price trends. It has been suggested, that price movement trends may be associated with the way prices overreact and under react to new information.

Wärneryd (2001) reports findings by Barberis (1998), that prices overreact to news within the time horizon of one year, and under react to news in a period of over one year. Such under reaction means that stocks become either overpriced or underpriced, hence when a trend continues for 3- 5 years (Wärneryd, 2001), a reversal of the trend is more probable than its continuation. This is the basic assumption behind contrarian and momentum investment strategies, where the former refers to purchasing stocks which have been down for some time (assuming the trend will be reversed soon) and the latter to purchasing stocks which have been rising for a period of less than 12 months, assuming one can ride the price increase, if only for a short time.

The way people observe and react to price changes is a significant characteristic of all market participants. Some might become concerned at the slightest decrease of the value of their stocks, others may see all price decreases as an opportunity to make even more money (by purchasing more cheaper stock). The way individuals observe and perceive these changes is a very important determinant of the decisions they make about investments. Various experts have shown (e.g. Shiller, 2003), that using contrarian and

momentum strategies in relation to the suggested time frames does indeed increase the probability of success. Based on what has been said, it is evident that a contrarian strategy involves some degree of optimism about the future and some long-term commitment. On the other hand, momentum strategies are the typical approach of those who want fast returns, and assume that getting rich on the stock market is quite easy and doesn't require much expert knowledge. That is why various researchers like Shiller (2003) and Goetzmann and Massa (1999) have suggested that using predominantly momentum strategies is one of the chief characteristics of noise traders, who are very likely to fall for short-term trends (either actual trends, or falsely identified) and assume they will continue until they make them rich (or indefinitely).

When considered in a proper time horizon and together with other relevant factors, a momentum strategy may quite well be used to form a part of a solid portfolio. However, attempting to ride out all (even falsely identified) trends may be very dangerous. Along with emotional attachment, illusion of control and social influence, using predominantly momentum strategies will be another chief characteristic of noise traders, which constitutes their irrational behavior and impairs decision making quality.

8.5 "Irrational" Traders and a Note on Cognitive and Risky Choice Biases

Four chief elements of an irrational investment strategy have been identified: strong emotional attachment (8.1), illusion of control (8.2), susceptibility to social influence (8.3) and momentum investing (8.4). However, as we discussed in Part one, investment decision making is also subject to risk biases and cognitive biases. Making investment decisions involves both risky and intertemporal choice, which has been shown to display a number of decision biases, summarized by Chapman and Weber (2006). Risky choice biases such as the *common ratio effect* and intertemporal choice biases as the *common difference effect* (p. 15) have been well established and are assumed to be characteristic of all decision making situations. Similarly, we discussed the cognitive biases identified and studied by Daniel Kahneman and Amos Tversky, which are based on a common tendency to ignore base rates when assessing probabilities (p. 49).

Risky choice biases as well as cognitive biases such as the *base-rate fallacy* are indeed assumed and have been shown to affect decision making processes. However, they are expected to be more common than the four characteristics of irrationality cited in 8.1-

8.4, namely based on the extensive research by Kahneman and Tversky (e.g., Tversky and Kahneman, 1982). It is undeniable that the research of cognitive biases by Kahneman and Tversky has provided many insights into economic behavior, and can account for various phenomena hidden form the purely economic point of view. Understanding such phenomena (like the fact that people have a tendency to simplify their problems using heuristics and frequently ignore base-rate probabilities) is key to understanding economic behavior.

For the purposes of further research, we will work with the assumption that while risky choice biases and cognitive biases undoubtedly have a significant effect on decision making in investment situations, such an effect is more wide-spread and common than the effects cited in 8.1-8.4, which are thought to be typical for irrational investors (noise traders) and constitute their group more exclusively.

8.6. Achievement Motivation and Investment Behavior

The concept of achievement motivation refers to a personality variable that has been used to explain individual differences in various areas of human functioning. However, views differ on what exactly achievement motivation is, on its individual elements, or ways how to measure it. Achievement motivation is usually defined as a multidimensional concept and has the subject of frequent research in industrial and organizational psychology, because of its various assumed effects. The behavior manifestations and characteristics of achievement motivation have been described differently by various authors. According to Ward (1997), achievement motivation has been used to refer to energetic performance, thriving on competition, desire to improve one's work, a commitment to performance goals and a generally proactive approach.

Initially, the "need for achievement" has been introduced to psychology by David McClelland, referring to one's desire for significant accomplishment (McClelland et al., 1958). McClelland claimed that the need to achieve is a distinct human motive, which can be distinguished from other needs and defined it as related to the difficulty of tasks that individuals choose to undertake. According to McCelland, individuals with a low need for achievement tend to choose tasks with very low or very high difficulty, as to avoid failure, or as to not be embarrassed by failure at a very difficult task. On the other hand, individuals

with a high need for achievement tend to set moderately difficult and challenging goals for themselves, which will allow them to "show off" their abilities.

McClelland maintained that the need to achieve is unitary disposition that is manifested through various characteristics, such as motivation to face challenges, striving for perfection, or the preference of finding new solutions rather than employing conventional ones. McClelland assumed that all such characteristics reflected a common underlying construct, and that inconsistencies among these characteristics in one person were highly improbable. Nevertheless, such inconsistencies have been observed (Sagie, 1994), which has lead to the adoption of a multifactorial approach to achievement motivation. Achievement motivation is then assumed to represent a general motivation for success and excellence, which may be satisfied by various modalities and the need for high achievement in one area isn't necessarily thought to imply a need for high achievement in another.

Wärneryd (2001, p. 185) reports on an interpretation of achievement motivation in relation to stock-market psychology by Bernard Weiner (1972). The level of achievement motivation may have a significant effect on how people make decisions in situations involving risk, such as investment decisions. As was said before, achievement motivation is thought to influence the difficulty of tasks that individuals undertake. In the light of the recent multifactorial and differentiated approach to achievement motivation, Weiner studied achievement motivation in relation to investment in stocks with varying probability of success.

Weiner presents a simplified definition of achievement motivation in relation to stock-market behavior and one that has implications for investment decision making. Weiner analyzed the reactions of people, who were labeled as high or low achievers to success or failure. Based on the two variables- high/low achievement motivation and success/failure, he presents four outcomes, which were discussed in chapter 2.2: 1. Failure in individuals with high achievement motivation leads to enhanced motivation, 2. Failure in individuals with low achievement motivation leads to decreased motivation, 3. Success in individuals with high achievement motivation least to decreased motivation, and 4. Success in individuals with low achievement motivation leads to enhanced motivation. Furthermore, Wiener claims that the level of achievement motivation influences the risk people are willing to take in relation to investment. Weiner suggests, that just like individuals with high achievement motivation are thought to avoid extremely easy or

extremely difficult tasks, they also have a tendency to avoid stocks with extremely low or extremely high success probabilities. That could mean investments in extremely low-risk bonds, or extremely risky shares with very low success probabilities. On the other hand, people with low achievement motivation who are afraid of failure may be perfectly willing to invest in stocks with extremely high risk, because a potential failure at such a venture would not be viewed or perceived as a shameful failure.

Weiner therefore provides a strong hint how to diagnose achievement motivation based on observed behavior in situations involving investment decision making. The characteristics of achievement motivation that were mentioned will serve as the basis for identifying high or low achievement motivation. One of the objectives set out for the present research is to assess the role of achievement motivation in the motivation to participate in the stock market. Using the elements of Weiner's approach to achievement motivation will represent the foundation to developing the items of a diagnostic tool of achievement motivation in relation to investment behavior.

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After the discussion on instances of irrational behavior in relation to investment decision making and the various influences which cause such behavior in Part one, the characteristics of noise traders were now systematized and grouped into four categories: 1. emotional attachment, 2. illusion of control, 3. susceptibility to social influence, and 4. predominant use of momentum strategies. Similarly, we defined the indicators of achievement motivation in relation to investment decision making, which include the reactions to success or failure and the preference to invest in stocks with varying levels of risk and success probabilities.

9. DESIGNING APPROPRIATE METHODS

Given the diversity of instances of irrational behavior which were discussed and their relatedness to decision making in very specific situations, designing an appropriate method for the examination of irrational decision making strategies was a complex task. The method used had allow all four elements which were labeled as characteristic of such behavior (8.1- 8.4) to be manifested- meaning biases stemming from emotional attachment, illusion of control, social influence and momentum investing. In addition, the role of achievement motivation in the context of investment decision making also had to be evaluated to assess whether the need to achieve can be considered as having any significant role in motivating stock-market participation.

Given the expected extent of the research for the present paper, and the need to assess multiple characteristics which constitute what has been labeled as "irrational decision making", a questionnaire method seemed as most appropriate for the task. A questionnaire would allow for relatively fast collection of standardized data from a larger number of participants at a reduced effort as compared to other possible methods. The four key elements which constitute irrational decision making (8.1- 8.4) and the indicators of the level of achievement motivation in relation to stock-market participation according to Weiner (8.6) will serve as the leads for constructing the questionnaire items. The purpose of the questionnaire will be to individually evaluate the tendency for irrational decision making in the extent of chapters 8.1- 8.4 as well as the level of achievement motivation in the extent provided in 8.6.

To supplement the results obtained by the questionnaire method, it was thought to be desirable to derive some findings on decision making of inexperienced individuals from the observation of their behavior in actual decision making situations. The objective was to be able to observe inexperienced subjects in an actual investment situation and to determine whether a tendency towards momentum investing and any social processes would be detected. According to Robert Shiller (2003), who reviewed extensive literature on behavioral finance and noise trader characteristics, the way individuals react to price changes represents the central trait which distinguishes noise traders form rational traders (or "smart money", as he calls them). Shiller summarizes the research by various authors (most notably Goetzmann and Massa, 1999), who have been able to observe the preference

for momentum or contrarian investing as a quite stable individual trait. Shiller claims the existence of a relatively stable group of simultaneously appearing traits, which include a greater susceptibility to influence by feedback from other investors, a strong preference of information on past price development in decision making, and a tendency to follow what is interpreted as current trends. According to Shiller, the preference for a momentum strategy is the single key characteristic of noise traders and one that other irrational tendencies and biases are bundled up around because it assumes basing decisions purely on past development while also following the behavior of others, who are also buying in.

Therefore a second method which would provide an opportunity to observe the actual decision making process was planned. Again, the objective was to detect irrational tendencies in a group of inexperienced individuals. It was assumed that a situation involving actual decision making on investment in various stocks, in which subjects would be allowed to communicate and possibly work together would allow for the manifestation of potential momentum investing tendencies as well as social influence and the role of feedback. The results would therefore supplement the ones provided by a questionnaire method, in which subjects only contemplate hypothetical situations.

The development of both methods as well as results obtained will be discussed in the following two extended chapters: 10. Irrational Strategy and Achievement Motivation Questionnaire and 11. Momentum Investment Preference and Social Influence Observation.

10. IRRATIONAL STRATEGY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE

The first step was to construct a questionnaire method for indentifying irrational investment strategies and the level of achievement motivation. One of the chief objectives was the create a method which would be simple to use and which would allow wider administration. Therefore the planned number of items was between 20- 30, depending on the results of initial testing. The questionnaire items were to be constructed based on the specific instances of irrational decision making discussed in previous chapters and summarized in 8.1-8.4. The questionnaire items were planned to be grouped into 5 categories, each referring to (a) emotional attachment, (b) illusion of control, (c) social influence, (d) momentum strategies, and (e) level of achievement motivation respectively. Results of the questionnaire would therefore yield two separate scores, one for the irrational decision making component (*a*, *b*, *c*, *and d* combined), and one for the level of achievement motivation.

10.1 Initial Version and Testing

10.1.1 Method Description

The first version of the questionnaire was planned to contain approximately 50- 60 items, half of which could be discarded after the analysis of preliminary results to allow approximately 20- 30 items in the revised version. Items were constructed to fall within one of the five abovementioned groups. Each item was designed as a general statement or a statement referring to the subject's personal state or preference. The subject would indicate agreement or appropriateness of the statement by marking answer "Yes", or indicate disagreement or inappropriateness of the statement by marking the answer "No". A third alternative of "Don't know" was also provided in case the subject didn't know the answer, or the item wasn't personally applicable.

The construction of individual items was guided and inspired by the discussion on the irrational tendencies in 8.1- 8.4 and achievement motivation as defined by Weiner (1972) and reported by Wärneryd (2001) (8.6). The answer to each item either represents a tendency towards irrationality or susceptibility to irrational influence, or immunity to the

given kind of irrational tendency expressed by the item. Items were randomly constructed as positive or negative statements- i.e. the answers indicating an irrational tendency varied between "yes" or "no" answers randomly. An answer indicating an irrational tendency or influence was scored "1"; answers indicating immunity to an irrational tendency or influence, or items answered "Don't know" were scored "0". Similarly, for items regarding achievement motivation, the statements referred to the characteristics and manifestations of high or low achievement motivation, with randomly varying positive or negative statements. Answers indicating high achievement motivation were scored "1" and answers not indicating high achievement motivation or answers of "Don't know" were scored "0". The irrationality score therefore indicates a positive irrational tendency with a low score not necessarily indicating a "rational" approach.

Items concerning emotional attachment were constructed based on the assumptions on emotional attachment to stocks by Siegel (2005), the refusal to realize losses or the subjects' potential impulsiveness. Concerning the illusion of control, items were designed which question the subject's preference for own selection of information and the preference of the internet and other media to expert advice in person. Also, items concerning the frequency updating information on the development of prices were included in this section. Social influence items were formulated in such a way as to enable the subjects to show their preference or indifference to private as opposed to public information and the interest in information on the number of individuals involved in a certain action to be followed. The preference of momentum strategies was assessed using verbal or visual descriptions of price development of particular stocks. An answer indicating the preference for a momentum strategy or a rejection of a contrarian strategy was scored "1". Items regarding achievement motivation were constructed according to the four principles referring to the relationship of achievement motivation and reaction to success or failure by Weiner (p. 74), as well as to show the value one puts on own abilities as compared to the role of luck. In addition, items regarding the preference or rejection of easy or difficult tasks were included. Apart from the actual questionnaire items, the form asked for each subject's sex and age. The questionnaire was entitled "Questionnaire of financial preferences" and included a short introduction explaining it's aim to examine individual preferences in planning of personal finances as well as instructions for completion. The order of items was selected at random by the author, with potentially less demanding questions regarding the role of luck or reaction to success or failure listed at the beginning. The questionnaire was constructed

and presented to subjects in Slovak (the author's native language). The initial version of the questionnaire, which consists of 56 items, is included in its entirety in appendix A (original and translated into English). The questionnaire yields two result scores- the irrationality score and achievement motivation score. The questionnaire consists of 37 irrationality items and 19 achievement motivation items.

10.1.2 Sample

Sample consisted of 36 persons, 21 women and 15 men. The mean age of the sample was 23.5 years. Persons participating in the initial testing of the questionnaire were the author's colleagues and friends- members of two e-mail groups to which the questionnaire was sent along with an introduction explaining its purpose. Both e-mail groups that the author used have approximately 50 members, so it is estimated about 100 people received and were asked to complete the questionnaire, which sets the return rate at roughly 30-35%. There was no differentiation between inexperienced and expert investors in this testing stage, as no other objective besides the refinement of the questionnaire method was set at this point.

10.1.3 Administration

The initial version of the questionnaire was prepared as an interactive MS Word document to be completed electronically. The questionnaire document was distributed on-line using two e-mail distribution lists the author is member to. Being the initial pilot version, such distribution and administration was considered sufficient. No other instruction besides the one at the beginning of the questionnaire (in appendix A) was provided. Subjects completed the questionnaire on their computers at their various respective locations (hence having no time limit) and returned the completed questionnaires to the author by reply e-mail.

10.1.4 Results

All analysis was performed using SPSS 12.0 software.

Mean irrationality score: 18,3

Mean achievement motivation score: 10,2

For details on the scoring method, please see Appendix B, for detailed frequency tables with STEN norms, please see Appendix C. The distribution of raw scores of irrationality and achievement motivation is shown below. Both scores show what can satisfactorily be regarded as a normal distribution.

Fig. 1: Raw score distribution, irrationality score, Init. version questionnaire

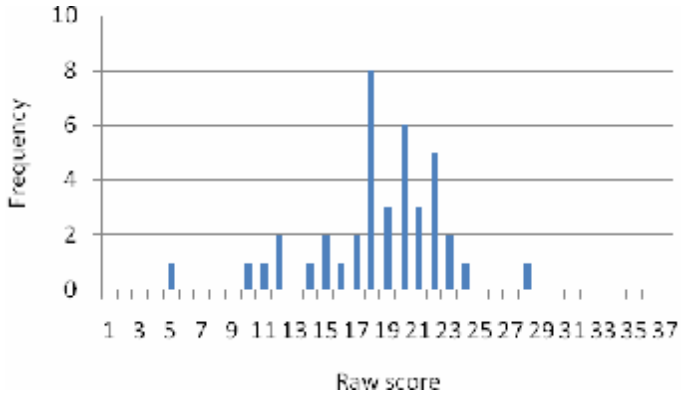
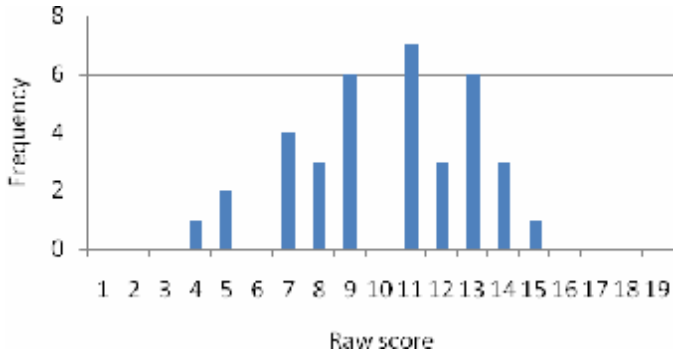


Fig. 2: Raw score distribution, achievement motivation score, Init. version questionnaire



10.1.5 Item analysis

As a next step, an analysis of items was performed, as to eliminate any unsuitable items. Details on the item analysis (individual correlations with raw scores, item difficulty) are included in Appendix C.

Emotional attachment component items found to have the highest correlations with the component score as well as the irrationality total score were items no. 23, 30, 42, 52,

and 55. Although the correlation of item 30 score with the component score and irrationality total was found to be only moderate (0,233 and 0,328 respectively), it was decided to keep the item and rephrase the statement so as to emphasize the element of emotional attachment. Original emotional attachment component item no. 41 was found to have a negative correlation with the component score and a very low correlation with the irrationality score, and this was considered to be due to an unclear message of the item upon reconsideration. Difficulty of items was calculated as the number of persons who scored in the given item out of total number of persons who answered the given question (i.e. difficulty expressed as the "simplicity" of an item, a higher number meaning a lower difficulty). The difficulty of the items chosen to remain in the questionnaire was considered to be satisfactory, except for item no. 52 (difficulty 0,72), which was to be rephrased.

Illusion of control component of irrationality items were generally found to have high or mediocre correlations with the component score as well as the total irrationality score. Items with the highest correlations with the component score were chosen to be kept (items no. 14, 16, 17, 25, and 33). Item no. 8 and 25 had the same correlation with the component score (0,491; sig. 0,95), however, item no. 25 had a higher correlation with the total irrationality score and was chosen over item no. 8. Items no. 16 and 25 to be kept were rephrased due to low difficulty (with a difficulty of 0,72 and 0,67 respectively the items seemed to "fool" subjects very easily by putting more emphasis on good past returns than fees, and the need to check investment frequently). Item no. 17, which had only a mediocre correlation with the total irrationality score (0,210) is to be kept due to its solid correlation (0,487*) with the component score.

Five items were eliminated from the social influence component set and items no. 9, 13, 22, 34 and 47 were kept. In general, seven out of the ten proposed items were found to have solid or quite strong correlations with the component score, as well as the total irrationality score; however, items no. 5 and 29 we also eliminated due to relatively low difficulty (0,67 and 0,74 respectively). The difficulty of the items chosen to remain was found to be relatively appropriate, ranging from 0,56 to 0,64. The items chosen to be kept were also found to have strong correlations to the total irrationality score (ranging from 0,526* to 0,783**).

Three items were eliminated from the momentum investing component set to leave a total of five items. Items to be kept were no. 12, 20, 31, 32 and 49. Items no. 26 and 35 were found to be poorly correlated with the component score, as well as the total

irrationality score. A possible explanation is that upon reconsideration, item 26 wasn't formulated clearly enough and the attempted "financial jargon" used in item 35 wasn't comprehensible enough to the layman. In addition, although item no. 4 was found to have a higher correlation with the component score than item 12, it was decided to keep the latter item due to its solid (0,452) correlation with the total irrationality score, while item no. 4 didn't show a satisfactory correlation with the total score (only 0,230). Two items with the highest correlations with the component score were found to be items 20 and 49, as was expected. Items chosen to be kept for the final version also showed a satisfactory level of difficulty.

Eight items with the most satisfactory correlations with the achievement motivation score were chosen for the final version of the questionnaire out of the 19 in the achievement motivation set. Items with unacceptable correlations with the component score were eliminated- these were items no. 10, 19, 37, 39, 45, 46, and 51. Some of these were upon review seen as poorly verbally related to the domain of achievement motivation, such as no. 51 ("Everybody makes their own luck") or no. 10 ("Luck is the most important key to success"). Items no. 1 and 2 were found to have a relatively poor but noticeable correlation with the component score (0,240 and 0,313 respectively), but in the light of other more conclusive correlations, these items weren't considered for rephrasing and were eliminated. The range of difficulty of items to be kept was found to be moderately broad- 0,39 to 0,61; Item no. 36 (difficulty level 0,39) was rephrased and reversed for the final version due to its resemblance to item no. 50 and relatively higher difficulty.

10.1.6 Reliability of Domains and Note on Validity of the Questionnaire

Based on the results, reliability of both the irrationality and achievement motivation domain of the questionnaire was evaluated. Internal consistency of the both domains was determined using the split-half method. Reliability couldn't have been satisfactorily determined by retesting, because it would have been quite difficult to maintain the same sample (same people of the two e-mail lists who chose to complete the questionnaire). Therefore a split-half correlation was calculated and subsequently adjusted for the length of the test using the Spearman-Brown formula.

Split-half reliability with Spearman-Brown adjustment for the irrationality domain (37 items) was found to be equal to 0,485, a relatively solid value considering an initial

version was being tested. Upon the elimination of all but the items to be kept for the final version (20 items kept), split-half reliability increased to 0,549, which seemed promising. Using the same method, reliability of the achievement motivation domain of the questionnaire (19 items) was found to be equal to a rather low 0,358. After the removal of items to be left out for the final version (8 items kept), reliability was slightly increased to a more promising 0,502. Rephrasing some of the questions was thought to increase the reliability of both domains even more.

The author is aware that a questionnaire domain of only 8 items can be criticized as inadequate. However, wanting to combine both domains into one questionnaire required some adjustments for length, taking into account the willingness of potential subjects to complete the questionnaire. Out of the 19 items proposed for the achievement motivation domain, only 8 were found to be satisfactory enough to be kept on. For the present task and within the framework of achievement motivation in relation to investment behavior as defined by Weiner, the items to be kept should suffice to provide a general picture of the trends concerning achievement motivation in the given sample. Therefore, reliability of the achievement motivation and its items evaluated using the same method as for the irrationality domain, and will also be evaluated in the revised version with the reduced number of questions. Hence we must keep in mind that the interpretation of all result data, especially results on achievement motivation must be considered out with caution.

The validity of the questionnaire method was taken at face value given the fact that it's sub-sets and items were constructed based on careful construction of the various components of irrational investment behavior in Part one and structured in chapter 8 of Part two.

10.2 Revised Version Questionnaire

10.2.1 Summary of Revisions Made

Based on the results and analysis in 10.1.4- 10.1.6, a revised version of the questionnaire was constructed. As planned, approximately half of the items in the initial version were eliminated, leaving a total of 28 items in the questionnaire. The method should therefore be more accessible in the sense of being less time-consuming and discouraging for potential subjects. Items that were eliminated were those found to have a poor correlation with total irrationality score (in case of irrationality items) or their respective component scores. Some of the items to be kept were also rephrased to achieve a more desirable level

of difficulty. In cases where the difficulty of original items was found to be roughly below 0,40 or above 0,60, the item was rephrased in order to allow greater accessibility in terms clearer wording, or greater emphasis on some of its elements.

The revised version includes five items for each of the four irrationality components of (a) achievement motivation, (b) illusion of control, (c) social influence, and (d) momentum investing, and eight items for the achievement motivation component (maximum irrationality score=20, maximum achievement motivation score= 8). The revised version also includes an additional item at the very end of the questionnaire, where subjects indicate whether they themselves have invested in a mutual fund in the past. The answer to the question is taken as indicative of their status as novice or experienced investors. However, it can be argued whether making an investment makes a person an "experienced" investor. For the purposes of the present research however, differentiation based on this fact will be sufficient to serve the intention of evaluating and improving the questionnaire method and to hint at possible differences at this level. The question has been included at the end, because it was thought it could affect the mindset of the subjects during the completion of the questionnaire by possibly suggesting that some sort of investment knowledge is being tested. Instructions were left largely unchanged, with one exception- due to the fact that the completed initial version questionnaires contained a considerably large number of don't know responses, subjects were now asked to consider each question again before choosing a "Don't know" answer. The original title, "Financial preferences questionnaire" was kept. For the revised version questionnaire in its entirety, please refer to Appendix D. The revised scoring chart for the questionnaire is included in Appendix E.

10.2.2 Sample

The aim was to administer the revised version of the questionnaire to a larger sample than the initial version, and determine the strength of the revised method in terms of item quality and reliability. In addition, it was also planned to compare the level of irrationality and achievement motivation in a group of experienced and inexperienced investors differentiated on the basis of having or not having invested in a mutual fund or other kind of stock. The objective was to probe the tendency to use irrational strategies and the level of achievement motivation in both groups. Based on the discussion in Part one, it was expected that the groups of inexperienced investors would display a higher proneness

to irrational behavior, while experienced investors would display a higher level of achievement motivation. However, the primary objective remains to continue to improve the questionnaire method and assess its capabilities and limitations.

The sample was gathered by personal contact as well as by electronic communication. No effort to obtain a sample representative of any population was made. Administration wasn't carried out in a group but individually at various times and locations. The revised version of the questionnaire was administered to a total of 89 subjects (39 women and 50 men), aged 18- 52 years.

10.2.3 Administration

The questionnaire was administered individually. Subjects received instructions at the beginning of the questionnaire (Appendix D), which is entitled "Financial Preferences Questionnaire". Distribution was performed via e-mail to the author's colleagues and friends as well as by personal contact. In case of e-mail contact, the persons who completed the initial version of the questionnaire were asked not to participate again at this stage. In addition, the questionnaire was handed out to other acquaintances in person, where completion never exceeded 15 minutes (no time limit was set). No subjects mentioned having problems with completing the questionnaire. Completed questionnaires were either returned to the author for analysis by reply e-mail or in person on paper.

10.2.4 Results

All analysis was performed using SPSS 12.0 software.

Mean irrationality score: 11,7

Mean achievement motivation score: 5,2

Details concerning the scoring method are included in Appendix E, detailed frequency tables with STEN norms for both scores are in Appendix F. Distribution of both raw scores is shown below. As was the case with the initial version questionnaire, both scores show what can satisfactorily be regarded as a normal distribution.

Fig. 3: Raw score distribution, irrationality score, Rev. version questionnaire

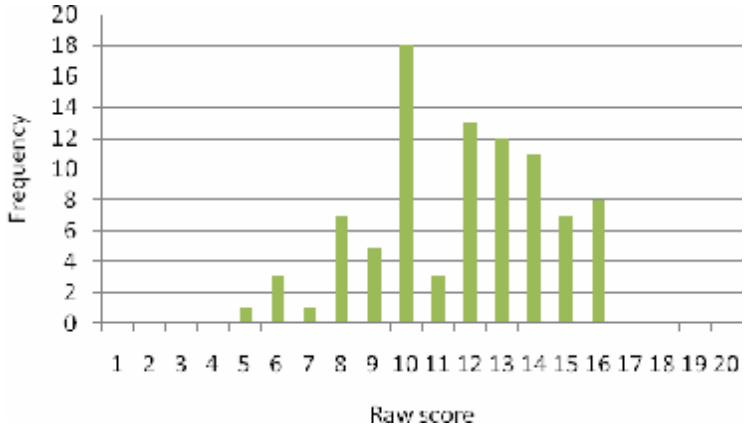
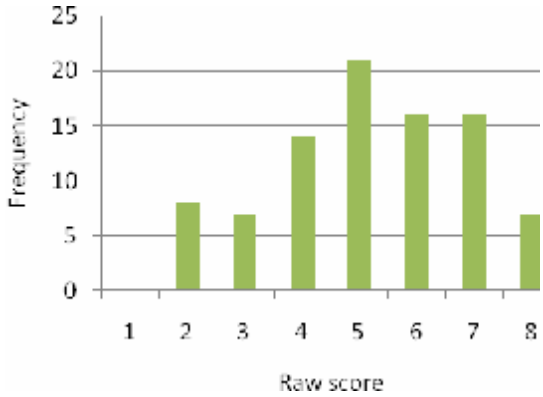


Fig. 4: Raw score distribution, achievement motivation score,
Rev. version questionnaire



10.2.5 Item analysis

Note: In the following discussion, the new (revised) item numbering is used; for corresponding items in the initial version, see Appendix F, table 15 and 16, item numbers in (parentheses).

For each item, correlations with the component score and achievement motivation score were calculated, as well as item difficulty. Detailed results of item analysis are included in Appendix F. In general, high correlations obtained in the initial version were maintained. Correlations with the irrationality component score with a significance below 0,95 have been found in case of items no. 2, 10, 14, 21, and 27 (0,420; 0,443; 0,455; 0,412 and 0,401). In the case of items 2 and 14, mediocre correlations have also been found with the total irrationality score (0,423 and 0,401 respectively). Correlations of irrationality

items with the total irrationality score was generally more satisfactory. In addition, items no. 6, 14 and 15 were also found to have a weaker, but still relatively sufficient correlation with the total irrationality score (0,332; 0,401; and 0,430 respectively). In some cases, where items were rephrased, the strength of correlations has improved (items no. 18, 25, and 27). In the case of item no. 27, a notably stronger correlation has been achieved (correlation with component score improved form 0,233 to 0,401). However, in case of items no. 5 and 17, slightly weaker correlations were found after rephrasing.

Item difficulty (no. of those who scored on the item / no. of those who answered the item) was maintained roughly the in the same range and can be regarded as relatively satisfactory, with room for improvement (ranging form 0,29 to 0,70 in the entire questionnaire). However, with the exception of items no. 2, 5, 16 and 28 difficulty ranged from 0,39 to 0,63. In some cases, rephrasing the original item helped improve its difficulty to a more desirable level (items no. 5, 25, and 17). For other rephrased items (no. 18 and 27), difficulty worsened or remained almost unaffected.

In general, the consistency of the questionnaire based on individual items analysis seems to be relatively strong, with almost all items having significant correlations with their relevant component scores and total domain scores. Item difficulty remains a slight problem, and improving difficulty to more favorable levels remains a task for future revisions.

10.2.6 Method Reliability and Validity

Reliability was evaluated for both domains by calculating internal consistency using the split-half method with Spearman-Brown adjustment. For the investor irrationality domain, reliability was found to be equal to 0,601. This is higher than the reliability of the initial version of the questionnaire (0,485) and slightly higher than the reliability of the initial version after the elimination of unsuitable items (0,549).

For the achievement motivation domain, split-half reliability was 0,552. This is a significant improvement from reliability of the first set of achievement motivation items (0,358). In general, reliability of both domains isn't disappointing, but still far from optimal.

As for validity of the questionnaire, same applies as in 10.1.6- validity is taken at face value based on the way the questionnaire items were put together.

10.2.7 Analyzing the Differences Between "Inexperienced" and "Experienced" subjects

The proportion of inexperienced subjects and subjects with experience with investing in mutual funds is shown in the following table.

Table 1: Proportion of "inexperienced" and "experienced" subjects.

Subjects		
Inexperienced	Experienced	Total
54	35	89

The figures below show the distribution of irrationality and achievement motivation raw scores in "inexperienced" and "experienced" subjects. Mean scores for both groups are shown in table 2.

Fig. 5: Raw score distribution, irrationality score, "Inexperienced" subjects

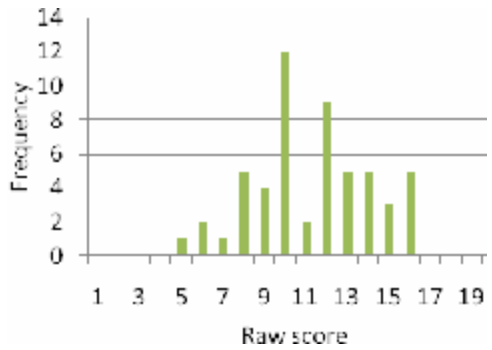


Fig. 6: Raw score distribution, irrationality score, "Experienced subjects"

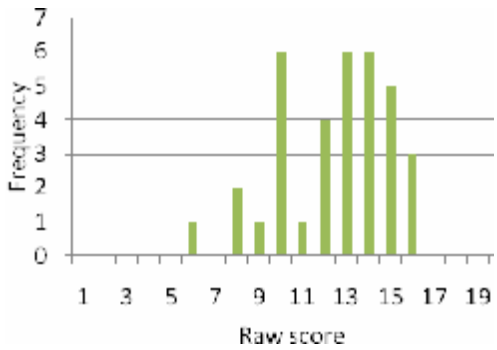


Fig. 7: Raw score distribution, achievement motivation score, "inexperienced" subjects

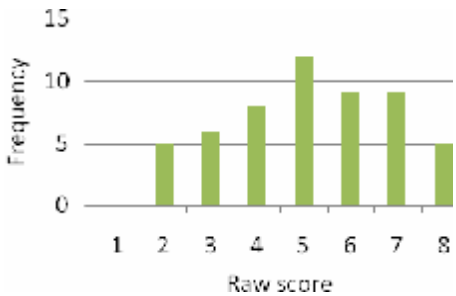


Fig. 8: Raw score distribution, achievement motivation score, "experienced" subjects

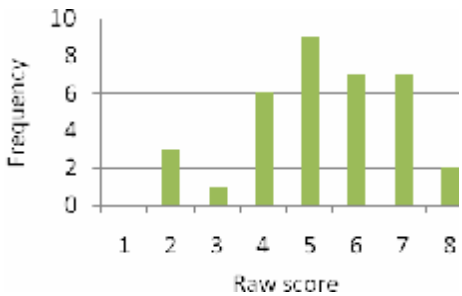


Table 2: Mean scores, "inexperienced" and "experienced" subjects.

Mean score	*"Inexperienced"*	*"Experienced"*
Irrationality score	11,2	5,12
Achievement motivation score	11,8	5,28

A statistical analysis was performed to further examine the differences in both groups. Contrary to the expectation, the group of "experienced" subjects was found to have a higher mean irrationality score than the group of "inexperienced" subjects. To determine whether the distribution of irrationality scores and achievement motivation scores in both samples (inexperienced, experienced subjects) was equivalent, a student's t-test with a two-tailed hypothesis was used (the variance of scores in both populations was found to be equivalent). However, the test showed that at the desired level of significance (0,95), the null hypothesis stating an equivalency of distributions could not be rejected. Therefore, it wasn't shown that irrationality scores had a significantly different distribution in the groups of "inexperienced" and "experienced" subjects.

The same test was carried out to compare the distributions of achievement motivation scores in both groups. In this case, the group of "experienced" subjects showed a slightly higher mean achievement motivation score (5,28 compared to 5,12), in line with expectation. However, again, the results of the t-test showed that the null hypothesis stating equivalent distributions could not be rejected at the desired level of significance (0,95). Judging from these results, the distributions of the achievement motivation scores were not significantly different (For details on both test statistics, please see Appendix G).

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The creation of a new method for the assessment of irrationality in relation to investment behavior and achievement motivation was discussed in this chapter. Based on what was said to be characteristic of irrational investment strategies and achievement motivation in relation to stock-market behavior in Part one and chapter 8 of Part two, a set of questionnaire items has been devised and tested. Based on a preliminary analysis, the questionnaire has been abridged and some items rephrased to allow greater accessibility, then tested again. A repeated items analysis based on administration to 87 non-representatively chosen subjects has shown that almost all questionnaire items have a relatively solid relationship with their tested characteristics and a set of STEN norms has been presented. Apart from the development of a diagnostic tool of investor irrationality and achievement motivation, the objective has been to test the differences in these two

domains between inexperienced and experienced subjects. Given the small scale and pioneer nature of the research, a distinction between “inexperienced” and “experienced” subjects was based only upon prior investment in mutual funds. A differentiation into groups of “inexperienced” and “experienced” subjects based on this characteristic did not however reveal a statistically significant difference in the distribution of both the irrationality score or achievement motivation score.

Administration of any questionnaire method is impaired by the presence of a desirability bias within the sample. Social desirability, or the tendency to present one’s self in a more favorable- desirable- light is a phenomenon which generally decreases the validity of any test method. The fact of social desirability has to be taken into account when constructing test questions, so that they allow as little space as possible for the subjects to decipher the true intent of the test method and to answer in a more desirable manner. Although effort has been made to eliminate the potential for a social desirability bias from the questionnaire method discussed in this chapter, a claim for the presence of such a bias still exists. What’s even more important is the fact that the test method involves the topic of dealing with money and savings quite abstractly. Although questions were devised with an effort to probe for various tendencies in a covert and indirect manner, the validity of the results can still be increased with supplemental research which would allow for the observation and interpretation of actual behavior.

11. MOMENTUM INVESTMENT PREFERENCE AND SOCIAL INFLUENCE OBSERVATION

11.1 Method and Administration

11.1.1 Method description

Two areas, which are considered to be especially intangible and distant to potential subjects in research concerning irrational investment strategies correspond to the components of the susceptibility to social influence and preference of momentum investing. The rationale for the development of an additional method, in which subjects would deal with actual investment problems is clear. Since the two main areas of interest were social influence during investment decision making and the preference of momentum strategies over contrarian or neutral strategies, a situation has been devised in which subjects would have the opportunity to invest their fictional savings and manage their investment over a short period of time. The preference for a momentum strategy could be observed by manipulating the price changes of various fictional stocks offered and monitoring the subjects' investment decisions. Monitoring interaction between subjects and their own accounts of how they reached their decisions will enable to detect the presence of social influence and social feedback.

The objective was to design a trial in which subjects would make actual decisions regarding their imaginary finances. The design called for a group administration, during which participants would invest fictional capital in the offered assortment of mutual funds. Various information about the funds would be provided, such as past returns, including brief information on composition. Subjects would then follow and manage their investment during a couple of steps, in which price changes would be announced. By manipulating the price developments, such a design would allow for the identification of a preference of momentum strategies, as well as the emergence of elements of social influence, given that the administration would take place in a group, where subjects would be allowed to communicate freely.

Subjects received materials explaining the procedure of the study and offering four fictional mutual funds to invest in. They instructions informed subjects they possessed a spare capital of 10,000 CZK (administration took place in the Czech republic) which could be invested and spread among the four offered funds or cash savings. On three sheets labeled A, B and C the subjects received information detailing the procedure of the study,

the four funds offered, and a working table to mark the development of their investment, respectively. Subjects were told the trial will involve time contraction, and they will receive feedback on the development of their investment in three steps, each in-between period corresponding to 1 year. Subjects could choose among a (1) Money-market Fund, (2) Bond Fund, (3) Composite Fund, and (4) European Shares Fund. Information on each fund included a summary of its composition, associated risk, expected returns and history of returns. For simplification, no fees were associated with investing in any fund. After making their first investment (e.g., 1000 CZK Money-market Fund, 2000 CZK Bond Fund, 3000 CZK Composite Fund, 4000 CZK European Shares Fund, 0 CZK cash), the results after 1 year were announced (e.g. Money-market fund: +1%, Bond Fund: +2%, Composite Fund: +5%, European Shares Fund: -9%). Using the table provided, the subjects were asked to calculate and mark the current capital value of their share in each fund as well as a sum value of all shares. The sum was to be invested again (divided among the same funds or cash), a second outcome was announced, a third investment performed, and finally the resulting outcome and capital value were calculated. After calculating the results, subjects were also asked to answer two questions regarding information on which they based their investment decisions in this trial (All trial materials- both Czech original and working English translation- are included in Appendix H).

11.1.2 Sample

Sample consisted of 27 students attending a class of the course of Economic Psychology at the Department of Psychology in summer 2007 semester. Attendees were asked to participate in the trial at the end of the class. Upon a verbal inquiry before the trial, all participants indicated they had no first-hand experience with investing in mutual funds.

11.1.3 Administration

Administration took place in a classroom at the end of a lecture attended by students of psychology, at Department of Psychology, Faculty of Philosophy and Arts, Charles University in Prague. None of those present refused participation in the trial. After reading the instructions (Sheet A in Appendix H), some questions regarding the trial procedures were asked and answered by the author and the trial was only commenced once

all participants' questions and concerns were sufficiently addressed. Participants worked in the classroom at their desks and were given no specific instructions to work alone or not to communicate with each other. Once the initial investment was performed, respective trial outcomes were announced at a few minutes' intervals, depending on the time it took all participants to calculate the current share value; 1st, 2nd and 3rd outcomes were announced verbally, and written on the board in the classroom (note: the calculation of earnings based on announced outcomes required the use of a calculator; however, this fact didn't present a problem as all participants worked with calculators on their cell phones).

Information on past returns of each of the four funds was provided on Sheet B (see Appendix H). To provide a sense of the possible development of each fund a the level of associated risk, past returns were indicated as a percentage increase or decrease during the period of (a) past one year, (b) past five years, and (c) since the establishment of the fund (exact time not specified). The history of returns of each Fund used in the trial is shown in table 3 below.

Table 3: History of returns of each Fund, provided to participants on Sheet B before initial investment; bull trends underlined.

	Earnings over a period of		
	1 year	5 years	since founding
Money-market Fund	+ 1%	+ 10%	+ 17%
Bond Fund	- 1%	+ 17%	+ 41%
Composite Fund	<u>+ 5%</u>	+ 41%	+ 98%
European Shares Fund	<u>+ 14%</u>	- 3%	+ 229%

Feedback during the trial was announced similarly, as a percentage increase or decrease in fund value over a period of one year. Before the first results were announced, participants were reminded of the contraction of time used in the trial, and that they can think of the time interval between each of the outcomes as being equal to one year. Since it was the aim of the trial was to observe a preference of momentum investing, the history of returns of Sheet B as well as announced outcomes were manipulated to show a clear "bull" tendency in some cases. The past returns indicated on Sheet B and present returns announced during the trial were the only concrete information subjects possessed about each fund, so that reactions to price changes could be observed without interference of other factors. Before making the second and third investment decisions, subjects only

received feedback regarding price changes. The results announced during the trial are shown in table 4.

Table 4: Outcomes of individual funds announced during trial; bull trends underlined.

	Results announced during trial		
	1st trial outcome	2nd trial outcome	3rd trial outcome
Money-market Fund	+ 2%	+ 3%	0%
Bond Fund	+ 3%	+ 3%	+ 1%
Composite Fund	+ 7%	+ 2%	+ 11%
European Shares Fund	- 3%	- 11%	+ 41%

The history of returns provided for each Fund was designed to affect the initial investment decision by showing two bull Funds. Similarly, the announced trial outcomes which affected the next investment decision (1st and 2nd trial outcome) were manipulated to show a clear bull tendency in two cases. In the 1st outcome, the Bond Fund and the Composite Fund (+ 3% and + 7% respectively) showed a growing tendency compared to Money-market and European Shares Fund (+ 2% and – 3% respectively). Similarly, the 2nd trial outcome showed a bull tendency by the Money-market and Bond Fund (each + 3%, compared to inferior returns by other funds). The 3rd trial outcome didn't influence any more decisions, and was announced only for the sake of the participants, who were thus able to calculate how much they made or lost during the trial, relative to the initial 10 000 CZK provided.

After completing the table and calculating their outcome, participants were also asked to provide answers to two questions concerning information they chose to base their decisions on.

11.1.4 Interpretation and Results

The results consisted of tables and questions (Sheet C, as shown in Appendix H) completed by the subjects during the trial in reaction to information provided in the instructions (history of returns on Sheet B) as well as outcomes announced in the course of the trial. The tendency for momentum strategies was to be detected by a preference of investment in those funds, which had recently shown relatively good returns (better

returns in the past year then other funds available). In each investment step, two of the four funds offered were manipulated into having relatively good returns in the previous year, while the other two funds showed inferior returns, or a loss. In the first investment phase, the momentum funds were the Composite and European Shares Fund, showing a 5% and 14% growth in the previous year respectively. After the 1st trial outcome (which was explained to have followed in one year's time), the Bond Fund and Composite Fund showed momentum growth, growing by 3% and 7% respectively. Similarly, after the 2nd trial outcome, the Money-market Fund and the Bond Fund showed momentum growth in relation to other funds, both increasing their value by 3%. The yearly results, which are considered to represent a momentum growth are underlined in tables 3 and 4 on page 94 and 95).

A preference of a momentum strategy in each of the three steps was defined as investing more than half of present available capital (more than 5000 CZK in the case of initial investment) in any or both of the bull funds (i.e. 1st investment: Composite Fund and European Shares Funds; 2nd investment: Bond Fund and Composite Fund; and 3rd investment: Money-market Fund and Bond Fund). Engaging in a momentum strategy in each instance of the three steps was scored 1 point, thus a preference for a momentum strategy in each of the three steps (= investing more than half of available capital in the funds labeled as bull funds in the given step) was scored 3 points ("momentum score"). A preference for a momentum strategy in two or more of the three steps was considered to indicate an overall preference for momentum strategies.

Out of the 27 tables with results collected, only 1 participant showed a complete immunity to momentum investing, avoiding a momentum preference in all three steps. 8 participants showed a momentum preference in only one of the three steps. 16 participants showed a momentum preference in two steps and 2 used what was defined as a momentum strategy in all three steps. Overall, 18 of the 27 participants were identified as preferring a momentum strategy (preferring a momentum strategy in two or more of the three steps). The results concerning the participants' momentum score are summarized in table 5 on the following page.

Table 5: Usage of momentum strategies among trial participants

Momentum score	*Number of participants*
0	1
1	8
2	16
3	2

In addition, 17 out of the 27 participants indicated an answer to question no. 1, "Which piece of information was most important for you when deciding among the various funds offered?". Answers varied, however, 10 participants out of the 17 who provided an answer indicated that they made their investment decisions not only based on the performance of a fund in the past, but based on its good returns in the past. The collected sheets included answers stating that decision making was based on "results in the past", "returns of the fund in the past", or "the fact that the fund grew in value before". Shiller (2003) maintained, that irrational investors are characterized by overestimating the predictive value of the performance of stocks in the past, and it seems that the findings here are showing just that. A significant number of those who answered the given questions claimed that past performance of a fund was the most important factor in their decision making. However, in addition to preferring information on past performance, the subjects seem to be interpreting it in a similar way. Recent good performance of a fund is interpreted as guarantee of its good returns in the future. Based on past performance, the participants chose a momentum strategy much more frequently than a contrarian strategy.

Question no. 2, "Besides the information provided, what prompted you to choose the fund(s) you invested in?" was aimed at detecting the role of social influence and feedback among participants. 17 of the 27 participants chose to provide an answer to question no. 2. Out of these 17, 13 participants specified answers that were interpreted as indicative of various kinds of social influence. These answers to question no. 2 included short statements such as: "consultation"; "experience of others"; "consulting with others"; and "talked to friends". The participants themselves admitted, that they made their decisions on which funds to choose not only by themselves, but relied on their colleagues around them and made decisions together.

In addition, social influence and feedback among participants was also detected by observation during the trial. As mentioned before, participants were intentionally given no instructions to work alone, therefore they could freely choose to make decisions together.

The simple aim of the observation task was to identify the number of ad-hoc working groups formed to make decisions, and the number of people who chose to work alone. To this end, the author prepared a sheet to mark the number of working groups formed and the number of people working alone. Consultation between participants could be observed throughout the entire trial. Subjects discussed with their peers before each of the three investment steps. It was observed that *all* participants sitting at their desk with a neighbor consulted with them. There were three larger working groups formed of neighbors in the closest rows, which discussed their decisions quite openly. Only 4 out of the 27 participants were observed to work completely alone throughout the entire trial.

11.2 Discussion of Findings

The fact that such a level of cooperation was observed during the trial can be considered indicative of a high level of social influence in completing the investment task. The trial was intended to be carried out in a larger group of people, who would have the chance to interact, thus simulating the conditions of the real financial market and investment decision making, where all participants may discuss their decisions with friends and significant others, or choose to follow somebody's lead. Due to the trial's design, participants had the open possibility to consult their investment decision with their peers, this imitating real-world conditions. In effect, a vast majority chose to do so (only 4 of 27 participants working completely alone).

However, the exact nature of social influence had to escape our scrutiny. We don't know, whether participants who consulted with their neighbor or a larger group all decided on the same or similar investment strategy. We can only draw on the findings on social influence in investment situations, which were discussed in Part one. Various authors (Shiller, 2003; Siegel, 2005) have stressed primarily the role of feedback between investors as a component of social influence in investment decision making. Feedback, which investors provide and receive in interaction with each other may be driven by the hindsight bias or the error of self-attribution (D. Bem, 1965; chapter 4.2), and contribute to the formation of herd movements which aren't based on much more than such feedback (this is the explanation of stock price bubbles favored by Siegel, 2005). Because no large trends could be observed by the trial participants in this case (they received no information on

how many others invested or have been investing in the various funds), we can only hint at the actual processes of social influence which took place.

One process which might have occurred is the well-known phenomenon labeled group polarization. This effect has been first observed as a shift towards greater risk taking in groups (then labeled *risky shift*) and studied in an unpublished master's thesis by James Stoner in 1961. Stoner's findings have later been elaborated by Moscovici and Zavalloni (1969) who have also observed a similar phenomenon and confirmed its existence. However, they found that what initially appeared as a tendency towards greater risk taking is in fact a tendency to intensify previous beliefs within a group- thus the phenomenon was labeled *group polarization*. Group polarization may represent yet another commonly known psychological concept which finds its application in investment decision making. In fact, an intensification of previous beliefs in intra-group interaction may contribute to the effects of feedback and in the case of investment decision making, it may be manifested exactly as James Stoner first observed the phenomenon- as a shift towards greater risk taking.

However, what we have observed was in fact an opposite tendency, and hardly a risky shift. It seems that group polarization may have served only to intensify and support a momentum preference. We have been primarily concerned with the effects of social influence having to do with feedback and resulting herd behavior, which impairs decision making quality due to insufficient or lacking consideration of other relevant information. Based on the results of the trial, it cannot be said that a shift towards greater risk has been observed. On the contrary, participants seem to have preferred a strategy of utilizing of what was perceived as bull trends. A majority of the participants didn't choose to follow a contrarian strategy, and were hoping to profit from growth trends. For the layman, indication of a bull trend by recent performance of a stock may be perceived as a sign of a lesser risk.

In any case, a considerable amount of social interaction was observed during the trial. Subjects themselves have indicated in their answers that interaction with their colleagues was a significant factor in their decision making. It can't be confirmed whether such social interaction lead to herding in groups working together. However, regardless of any potential herd behavior, both the objective observation and subjective admission of the role of social interaction in investment decision making during the trial is evidence that social influence indeed played an significant role in decision making by participants- inexperienced investors.

The second effect studied in the trial besides social influence was a preference for momentum strategies. In this sense, both an emphasis on past performance in decision making and a preference for momentum strategies was observed. 18 of the 27 participants were labeled momentum traders according to the definition used for the purpose of the trial (a momentum score or 2 or 3, i.e. two or more instances of preference of bull funds). The results warrant saying that a general tendency towards a momentum strategy was observed, given the fact that a preference for momentum funds was both objective observed and subjectively confirmed by some participants in their written answers.

A momentum strategy is usually defined as buying stocks which have had high returns over the recent past (various authors suggest different time frames, usually between 3 months and 1 year). When an appropriate time frame is considered (not more than 1 year), a momentum strategy has been found to provide fairly mediocre returns (Jegadeesh and Titman, 1993). Since this phenomenon cannot be reconciled with the efficient markets theory, some have claimed that the success of momentum investing lies in the fact that over a period of up to one year stocks tend to overreact to news, which continues to make them overpriced. Momentum investing has been shown to produce good returns when used with the suggested time frame. However, Robert Shiller (2003), who summarized existing research findings on the characteristics of noise traders maintained that a predominant tendency to use mostly momentum strategies along with an overestimation of the significance of past performance of stocks in general is one of the key characteristics of irrational noise traders. Shiller claims that a tendency towards momentum investing is associated with other elements of irrational behavior, such as influence by social feedback. In other words, noise traders will use momentum strategies based on past performance of stocks, regardless of any time frame and other available information.

In the case of the present trial, it could be argued that participants didn't consider any other information on the funds offered because no other information was available. However, the information provided in the trial materials doesn't contain much less than any promotion materials on mutual funds offered by any bank today. Participants received information on the associated level of risk, brief information about the composition of the fund, as well as the recommended duration of investment. Therefore we can conclude that the observed preference for past performance of mutual funds was in line with the findings

of Odean (1999), who claims investors tend to consider past performance of stocks as the singe most important piece of information.

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The research trial described in this chapter has been designed to detect some of the noise trader characteristics among inexperienced investors using a method involving actual investment decision making. In conditions which were designed to be analogous to an actual market environment, participants who had no experience with investing have shown a tendency towards momentum investing, engaged in a great deal of social interaction during the trial and admitted the significance of social influence in their decision making. The trial was performed in the conditions of a university classroom, without a representative sample and experimental testing. However, the participants- students in their mid-20s- represented a group of potential future investors with no experience in the matter. They have shown that they are susceptible to two significant characteristics of irrational trading: belief in the continuation of perceived trends and the overestimation of the ability to make use of them (momentum investing) as well as intensive social feedback.

12. GENERAL DISCUSSION

Since it has been established that stock market traders cannot be assumed to behave according to purely Bayesian principles, stock-market psychology and behavioral finance have provided many insights into quite a few market processes by supplementing purely economic models with psychological findings. In the previous chapters, the objective was to bring some of these findings into light and show how they can be used to explain irrational behavior of individuals investing on the stock market.

The discussion on irrational, or "noise" traders isn't that new and has been approached from different viewpoints. Economists have introduced the concept of the "noise trader" at first to reconcile the reality of the markets with the efficient market theory, claiming that there are two groups (smart and noise), which can even out their actions. Robert Shiller summarizes what has been done in the area of economy to better understand the concept of the noise trader. His text shows however, that the debate is very inconsistent. Shiller can only sum up that economically speaking, the noise trader seems to be associated with momentum investing. Siegel (2005) adds emotional impairment to the lot, but without speaking about noise traders in particular. It is almost as if in this case economy was dealing with a subject that eludes her because it is beyond the domain of quantification and mathematical models. The fact is that people don't behave like rational agents, and that is why aggregate economic models working with this assumption will never be completely accurate. On the contrary, this is a subject that requires descending to the individual level, and focusing on the various characteristics which- economists, like it or not- have been the domain of a quite different discipline. The importance of results that can be achieved by supplementing economic models with psychological findings drawn at the individual level is brilliantly demonstrated by the 2002 economy Nobel, which was awarded to a psychologist, and whose theories we have discussed in previous chapters (Daniel Kahneman).

One of the objectives has been to present a structured discussion on what in fact "irrational" investing refers to, using findings of psychology and behavioral finance. Upon presenting the mosaic of the relevant elements, the author has attempted to create a questionnaire tool, which would incorporate "irrational" investing as defined herein and set a direction in which similar methods can be developed. The questionnaire that was developed also touches upon the subject of motivation and was designed to try to test the

assumption that achievement motivation plays a significant role in drawing people to the stock market. Upon revision based on initial testing of a broader set of items, a fairly solid method testing irrational investing tendencies as well as achievement motivation was developed. Item analysis and reliability shows the method has fairly good parameters, and has set the right course for further improvement. Overall, it has been shown that a questionnaire method based on behavior and characteristics said to be typical for irrational decision making in relation to finances seems to be a constructive step in further research on the topic.

During the analysis of the results yielded by the questionnaire, it seemed that the social influence domain showed a stronger relation to overall irrationality than the other three domains. This would be in line with the theory that price bubbles and other distortions in the market are primarily caused by herd behavior, which is in turn caused primarily by feedback between individuals. During the trial aimed at detecting momentum investing and social influence, the latter certainly emerged as a strong component. However, it can be argued whether individuals during the trial engaged in group discussions and decision making only or primarily because they were involved in an investment task and whether social influence can be so tightly related to investment decision making. But upon reconsideration, this comment is irrelevant. The processes of social influence are at work in all parts of our lives, and investment decision making is one of them. The trial described in chapter 11 only showed that social interaction is a significant factor in situations involving investment decision making. However, it is here that social influence can play a particularly negative role.

The issue of the questionnaire sample also deserves a separate note as neither the initial nor the revised version questionnaire was tested on a sample chosen to be representative for any specific population. However, for the initial stages of the development and further improvement of the method, the chosen sample was considered adequate. The norms and results however need to be interpreted with caution and in relation to the sample used. In addition, no gender differences or the effects of age have been examined, as such an analysis would have limited value on a sample of such nature and size. Analyzing gender and age effects in relation to irrational investment behavior remains a task for further research.

One of the purposes of the development of the questionnaire was to assess the level of irrational tendencies in inexperienced as compared to experienced investors. The only

differentiating factor chosen was having previously invested in stocks. However, dividing the second sample in two groups based on previous investment in stocks hasn't yielded a significant difference in distribution of the rationality or achievement motivation score. The method of differentiation can be questioned, as having invested money in mutual funds doesn't have to constitute any experience and immunity to irrational influences. Four groups have been discussed in previous chapters: "noise traders" and "smart money", as well as novices and experts. One of the objectives has been to venture in the direction of determining, to what extent do the groups of "noise traders" and novices overlap. It is now evident that such a task would require a much clearer definition of the novice and expert, or "inexperienced" and "experienced" individuals. In case of the present research, it is probably more accurate to assume that most, if not all of the sample consisted of what is close to any definition of the novice or naïve investor. According to the results, only mediocre levels of irrationality as defined by the questionnaire have been found, the mean score lying between STEN 5 and 6.

The second focus of the questionnaire was the issue of achievement motivation. Again, to determine the role of achievement motivation in the motivation for stock trading a much clearer definition of the expert and experienced investor would have to be constructed. Achievement motivation is a wide concept that has been examined in various contexts and for the purposes herein, we have worked with the simplified definition in relation to stock trading. The mean level of achievement motivation found in the second sample was at the level of STEN 6. It has been suggested that most active market traders will probably be high achievers . Although some direction for future research of the relationship of stock market trading and achievement motivation has been shown, it is clear that to further examine the connection, a more extensive area has to be devoted to these concepts.

One possible explanation why a significant difference in the distribution of neither the irrationality nor the achievement motivation score has been found is that the sample in fact consisted only of what can be broadly defined as "novices", with no or very little real experts present in the sample. Perhaps in the future, it would prove more constructive to base the differentiation between experts and novices on the frequency and duration of market trading, while making a greater effort to gain access to data from communities of professionals.

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In 2002, Daniel Kahneman was awarded the Nobel Prize for economics for the final destruction of the 200-year old theory of the rational investor. Kahneman has shown that individuals are in fact susceptible to many biases which influence economic behavior and decision making- we have discussed some of these in the previous chapters. In other words, Kahneman showed that individuals are not rational agents and described the irrational tendencies they are prone to. However, Kahneman probably won in close competition to another social observer, who published a very similar theory in the same year. Scott Adams (2003), the author of the famous "Dilbert" comics made a complementary psychological discovery, originally published in "Dilbert and the Way of the Weasel". According to Adams, the two century old history of Wall street is full of weasels (definition: "anyone trying to get away with something"), who distort the balance of the efficient markets model in a way very similar to the irrational individuals of Kahneman.

In his book (Adams, 2003), the author presents his theory which probably gave the Nobel Prize committee much to think about when making their decision on the 2002 economics prize laureate. Adams called it the "United Theory of Everything Financial", and presented it in only 129 words. Here it goes:

1. Make a will
2. Pay off your credit cards
3. Get term life insurance if you have a family to support
4. Fund your 401k *(note: a type of employer-sponsored retirement plan in the United States)* to the maximum
5. Fund your IRA *(individual retirement account)* to the maximum
6. Buy a house if you want to live in a house and can afford it
7. Put six months worth of expenses in a money-market account
8. Take whatever money is left over and invest 70% in a stock index fund and 30% in a bond fund through any discount broker and never touch it until retirement
9. If any of this confuses you, or you have something special going on (retirement, college planning, tax issues), hire a fee-based financial planner, not one who charges a percentage of your portfolio.

Adams first tried publishing the theory by itself, as a one-page book, but all publishing houses refused him. Thankfully, it was finally published in another one of his Dilbert books (Adams, 2003). The Unified Theory of Everything Financial is simple and concise, yet upon closer inspection we see it has in fact some very strong foundations and is composed of advice which is warranted by many experts and the facts of stock price development. Adams claims that these 9 points comprise "everything you ever need to know about personal investing", and what he's saying isn't that far-fetched.

"Anything else you might want to do with your money is worse compared to my one-page formula". Sounds too simplistic, but let's compare the 9-point formula with what has been said about irrational investors. When discussing social influence, we have shown that it may really lead to unwarranted herd behavior, the negative effects of which have been discussed. In addition, we have shown that personal research by individual investors tends to be biased (*confirmation bias*, *illusion of control*), so maybe they had just better keep out of it. It seems that Adams' formula is an idiot-proof guide how to resist the irrational impulses we have been discussing from the beginning. And let's look at it form an economic point of view: in a separate analysis, Siegel (2005) has shown, that not only do index funds on average beat individually managed specialized mutual funds, but that frequent trading leads to inferior returns. In this light, Adams also presents an idiot-proof formula how achieve the highest probability of good return. With a little exaggeration, it seems that the Nobel Prize committee must have had to make a tough choice.

The irrationality of some (if not most) market participants seems to be a fact. It can either be approached from the economic point of view (e.g., Siegel, 2005) by showing how ignoring fundamental information (such as base rates, or fundamental information about shares) leads to inferior returns in the long-run. It can however also be approached at the individual level, by describing the motives and tendencies which lead individuals to such decisions and actions which are considered "irrational". The former is the domain of economists; the latter is the domain of behavioral finance and the findings of researchers like Kahneman and others. And only by combining these two complementary approaches can we get the full picture of what is going on.

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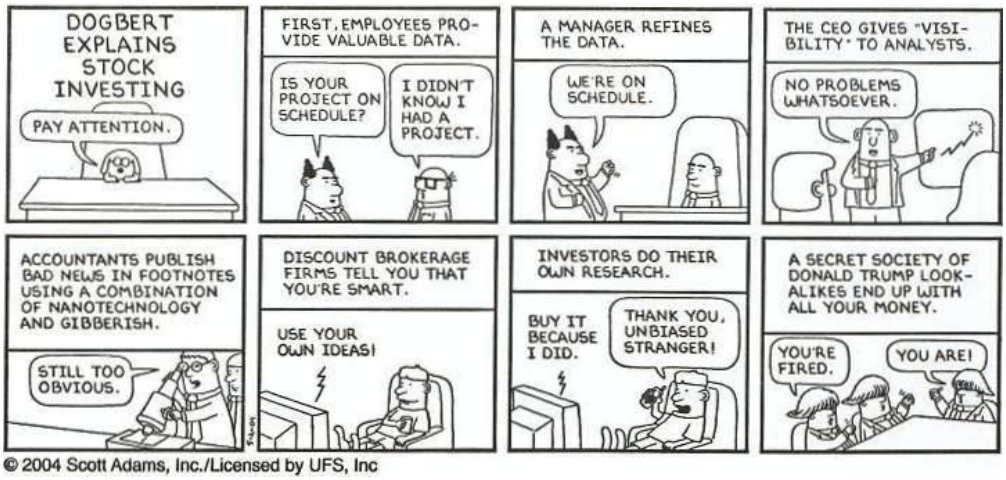

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APPENDIX A

INVESTOR IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, Initial version, original (Slovak)

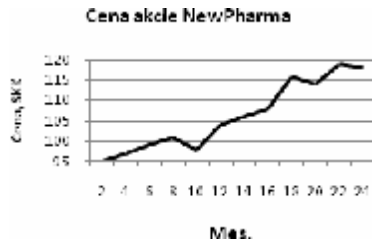
Dotazník finančných preferencií

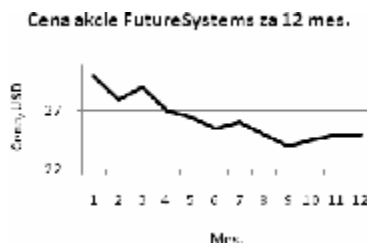
Cieľom tohto dotazníku je zisťovať prevládajúce preferencie v oblasti plánovania osobných financií, najmä investovania do v súčasnosti u nás rozšírených podielových fondov. Dotazník obsahuje 56 položiek- výrokov. Pri každom výroku prosím zaznačte „Áno“, ak s ním súhlasíte, alebo Vás vystihuje, prípadne „Nie“, ak s výrokom nesúhlasíte, alebo Vás nevystihuje. V prípade, ak sa neviete rozhodnúť, môžete zaznačiť možnosť „Neviem“.

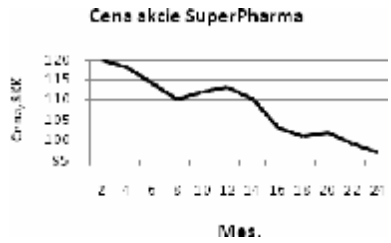
Pohlavie: ☐ M ☐ Ž

Vek:

1. Aby bol človek v živote úspešný, musí sa o to pričiniť hlavne vlastnými schopnosťami a tvrdou prácou.	☐ Áno	☐ Neviem	☐ Nie
2. Po dosiahnutí pracovného úspechu väčšinou potrebujem krátku chvíľu na to, aby som si „oddýchol/la“.	☐ Áno	☐ Neviem	☐ Nie
3. Ľudia, ktorí bývajú úspešní na finančnej burze nikdy nie sú tí, ktorí idú na vlastnú päsť proti väčšinovému prúdu.	☐ Áno	☐ Neviem	☐ Nie
4. Investovať do akcií, alebo podielových fondov, ktorých hodnota v posledných mesiacoch stále klesala, sa nikdy nevypláca.	☐ Áno	☐ Neviem	☐ Nie
5. Finančné trhy poskytujú príležitosť, ako môže ktokoľvek rýchlo a jednoducho zbohatnúť.	☐ Áno	☐ Neviem	☐ Nie
6. Len veľmi zriedka sa mi stane, že by som si kúpil niečo, čo som predtým neplánoval.	☐ Áno	☐ Neviem	☐ Nie
7. Rozhodovanie, ako investovať časť svojich úspor by pre mňa neznamenalo výrazne zvýšené napätie.	☐ Áno	☐ Neviem	☐ Nie
8. Ak sa človek rozhodne investovať peniaze na dlhšie obdobie, celkom postačuje ak bude vývoj svojej investície kontrolovať raz za pár týždňov.	☐ Áno	☐ Neviem	☐ Nie
9. Dobrý známy, ktorý sa pohybuje vo finančníctve je spoľahlivejším zdrojom informácií ako verejné spravodajstvo z finančných trhov.	☐ Áno	☐ Neviem	☐ Nie
10. Najväčší podiel na úspechu máva väčšinou šťastie.	☐ Áno	☐ Neviem	☐ Nie
11. Priťahujú ma veľmi veľké výzvy.	☐ Áno	☐ Neviem	☐ Nie
12. Vo všeobecnosti platí, že je výhodné investovať do takých cenných papierov, ktorých hodnota v poslednej dobe stále rastie.	☐ Áno	☐ Neviem	☐ Nie
13. Skutočne bezpečnou investíciou bývajú len najrozšírenejšie podielové fondy známych a renomovaných bánk a byť ziskový na iných podielových fondoch je skôr záležitosťou šťastia.	☐ Áno	☐ Neviem	☐ Nie

14. Vďaka internetu má človek prístup k spoľahlivejším a aktuálnejším informáciám, ako by mu poskytol finančný poradca.	☐ Áno	☐ Neviem	☐ Nie
15. Ak je človek, ktorý sa rozhodne investovať schopný znášať aj dlhé obdobie poklesu hodnoty investície, je len otázkou času, kedy na investícii zarobí.	☐ Áno	☐ Neviem	☐ Nie
16. Pri výbere podielového fondu sú vysoké výnosy fondu v minulosti dôležitejším faktorom ako výška vstupných poplatkov.	☐ Áno	☐ Neviem	☐ Nie
17. Investovanie peňazí je skoro ako ďalšie zamestnanie- človek musí pozorne sledovať vývoj svojej investície a dobre poznať situáciu na finančných trhoch.	☐ Áno	☐ Neviem	☐ Nie
18. Ak v niečom nie som taký úspešný, ako by som chcel, mám väčšinou dosť energie na to, aby som sa zlepšil.	☐ Áno	☐ Neviem	☐ Nie
19. Myslím, že pracovné povýšenie by pre mňa predstavovalo niečo ako „injekciu“ motivácie k ďalšej práci.	☐ Áno	☐ Neviem	☐ Nie
20. Graf zobrazuje vývoj ceny akcie spoločnosti NewPharma za posledné dva roky. Investovať do akcií NewPharma sa v súčasnosti skôr oplatí. 	☐ Áno	☐ Neviem	☐ Nie
21. Finančné spravodajstvo: „ *Dôveru investorov k spoločnosti Comp123 posilňujú zrejme aj nepotvrdené informácie o možnom prevzatí veľkým americkým koncernom, ktorý by dokázal zabezpečiť ďalšie rozširovanie jej aktivít na americké trhy...“* Podobné informácie nemajú pri rozhodovaní o nakúpe akcií uvedenej spoločnosti vysoký význam.	☐ Áno	☐ Neviem	☐ Nie
22. Novo založené podielové fondy sú vždy rizikovejšie ako tie, ktoré už fungujú dlhší čas a prinášajú výnosy.	☐ Áno	☐ Neviem	☐ Nie
23. Som človek, ktorý skôr nemá sklon k impulzívnym rozhodnutiam.	☐ Áno	☐ Neviem	☐ Nie
24. Pozorné sledovanie „neoficiálnych“ a kuloárnych správ z finančných trhov môže priniesť veľmi dôležité informácie, o ktorých by sa človek inak nedozvedel.	☐ Áno	☐ Neviem	☐ Nie
25. Peter investoval sumu rovnú svojmu mesačnému príjmu do podielového fondu Európskych akcií. Vývoj ceny a aktuálnu hodnotu by mal kontrolovať niekoľko krát do týždňa.	☐ Áno	☐ Neviem	☐ Nie
26. Ak hodnota podielového fondu aj dlhodobo klesá, nemusí to nutne znamenať, že v budúcnosti bude prinášať nižšie výnosy ako iné, rastúce fondy.	☐ Áno	☐ Neviem	☐ Nie
27. Cítim, že úspech v práci (ukončenie projektu, splnenie záväzkov na daný mesiac, atď.) mi vždy dodá	☐ Áno	☐ Neviem	☐ Nie

energiu.			
28. Som pyšný/á na svoje schopnosti.	☐ Áno	☐ Neviem	☐ Nie
29. O najlepšej príležitosti ako zhodnotiť peniaze sa skôr dozviem od známeho, ktorý úspešne investoval ako z verejne prístupných zdrojov- laik sa k takým informáciám sám nedostane.	☐ Áno	☐ Neviem	☐ Nie
30. Pri výbere podielového fondu je dobré meno správcovskej spoločnosti dôležitejšie ako konkrétne zloženie daného fondu.	☐ Áno	☐ Neviem	☐ Nie
31. Hodnota Petrovho fondu Európskych akcií stúpla za pol roka o 18% a bolo by stratenou príležitosťou, ak by teraz do fondu neinvestoval ďalšie peniaze.	☐ Áno	☐ Neviem	☐ Nie
32. Hodnota iného fondu Amerických akcií, do ktorého Peter investoval klesla za to isté obdobie pol roka o 22%. Vložiť do tohto fondu ďalšie peniaze by teda bolo bláznovstvom.	☐ Áno	☐ Neviem	☐ Nie
33. Najlepšie informácie o akciách, podielových fondoch a vývoji trhov si nájdem sám/sama na internete, pretože mám tak prístup k väčšiemu množstvu informácií, ako mi je schopný poskytnúť jeden odborník.	☐ Áno	☐ Neviem	☐ Nie
34. Renomovaná svetová investičná spoločnosť prichádza s podielovým fondom rizikových akcií, ktorý ponúka možnosť mimoriadne vysokého výnosu. Pri rozhodovaní o investícií do tohto fondu by ma zaujímalo, koľko osôb už do fondu investovalo.	☐ Áno	☐ Neviem	☐ Nie
35. Finančné spravodajstvo: *„... a akcie Francúzskej spoločnosti CBC Energy majú za sebou už piaty týždeň úspešného obchodovania, keď si dnes opäť pripísali zisk 1.14% a ukončili obchodovanie na novej rekordnej úrovni...“* Dá sa povedať, že akcie CBC Energy momentálne poskytujú dobrú príležitosť na ďalší výnos.	☐ Áno	☐ Neviem	☐ Nie
36. Po neúspechu sa nedokážem rýchlo zmobilizovať do ďalšej aktivity.	☐ Áno	☐ Neviem	☐ Nie
37. Úspech sa v živote dostaví väčšinou vtedy, keď ho človek najmenej očakáva.	☐ Áno	☐ Neviem	☐ Nie
38. V práci si najradšej vyberám skôr nenáročné projekty a úlohy.	☐ Áno	☐ Neviem	☐ Nie
39. Každý neúspech väčšinou znášam ťažko a chvíľu mi trvá, kým sa z neho pozbieram.	☐ Áno	☐ Neviem	☐ Nie
40. Zverejňovaným negatívnym prognózam o vývoji finančných trhov netreba venovať príliš veľkú pozornosť.	☐ Áno	☐ Neviem	☐ Nie
41. Akcie spoločnosti FutureSystems, ktoré boli zakúpené pred rokom za cenu 30 USD/ks, by bolo na základe vývoja ceny v súčasnosti najlepšie predať. 	☐ Áno	☐ Neviem	☐ Nie

42. Podielové fondy, ktoré ponúkajú známe a veľké banky a finančné inštitúcie sú vo všeobecnosti výnosné a málo rizikové.	☐ Áno	☐ Neviem	☐ Nie
43. Informácie, ktoré mi poskytne seriózny finančný poradca (napríklad v banke) budú stačiť na to, aby som sa vedel/a správne rozhodnúť kam investovať.	☐ Áno	☐ Neviem	☐ Nie
44. Ako náhle sa mi v živote podarí splniť predsavzatý cieľ, musím si hneď hľadať ďalší.	☐ Áno	☐ Neviem	☐ Nie
45. To, čo som v živote dosiahol/la, bolo vďaka vlastnému úsiliu a šťastie v tom nehralo veľkú úlohu.	☐ Áno	☐ Neviem	☐ Nie
46. Po zložení ťažkej skúšky si potrebujem väčšinou odpočinúť a nabrať ďalšie sily.	☐ Áno	☐ Neviem	☐ Nie
47. Ak do podielového fondu investovalo v minulosti už veľmi veľa ľudí, obvykle to znamená, že stabilne prináša spoľahlivý výnos.	☐ Áno	☐ Neviem	☐ Nie
48. Ak človek pozorne sleduje neoficiálne informácie a odhady predpokladaného vývoja finančných trhov, nepremeškátak dôležité informácie, ktoré na širokú verejnosť inak nepreniknú.	☐ Áno	☐ Neviem	☐ Nie
49. Akcie spoločnosti SuperPharma, ktorých cena sa za posledné dva roky vyvíjala tak ako to ukazuje graf, by pravdepodobne neboli dobrou investíciou.  	☐ Áno	☐ Neviem	☐ Nie
50. Ak sa mi niečo v živote nepodarí, je pre mňa ťažké znovu sa zabrať do práce.	☐ Áno	☐ Neviem	☐ Nie
51. Každý je strojcom vlastného šťastia.	☐ Áno	☐ Neviem	☐ Nie
52. Akcie, ktorých hodnota začína klesať je väčšinou lepšie rýchlo predať, ako dlhšiu dobu čakať na zlepšenie.	☐ Áno	☐ Neviem	☐ Nie
53. Každý sa môže stať úspešným. Je to len otázkou toho byť v správny čas na správnom mieste.	☐ Áno	☐ Neviem	☐ Nie
54. Vyhľadávanie informácií od rôznych poradcov a z rôznych zdrojov na internete mi poskytne najlepší prehľad o tom, pre ktorú investíciu sa rozhodnúť.	☐ Áno	☐ Neviem	☐ Nie
55. Ak hodnota akcií alebo podielového fondu klesá, je vždy chybou investíciu okamžite predať bez toho, aby človek počkal na ďalší vývoj.	☐ Áno	☐ Neviem	☐ Nie
56. Z neúspechu pri veľmi náročnej úlohe by som si príliš nelámal hlavu.	☐ Áno	☐ Neviem	☐ Nie

INVESTOR IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, initial version, English
(Note: working translation from Slovak original; English version not tested)

Financial preferences questionnaire

The aim of this questionnaire is to examine the dominant preferences in personal finance planning, especially investing in mutual funds, which have presently become very popular. The questionnaire consists of 56 items- statements. For each statement, please indicate "Yes", if you agree with the statement or if it reflects your views, or indicate "No" if you don't agree with the statement, or if it doesn't reflect your views. You can also indicate "Don't know" in case you can't decide.

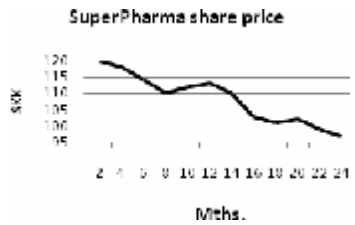
Sex: ☐ M ☐ F

Age:

1. One can only rely on own abilities and hard work to ever be successful in life.	☐ Yes	☐ Don't know	☐ No
2. After reaching a work-related target, I usually need a short while to unwind.	☐ Yes	☐ Don't know	☐ No
3. The people who successful on the stock market are never those, who venture alone against the main stream.	☐ Yes	☐ Don't know	☐ No
4. Investing in stocks or mutual funds, the value of which has been decreasing in the past couple of months, is never a good bet.	☐ Yes	☐ Don't know	☐ No
5. Financial markets are an opportunity for anyone to make fast and easy money.	☐ Yes	☐ Don't know	☐ No
6. I usually don't make any unplanned purchases.	☐ Yes	☐ Don't know	☐ No
7. Planning how to invest a portion of my savings would not be a very stressful situation for me.	☐ Yes	☐ Don't know	☐ No
8. If a person decides on investment for an extended period of time, it is completely sufficient to check how the investment is doing once every few weeks.	☐ Yes	☐ Don't know	☐ No
9. A close acquaintance who works in the financial business will be a better source of information than public newscasts from the financial markets..	☐ Yes	☐ Don't know	☐ No
10. Luck is the most important key to success.	☐ Yes	☐ Don't know	☐ No
11. I am attracted by tough challenges.	☐ Yes	☐ Don't know	☐ No
12. In general, it's better to invest in stocks, the price of which has recently been on the rise.	☐ Yes	☐ Don't know	☐ No
13. The mutual funds of well-known and reputable banks are usually the only really safe investment; making money on other funds is more a matter of being lucky.	☐ Yes	☐ Don't know	☐ No
14. The internet provides access to more reliable and up-to-date information than a personal financial advisor.	☐ Yes	☐ Don't know	☐ No
15. If a person who has decided to invest money is capable of tolerating even an extended period of decrease in value, it is only the question of time when he or she will be rewarded with returns.	☐ Yes	☐ Don't know	☐ No

16. When choosing a mutual fund, it is more important to look at development of its value in the past than at the associated fees.	☐ Yes	☐ Don't know	☐ No
17. Investing money is almost like having a second job: you have to closely watch the development of your investment and be acquainted with the situation on financial markets.	☐ Yes	☐ Don't know	☐ No
18. If I'm not as successful as I'd like to be at something, I usually have enough energy to get better.	☐ Yes	☐ Don't know	☐ No
19. I think that a promotion at work would be the same as an "injection" of motivation for me.	☐ Yes	☐ Don't know	☐ No
20. The graph shows the development of the price per share of NewPharma in the past two years. The current good recommendation would be to buy.  	☐ Yes	☐ Don't know	☐ No
21. Business news: *"Investors' trust of Comp123 also seems to be enhanced by rumors on a possible takeover by a large US corporation, which could enable the expansion of the company's activities on American markets…"* Similar information doesn't play a significant role in the deciding whether to buy Comp123's shares.	☐ Yes	☐ Don't know	☐ No
22. Newly established mutual funds are always riskier than those, which have been around and providing returns for some time.	☐ Yes	☐ Don't know	☐ No
23. I usually don't make impulsive decisions.	☐ Yes	☐ Don't know	☐ No
24. Closely following "unofficial" information and rumors from the financial markets can be the source of very important information, which wouldn't reach me otherwise.	☐ Yes	☐ Don't know	☐ No
25. Peter has invested a sum equal to his monthly income in a mutual fund of European company shares. He should be checking the value of his investment a couple of times per week.	☐ Yes	☐ Don't know	☐ No
26. If the value of a mutual fund keeps decreasing, even for an extended period of time, it doesn't necessarily mean that the fund will provide lower returns in the future than other funds, currently on the rise.	☐ Yes	☐ Don't know	☐ No
27. I feel that a success at work (finishing a project, completing this month's assignments, etc.) always boosts my energy.	☐ Yes	☐ Don't know	☐ No
28. I'm proud of my abilities.	☐ Yes	☐ Don't know	☐ No
29. A friend who has been a successful investor will give me better advice on how to get good returns than I could get from public sources- information like that just isn't available to anybody.	☐ Yes	☐ Don't know	☐ No

30. When selecting a mutual fund, a reputable fund managing company is more important than the actual composition of the fund.	☐ Yes	☐ Don't know	☐ No
31. The value of Peter's fund of European shares increased by 18% in the past 6 months and it would be a lost opportunity if he didn't invest more in the same fund now.	☐ Yes	☐ Don't know	☐ No
32. The value of different mutual fund of North American shares, which Peter has invested in, fell by 22% in the same period of six months. Investing more money in this fund would be crazy.	☐ Yes	☐ Don't know	☐ No
33. I can find the best information on shares, mutual funds and financial markets online and by myself, because that way I can access more information than one expert could provide.	☐ Yes	☐ Don't know	☐ No
34. A world-renown investment firm has started offering a new mutual fund composed of risky shares, which offers the possibility of very high returns. When deciding whether to invest in the fund, I would also like to know how many people have invested in it so far.	☐ Yes	☐ Don't know	☐ No
35. Financial news: *"… and the shares of the French company CBC Energy have had the fifth consecutive week of successful trading, adding another 1.14% to their value today and finishing on a new record high…"* Investing in shares of CBC Energy currently represents a good opportunity for more returns.	☐ Yes	☐ Don't know	☐ No
36. After a failure, I can't quickly find the energy to start up something else.	☐ Yes	☐ Don't know	☐ No
37. The moment success usually comes is the moment you least expect it.	☐ Yes	☐ Don't know	☐ No
38. I usually prefer less demanding projects and tasks at work.	☐ Yes	☐ Don't know	☐ No
39. I find it hard when I fail to reach a goal, and I always need some time to gather up my energy again.	☐ Yes	☐ Don't know	☐ No
40. It's generally not necessary to pay much attention to various negative predictions concerning market developments.	☐ Yes	☐ Don't know	☐ No
41. Shares of FutureSystems, which were purchased one year ago for $30 per share, would presently best be sold, based on the shown development of the price. 	☐ Yes	☐ Don't know	☐ No
42. The mutual funds offered by large and well-known banks and financial institutions provide generally good returns and aren't very risky.	☐ Yes	☐ Don't know	☐ No

43. Information form a trustworthy financial advisor (for example, at your bank) will be sufficient for me to be able to decide how to invest my money.	☐ Yes	☐ Don't know	☐ No
44. As soon as I reach a target I set for myself, I have to start looking for another one.	☐ Yes	☐ Don't know	☐ No
45. Everything I have accomplished in life, was thanks to my own effort and luck had little to do with it.	☐ Yes	☐ Don't know	☐ No
46. After completing a difficult exam, I would need some time to relax and muster my energy.	☐ Yes	☐ Don't know	☐ No
47. If a large number of people have invested in a mutual fund in the past, it usually means that it steadily provides good returns.	☐ Yes	☐ Don't know	☐ No
48. If a person closely follows unofficial rumors and predictions on the development of financial markets, they won't miss any important information, which doesn't make it to the mainstream media.	☐ Yes	☐ Don't know	☐ No
49. The shares of SuperPharma (price over the past two years shown on graph below) probably wouldn't be a good investment right now. 	☐ Yes	☐ Don't know	☐ No
50. If something doesn't work out like I planned, it's difficult for me to force myself to get back to work.	☐ Yes	☐ Don't know	☐ No
51. Everybody makes their own luck.	☐ Yes	☐ Don't know	☐ No
52. It's better to sell shares with decreasing value right away, than to wait for a long time if the trend reverses.	☐ Yes	☐ Don't know	☐ No
53. Anybody can be successful. It's only a question of being at the right place at the right time.	☐ Yes	☐ Don't know	☐ No
54. Looking up recommendations from various advisors and different sources on the internet will provide me with best information on where to invest.	☐ Yes	☐ Don't know	☐ No
55. If the value of a share of mutual fund is decreasing, it is always a mistake to sell the investment immediately without waiting around for a while.	☐ Yes	☐ Don't know	☐ No
56. Failure at a very difficult assignment would not make feel too frustrated.	☐ Yes	☐ Don't know	☐ No

APPENDIX B

INVESTOR IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, Initial version, scoring

Table indicates items corresponding to four components of irrationality score (emotional attachment, illusion of control, social influence, momentum investing) and single component of achievement motivation score. The answer given next to each item number corresponds to a positive answer (i.e. indicative of emotional attachment, social influence, or a high level of achievement motivation), each scored 1 point. Negative answers and "Don't know" answers are scored 0.

Example. Answer "No" in item no. 6 indicates an emotional attachment; answer "Yes" in item no. 1 indicates high achievement motivation.

Irrationality score range: 0- 37 points
Achievement motivation score range: 0- 19 points

Emotional attachment	*Illusion of control*	*Social infl.*	*Momentum investing*	*Achievement motivation*
6-no, 7-no, 15-yes, 23-no, 30-yes, 41-no, 42-yes, 52-no, 55-yes,	8- no, 14- yes, 16-yes, 17-yes, 24-yes, 25-yes, 33- yes, 40-yes, 43-no, 54-yes,	3-yes, 5-yes, 9-yes, 13-yes, 21-no, 22-yes, 29-yes, 34-yes, 47-yes, 48-yes,	4-no, 12-yes, 20-yes, 26-no, 31-yes, 32-yes, 35-yes, 49-yes	1-yes, 2-yes, 10-no, 11-no, 18-yes, 19-no, 27-no, 28- yes, 36-yes, 37-no, 38-no, 39-no, 44-no, 45-yes, 46-yes, 50-no, 51-yes, 53- no, 56-no

APPENDIX C

FREQUENCY TABLES, ITEM ANALYSIS; IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, INITIAL VERSION BEFORE REVISION

N= 36

Table 6: Irrationality score, table of results.

Raw score	Frequency	Cumulative percentage	Cumulative frequency	Z-score	STEN
< 4	0	0	0,00	-4	1
5	1	2,78	0,03	-1,88	2
10	1	5,56	0,06	-1,56	2
11	1	8,34	0,08	-1,40	3
12	2	13,90	0,14	-1,08	3
14	1	16,68	0,17	-0,95	4
15	2	22,24	0,22	-0,77	4
16	1	25,02	0,25	-0,67	4
17	2	30,58	0,31	-0,50	5
18	4	41,69	0,42	-0,20	5
19	3	50,02	0,50	0	6
20	6	66,69	0,67	0,44	6
21	3	75,02	0,75	0,67	7
22	5	88,91	0,89	1,22	8
23	2	94.47	0,95	1,64	9
24	1	97,25	0,97	1,88	9
28	1	100,00	1,00	4	10
> 29	0	100,00	1,00	4	10

N=36

Table 7.: Achievement motivation score, table of results.

Raw score	Frequency	Cumulative percentage	Cumulative frequency	Z-score	STEN
< 3	0	0	0	-4	1
4	1	2,78	0,03	-1,88	2
5	2	8,34	0,08	-1,40	2
7	4	19,45	0,19	-0,88	4
8	3	27,78	0,28	-0,58	4
9	6	44,45	0,44	-0,15	5
11	7	63,89	0,64	0,35	6
12	3	72,23	0,72	0,58	7
13	6	88,91	0,89	1,22	8
14	3	97,22	0,97	1,88	9
15	1	100,00	1,00	4	10
>16	0	100,00	1,00	4	10

Table 8: Emotional attachment component items. Correlation with component score, irrationality score; item difficulty (no. scored / no. total answers).

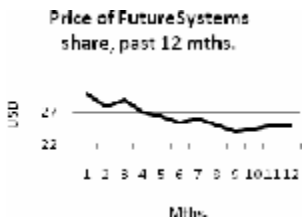
Item no.	*Wording (working English translation)*	*Correlation with raw score*		*Item Difficulty*
		Emotional attachment	*Irrationality total*	
6	I usually don't make any unplanned purchases.	0,084	0,276	0,39
7	Planning how to invest a portion of my savings would not be a very stressful situation for me.	0,178	0,288	0,44
15	If a person who has decided to invest money is capable of tolerating even an extended period of decrease in value, it is only the question of time when he or she will be rewarded with returns.	0,058	0,011	0,69
23	I usually don't make impulsive decisions.	0,566*	0,433*	0,58
30	When selecting a mutual fund, a reputable fund managing company is more important that the actual composition of the fund.	0,233	0,328	0,61
41	Shares of FutureSystems, which were purchased one year ago for $30 per share, would presently best be sold, based on the shown development of the price. 	-0,066	0,016	0,19
42	The mutual funds offered by large and well-known banks and financial institutions provide generally good returns and aren't very risky.	0,734**	0,560*	0,56
52	It's better to sell shares with decreasing value right away, than to wait for a long time if the trend reverses.	0,655**	0,653**	0,72
55	If the value of a share of mutual fund is decreasing, it is always a mistake to sell the investment immediately without waiting around for a while.	0,733**	0,508*	0,47

Table 9: Illusion of control component items. Correlation with component score, irrationality score; item difficulty (no. scored / no. total answers).

Item no.	*Wording (working English translation)*	*Correlation with raw score*		*Item Difficulty*
		Illusion of control	*Irrationality total*	
8	If a person decides on investment for an extended period of time, it is completely sufficient to check how the investment is doing once every few weeks.	0,491*	0,390	0,44
14	The internet provides access to more reliable and up-to-date information than could be personally offered by a financial advisor.	0,602*	0,531*	0,56
16	When choosing a mutual fund, it is more important to look at development of its value in the past than at the associated fees.	0,740**	0,826**	0,72
17	Investing money is almost like having a second job: you have to closely watch the development of your investment and be acquainted with the situation on financial markets.	0,487*	0,210	0,61
24	Closely following "unofficial" information and rumors from the financial markets can be the source of important information, which wouldn't reach me otherwise.	0,240	0,040	0,75

25	Peter has invested a sum equal to his monthly income in a mutual fund of European company shares. He should be checking the value of his investment a couple of times per week.	0,491*	0,512*	0,67
33	I can find the best information on shares, mutual funds and financial markets online and by myself, because that way I can access more information than one expert could provide.	0,833**	0,726**	0,44
40	It's generally not necessary to pay much attention to various negative predictions concerning market developments.	-0,106	-0,278	0,30
43	Information form a trustworthy financial advisor (for example, at your bank) will be sufficient for me to be able to decide how to invest my money.	0,258	0,178	0,33
54	Looking up recommendations from various advisors and different sources on the internet will provide me with best information on where to invest.	0,410	0,150	0,78

Table 10: Social influence component items. Correlation with component score, irrationality score; item difficulty (no. scored / no. total answers).

Item no.	*Wording (working English translation)*	*Correlation with raw score*		*Item Difficulty*
		Social influence	*Irrationality total*	
3	The people who successful on the stock market are never those, who venture alone against the main stream.	0,020	-0,120	0,44
5	Financial markets are an opportunity for anyone to make fast and easy money.	0,340	0,050	0,67
9	A close acquaintance who works in the financial business will be a better source of information than public newscasts from the financial markets..	0,833**	0,626**	0,56
13	The mutual funds of well-known and reputable banks are usually the only really safe investment; making money on other funds is more a matter of being lucky.	0,643**	0,733**	0,58
21	Business news: "*Investors' trust of Comp123 also seems to be enhanced by rumors on a possible takeover by a large US corporation, which could enable the expansion of the company's activities on American markets…*" Similar information doesn't play a significant role in the deciding whether to buy Comp123's shares.	0,210	0,015	0,22
22	Newly established mutual funds are always riskier than those, which have been around and providing returns for some time.	0,636**	0,526*	0,56
29	A friend who has been a successful investor will give me better advice on how to get good returns than I could get from public sources- information like that just isn't available to anybody.	0,550*	0,654**	0,74
34	A world-renown investment firm has started offering a new mutual fund composed of risky shares, which offers the possibility of very high returns. When deciding whether to invest in the fund, I would also like to know how many people have invested in it so far.	0,816**	0,783**	0,64
47	If a large number of people have invested in a mutual fund in the past, it usually means that it steadily provides good returns.	0,656**	0,740**	0,58
48	If a person closely follows unofficial rumors and predictions on the development of financial markets, they won't miss any important information, which doesn't make it to the mainstream media.	-0,230	0,018	0,33

Table 11: Momentum investing component items. Correlation with component score, irrationality score; item difficulty (no. scored / no. total answers).

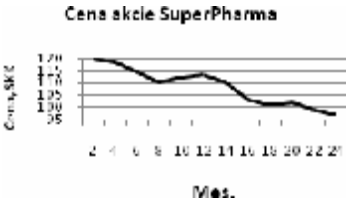
Item no.	*Wording*	*Correlation with raw score*		*Item Difficulty*
		Momentum investing	*Irrationality total*	
4	Investing in stocks or mutual funds, the value of which has been decreasing in the past couple of months, is never a good bet.	0,450	0,230	0,68
12	In general, it's better to invest in stocks, the price of which has recently been on the rise.	0,351	0,452	0,44
20	The graph shows the development of the price per share of NewPharma in the past two years. The current good recommendation would be to buy. 	0,682**	0,530*	0,58
26	If the value of a mutual fund keeps decreasing, even for an extended period of time, it doesn't necessarily mean that the fund will provide lower returns in the future than other funds, currently on the rise.	0,150	0,031	0,28
31	The value of Peter's fund of European shares increased by 18% in the past 6 months and it would be a lost opportunity if he didn't invest more in the same fund now.	0,487*	0,392	0,61
32	The value of different mutual fund of North American shares, which Peter has invested in, fell by 22% in the same period of six months. Investing more money in this fund would be crazy.	0,435	0,573*	0,64
35	Financial news: "*… and the shares of the French company CBC Energy have had the fifth consecutive week of successful trading, adding another 1.14% to their value today and finishing on a new record high…*" Investing in shares of CBC Energy currently represents a good opportunity for more returns.	0,010	-0,205	0,74
49	The shares of SuperPharma (price over the past two years shown on graph below) probably wouldn't be a good investment right now. 	0,750**	0,643**	0,61

Table 12: Achievement motivation component items. Correlation with achievement motivation score; item difficulty (no. scored / no. total answers).

Item no.	*Wording*	*Correlation with achievement motivation raw score*	*Item Difficulty*
1	One can only rely on own abilities and hard work to ever be successful in life.	0,240	0,39
2	After reaching a work-related target, I usually need a short while to unwind.	0,313	0,74
10	Luck is the most important key to success.	-0,084	0,19
11	I am attracted by tough challenges.	0,433	0,39
18	If I'm not as successful as I'd like to be at something, I usually have enough energy to get better.	0,310	0,33
19	I think that a promotion at work would be the same as an "injection" of motivation for me.	0,190	0,39
27	I feel that a success at work (finishing a project, completing this month's assignments, etc.) always boosts my energy.	0,478*	0,56
28	I'm proud of my abilities.	0,788**	0,61
36	After any failure, I can quickly find the energy to start up something else.	0,665**	0,39
37	The moment success usually comes is the moment you least expect it.	-0,099	0,44
38	I usually prefer less demanding projects and tasks at work.	0,589*	0,67
39	I find it hard when I fail to reach a goal, and I always need some time to gather up my energy again.	0,074	0,28
44	As soon as I reach a target I set for myself, I have to start looking for another one.	0,653**	0,44
45	Everything I have accomplished in life, was thanks to my own effort and luck had little to do with it.	0,050	0,33
46	After completing a difficult exam, I would need some time to relax and muster my energy.	-0,310	0,81
50	If something doesn't work out like I planned, it's difficult for me to force myself to get back to work.	0,799**	0,61
51	Everybody makes their own luck.	-0,215	0,23
53	Anybody can be successful. It's only a question of being at the right place at the right time.	0,498*	0,44
56	Failure at a very difficult assignment would not make feel too frustrated.	0,510*	0,42

All tables:
* significance 0,95
** significance 0,99

APPENDIX D

INVESTOR IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, Revised version, original (Slovak)

Dotazník finančných preferencií

Cieľom tohto dotazníku je zisťovať prevládajúce preferencie v oblasti plánovania osobných financií, najmä investovania do v súčasnosti u nás rozšírených podielových fondov. Dotazník obsahuje 28 položiek- výrokov. Pri každom výroku prosím zaznačte „Áno“, ak s ním súhlasíte, alebo Vás vystihuje, „Nie“, ak s výrokom nesúhlasíte, alebo Vás nevystihuje, alebo “Neviem”, ak sa neviete rozhodnúť, alebo neviete odpovedať. Predtým, než označíte možnosť “Neviem” si však prosím pozorne prečítajte daný výrok ešte raz a pokúste sa túto možnosť využívať čo najmenej.

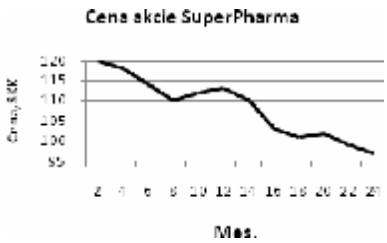
Na začiatku prosím uveďte nasledujúce údaje:

Pohlavie: ☐ M ☐ Ž

Vek:

1. Dobrý známy, ktorý sa pohybuje vo finančníctve je spoľahlivejším zdrojom informácií ako verejné spravodajstvo z finančných trhov.	☐ Áno	☐ Neviem	☐ Nie
2. Vo všeobecnosti platí, že je výhodné investovať do takých podielových fondov, ktorých hodnota v poslednej dobe stále rastie.	☐ Áno	☐ Neviem	☐ Nie
3. Skutočne bezpečnou investíciou bývajú len najrozšírenejšie podielové fondy známych a renomovaných bánk a byť ziskový na iných podielových fondoch je skôr záležitosťou šťastia.	☐ Áno	☐ Neviem	☐ Nie
4. Vďaka internetu má človek prístup k spoľahlivejším a aktuálnejším informáciám, ako by mu poskytol finančný poradca.	☐ Áno	☐ Neviem	☐ Nie
5. Pri výbere do ktorého fondu investovať je dôležitejšie pozerať sa na jeho dobré výsledky v minulosti, ako na výšku vstupných a ďalších poplatkov.	☐ Áno	☐ Neviem	☐ Nie
6. Investovanie peňazí je skoro ako ďalšie zamestnanie- človek musí pozorne sledovať vývoj svojej investície a dobre poznať situáciu na finančných trhoch.	☐ Áno	☐ Neviem	☐ Nie
7. Graf zobrazuje vývoj ceny akcie spoločnosti NewPharma za posledné dva roky. Investovať do akcií NewPharma sa v súčasnosti skôr oplatí. 	☐ Áno	☐ Neviem	☐ Nie

8. Novo založené podielové fondy sú vždy rizikovejšie ako tie, ktoré už fungujú dlhší čas a prinášajú výnosy.	☐ Áno	☐ Neviem	☐ Nie
9. Som človek, ktorý skôr nemá sklon k impulzívnym rozhodnutiam.	☐ Áno	☐ Neviem	☐ Nie
10. Peter investoval sumu rovnú svojmu mesačnému príjmu do podielového fondu Európskych akcií. O vývoj svojej investície by sa mal zaujímať niekoľko krát do týždňa.	☐ Áno	☐ Neviem	☐ Nie
11. Cítim, že úspech v práci (ukončenie projektu, splnenie záväzkov na daný mesiac, atď.) mi vždy dodá energiu.	☐ Áno	☐ Neviem	☐ Nie
12. Som pyšný/á na svoje schopnosti.	☐ Áno	☐ Neviem	☐ Nie
13. Ak hodnota akcií alebo podielového fondu klesá, nie je dobré investíciu okamžite predať bez toho, aby človek počkal na ďalší vývoj.	☐ Áno	☐ Neviem	☐ Nie
14. Hodnota Petrovho fondu Európskych akcií stúpla za pol roka o 18% a bolo by stratenou príležitosťou, ak by teraz do fondu neinvestoval ďalšie peniaze.	☐ Áno	☐ Neviem	☐ Nie
15. Hodnota iného fondu Amerických akcií, do ktorého Peter investoval klesla za to isté obdobie pol roka o 22%. Vložiť do tohto fondu ďalšie peniaze by teda asi nebolo výhodné.	☐ Áno	☐ Neviem	☐ Nie
16. Najlepšie informácie o akciách, podielových fondoch a vývoji trhov si nájdem sám/sama na internete, pretože mám tak prístup k väčšiemu množstvu informácií, ako mi je schopný poskytnúť jeden odborník.	☐ Áno	☐ Neviem	☐ Nie
17. Renomovaná svetová investičná spoločnosť prichádza s podielovým fondom rizikových akcií, ktorý ponúka možnosť mimoriadne vysokého výnosu. Pri rozhodovaní o investícií do tohto fondu by ma zaujímalo, koľko osôb už do fondu investovalo.	☐ Áno	☐ Neviem	☐ Nie
18. Keď sa mi nepodarí splniť jednu úlohu, nerobí mi problém začať rýchlo pracovať na niečom novom.	☐ Áno	☐ Neviem	☐ Nie
19. V práci si najradšej vyberám skôr nenáročné projekty a úlohy.	☐ Áno	☐ Neviem	☐ Nie
20. Podielové fondy, ktoré ponúkajú známe a veľké banky a finančné inštitúcie sú vo všeobecnosti výnosné a málo rizikové.	☐ Áno	☐ Neviem	☐ Nie
21. Ako náhle sa mi v živote podarí splniť predsavzatý cieľ, musím si hneď hľadať ďalší.	☐ Áno	☐ Neviem	☐ Nie
22. Ak do podielového fondu investovalo v minulosti už veľmi veľa ľudí, obvykle to znamená, že stabilne prináša spoľahlivý výnos.	☐ Áno	☐ Neviem	☐ Nie

23. Akcie spoločnosti SuperPharma, ktorých cena sa za posledné dva roky vyvíjala tak ako to ukazuje graf, by pravdepodobne neboli dobrou investíciou.  	☐ Áno	☐ Neviem	☐ Nie
24. Ak sa mi niečo v živote nevyjde, je pre mňa ťažké znovu sa zabrať do práce.	☐ Áno	☐ Neviem	☐ Nie
25. Akcie, ktorých hodnota začína klesať je väčšinou lepšie predať, ako čakať na zlepšenie.	☐ Áno	☐ Neviem	☐ Nie
26. Každý sa môže stať úspešným. Je to len otázkou toho byť v správny čas na správnom mieste.	☐ Áno	☐ Neviem	☐ Nie
27. Pri výbere podielového fondu je dobrá povesť správcovskej spoločnosti dôležitejšia ako konkrétne zloženie daného fondu.	☐ Áno	☐ Neviem	☐ Nie
28. Z neúspechu pri veľmi náročnej úlohe by som si príliš nelámal hlavu.	☐ Áno	☐ Neviem	☐ Nie

A posledná otázka:

Investovali ste už niekedy peniaze do podielových fondov, alebo iných cenných papierov?

☐ Áno ☐ Nie

INVESTOR IRRATIONALITY AND MOTIVATION QUESTIONNAIRE, Revised version, English

(Note: working translation from Slovak original; English version not tested)

Financial preferences questionnaire

The aim of this questionnaire is to examine the dominant preferences in personal finance planning, especially investing in mutual funds, which have presently become very popular. The questionnaire consists of 28 items- statements. For each statement, please mark "Yes", if you agree with the statement, or if it reflects your views, mark "No" if you don't agree with the statement, or if it doesn't reflect your views, or mark "Don't know", in case you can't decide, or can't answer. However, before marking "Don't know", please take the time to read the given statement again and try to use as few "Don't know" answers as you can.

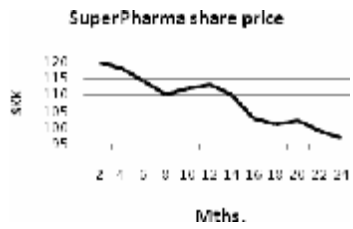
Before we start, please mark the following:

Sex: ☐ M ☐ F

Age:

1. A close acquaintance who works in the financial business will be a better source of information than public newscasts from the financial markets.	☐ Yes	☐ Don't know	☐ No
2. In general, it's better to invest in mutual funds, the price of which has recently been on the rise.	☐ Yes	☐ Don't know	☐ No
3. The mutual funds of well-known and reputable banks are usually the only really safe investment; making money on other funds is more a matter of being lucky.	☐ Yes	☐ Don't know	☐ No
4. The internet provides access to more reliable and up-to-date information than a personal financial advisor.	☐ Yes	☐ Don't know	☐ No
5. When choosing which mutual fund to invest in, it is more important to look for good returns in the past, than low associated entry and other fees.	☐ Yes	☐ Don't know	☐ No
6. Investing money is almost like having a second job: you have to closely watch the development of your investment and be acquainted with the situation on financial markets.	☐ Yes	☐ Don't know	☐ No
7. The graph shows the development of the price per share of NewPharma in the past two years. The current good recommendation would be to buy. 	☐ Yes	☐ Don't know	☐ No
8. Newly established mutual funds are always riskier than those, which have been around and providing returns for some time.	☐ Yes	☐ Don't know	☐ No

9. I usually don't make impulsive decisions.	☐ Yes	☐ Don't know	☐ No
10. Peter has invested a sum equal to his monthly income in a mutual fund of European company shares. He should pay attention to the development of his investment a couple of times per week.	☐ Yes	☐ Don't know	☐ No
11. I feel that a success at work (finishing a project, completing this month's assignments, etc.) always boosts my energy.	☐ Yes	☐ Don't know	☐ No
12. I'm proud of my abilities.	☐ Yes	☐ Don't know	☐ No
13. If the value of a share of mutual fund is decreasing, it is always a mistake to sell the investment immediately without waiting around for a while.	☐ Yes	☐ Don't know	☐ No
14. The value of Peter's fund of European shares increased by 18% in the past 6 months and it would be a lost opportunity if he didn't invest more in the same fund now.	☐ Yes	☐ Don't know	☐ No
15. The value of different mutual fund of North American shares, which Peter has invested in, fell by 22% in the same period of six months. Investing more money in this fund not be a good idea.	☐ Yes	☐ Don't know	☐ No
16. I can find the best information on shares, mutual funds and financial markets online and by myself, because that way I can access more information than one expert could provide.	☐ Yes	☐ Don't know	☐ No
17. A world-renown investment firm has started offering a new mutual fund composed of risky shares, which offers the possibility of very high returns. When deciding whether to invest in the fund, I would also like to know how many people have invested in it so far.	☐ Yes	☐ Don't know	☐ No
18. When I fail to reach one goal, I can usually mobilize quite fast to start up something else.	☐ Yes	☐ Don't know	☐ No
19. I usually prefer less demanding projects and tasks at work.	☐ Yes	☐ Don't know	☐ No
20. The mutual funds offered by large and well-known banks and financial institutions provide generally good returns and aren't very risky.	☐ Yes	☐ Don't know	☐ No
21. As soon as I reach a target I set for myself, I have to start looking for another one.	☐ Yes	☐ Don't know	☐ No
22. If a large number of people have invested in a mutual fund in the past, it usually means that it steadily provides good returns.	☐ Yes	☐ Don't know	☐ No
23. The shares of SuperPharma (price over the past two years shown on graph below) probably wouldn't be a good investment right now.	☐ Yes	☐ Don't know	☐ No

			
24. If something doesn't work out like I planned, it's difficult for me to force myself to get back to work.	☐ Yes	☐ Don't know	☐ No
25. It's better to sell shares with decreasing value, than to wait if the trend reverses.	☐ Yes	☐ Don't know	☐ No
26. Anybody can be successful. It's only a question of being at the right place at the right time.	☐ Yes	☐ Don't know	☐ No
27. When selecting a mutual fund, a good reputation of the fund managing company is more important than the actual composition of the fund.	☐ Yes	☐ Don't know	☐ No
28. Failure at a very difficult assignment would not make feel too frustrated.	☐ Yes	☐ Don't know	☐ No

An the final question:

Have you ever invested in mutual funds or any other securities?

☐ Yes ☐ No

APPENDIX E

INVESTOR IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, Revised version, scoring

Irrationality score range: 0- 20 points
Achievement motivation score range: 0- 8 points

Emotional attachment	*Illusion of control*	*Social infl.*	*Momentum investing*	*Achievement motivation*
9-no, 13-yes, 20-yes, 25-no, 27-yes	4- yes, 5-yes, 6-yes, 10-yes, 16-yes	1-yes, 3-yes, 8-yes, 17-yes, 22-yes	2-yes, 7-yes, 14-yes, 15-yes, 23-yes	11- no, 12- yes, 18-no, 19-no, 21-no, 24-no, 26- no, 28-no

APPENDIX F

FREQUENCY TABLES, ITEMS ANALYSIS; IRRATIONALITY AND ACHIEVEMENT MOTIVATION QUESTIONNAIRE, Revised version

N= 89

Table 13: Irrationality score, table of results

Raw score	Frequency	Cumulative percentage	Cumulative frequency	Z-score	STEN
< 4	0	0,00	0,00	-4	1
5	1	1,12	0,01	-2,33	1
6	3	4,49	0,04	-1,75	2
7	1	5,61	0,06	-1,55	2
8	7	13,67	0,14	-1,08	3
9	5	19,08	0,19	-0,88	4
10	18	39,32	0,39	-0,28	5
11	3	42,69	0,43	-0,18	5
12	13	57,29	0,57	0,18	6
13	12	70,77	0,71	0,55	7
14	11	83,12	0,83	0,95	7
15	7	90,98	0,91	1,34	8
16	8	100,00	100,00	4	10
> 17	0	100,00	100,00	4	10

N=89

Table 14.: Achievement motivation score, table of results.

Raw score	Frequency	Cumulative percentage	Cumulative frequency	Z-score	STEN
< 1	0	0,00	0,00	-4	1
2	8	8,90	0,09	-1,34	3
3	7	16,69	0,17	-0,95	4
4	14	32,42	0,32	-0,47	5
5	21	56,02	0,56	0,15	6
6	16	74,00	0,74	0,64	7
7	16	91,98	0,92	1,40	8
8	7	100,00	1,00	4	10

Table 15: Irrationality components items. Correlation with component score, irrationality score; item difficulty (no. scored / no. total answers).

	Item no. (init. v.)	*Wording (working English translation)*	*Correlation with raw score*		*Item Difficulty*
			Component score	*Irrationality total*	
Emotional attachment	9 (23)	I usually don't make impulsive decisions.	0,684**	0,467*	0,63
	13 (55)	If the value of a share of mutual fund is decreasing, it is always a mistake to sell the investment immediately without waiting around for a while.	0,656**	0,609*	0,62
	20 (42)	The mutual funds offered by large and well-known banks and financial institutions provide generally good returns and aren't very risky.	0,710**	0,530*	0,50
	25 (52)	It's better to sell shares with decreasing value right away, than to wait for a long time if the trend reverses.	0,587*	0,723**	0,55
	27 (30)	When selecting a mutual fund, a reputable fund managing company is more important that the actual composition of the fund.	0,401	0,630**	0,63
Illusion of control	4 (14)	The internet provides access to more reliable and up-to-date information than could be personally offered by a financial advisor.	0,502*	0,773**	0,65
	5 (16)	When choosing a mutual fund, it is more important to look at development of its value in the past than at the associated fees.	0,722**	0,669**	0,39
	6 (17)	Investing money is almost like having a second job: you have to closely watch the development of your investment and be acquainted with the situation on financial markets.	0,510*	0,332	0,63
	10 (25)	Peter has invested a sum equal to his monthly income in a mutual fund of European company shares. He should be checking the value of his investment a couple of times per week.	0,443	0,550*	0,39
	16 (33)	I can find the best information on shares, mutual funds and financial markets online and by myself, because that way I can access more information than one expert could provide.	0,727**	0,713**	0,70
Social influence	1 (9)	A close acquaintance who works in the financial business will be a better source of information than public newscasts from the financial markets..	0,811**	0,599*	0,43
	3 (13)	The mutual funds of well-known and reputable banks are usually the only really safe investment; making money on other funds is more a matter of being lucky.	0,550*	0,741**	0,58
	8 (22)	Newly established mutual funds are always riskier than those, which have been around and providing returns for some time.	0,689**	0,643**	0,58
	17 (34)	A world-renown investment firm has started offering a new mutual fund composed of risky shares, which offers the possibility of very high returns. When deciding whether to invest in the fund, I would also like to know how many people have invested in it so far.	0,820**	0,633**	0,39
	22 (47)	If a large number of people have invested in a mutual fund in the past, it usually means that it steadily provides good returns.	0,700**	0,603*	0,57

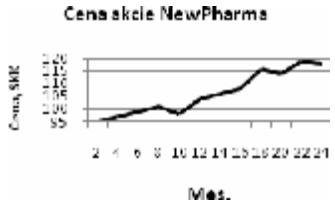
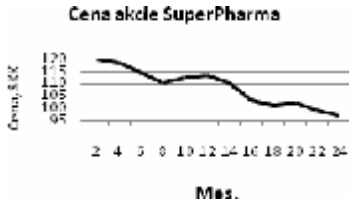
Momentum investing	2 (12)	In general, it's better to invest in stocks, the price of which has recently been on the rise.	0,420	0,432	0,69
	7 (20)	The graph shows the development of the price per share of NewPharma in the past two years. The current good recommendation would be to buy. 	0,654**	0,501*	0,47
	14 (31)	The value of Peter's fund of European shares increased by 18% in the past 6 months and it would be a lost opportunity if he didn't invest more in the same fund now.	0,455	0,401	0,47
	15 (32)	The value of different mutual fund of North American shares, which Peter has invested in, fell by 22% in the same period of six months. Investing more money in this fund would be crazy.	0,532*	0,430	0,57
	23 (49)	The shares of SuperPharma (price over the past two years shown on graph below) probably wouldn't be a good investment right now. 	0,812**	0,732**	0,44

Table 16: Achievement motivation component items. Correlation with achievement motivation score; item difficulty (no. scored / no. total answers).

Item no.	*Wording*	*Correlation with achievement motivation raw score*	*Item Difficulty*
11 (27)	I feel that a success at work (finishing a project, completing this month's assignments, etc.) always boosts my energy.	0,440	0,39
12 (28)	I'm proud of my abilities.	0,599**	0,58
18 (36)	After any failure, I can quickly find the energy to start up something else.	0,674**	0,40
19 (38)	I usually prefer less demanding projects and tasks at work.	0,521*	0,69
21 (44)	As soon as I reach a target I set for myself, I have to start looking for another one.	0,412	0,46
24 (50)	If something doesn't work out like I planned, it's difficult for me to force myself to get back to work.	0,730**	0,43
26 (53)	Anybody can be successful. It's only a question of being at the right place at the right time.	0,590*	0,60
28 (56)	Failure at a very difficult assignment would not make feel too frustrated.	0,490*	0,29

All tables:
* significance 0,95, ** significance 0,99

APPENDIX G

SAMPLE CHARACTERISTICS, INEXPERIENCED AND EXPERIENCED INVESTORS, IRRATIONALITY SCORE, ACHIEVEMENT MOTIVATION SCORE; TEST STATISTICS.

Table 17: Irrationality score. Sample characteristics, inexperienced and experienced investors.

Raw score	*Inexperienced (N=54)*		*Experienced (N=35)*	
	x_1	x_1^2	x_2	x_2^2
∑	610	7308	415	5635
mean	11,2		11,8	

Statement of hypothesis:
H_0: $\mu_{x1} = \mu_{x2}$
H_A: $\mu_{x1} \neq \mu_{x2}$

Test statistics:
Level of significance p=0,05
$t = (x_{1pr} - x_{2pr}) / \sqrt{[\{(1 / n_{x1}) + (1 / n_{x2})\} \cdot \{(n-1) \cdot s_{x1} + (n-1) \cdot s_{x2}\} / (n_{x1} + n_{x2} - 2)]}$
t= 1,034
$v = n_{x1} + n_{x2} - 2 = 87$
$t_{0.05}(87) = 1,990$
$|t| < t_{0.05}$ **è** H_0 not rejected

Table 18: Achievement motivation score. Sample characteristics, inexperienced and experienced investors.

Raw score	*Inexperienced (N=54)*		*Experienced (N=35)*	
	x_1	x_1^2	x_2	x_2^2
∑	277	1587	185	1049
mean	5,12		5,28	

Statement of hypothesis:
H_0: $\mu_{x1} = \mu_{x2}$
H_A: $\mu_{x1} \neq \mu_{x2}$

Test statistics:
Level of significance p=0,05
t= 1,732
$|t| < t_{0.05}$ **è** H_0 not rejected

APPENDIX H

TRIAL MATERIALS FOR SUBJECTS (sheets A, B, and C), original (Czech)

LIST A

Rádi bychom Vás požádali o účast ve výzkumu investičního chování. V této chvíli jste se stali výherci fiktivního kapitálu ve výši 10 000 Kč, který máte možnost zhodnotit investováním do podílových fondů. Podílové fondy jsou kolektivní formou investování- nákupem podílových listů se investor může podílet na investici do různých cenných papírů, vývoj kterých se pak promítá do růstu nebo poklesu investované sumy.

Protože podílové fondy investují peníze do různých cenných papírů jako jsou dluhopisy nebo akcie (kterých cena v čase kolísá), může se stát, že hodnota Vaší investice na čas poklesne. Investování do podílových fondů proto s sebou nese riziko. Cenné papíry však za cenu tohoto rizika nabízejí možnost mnohem vyššího zhodnocení než úrokové sazby běžných bankovních účtů. Informace o nabízených fondech, jejich rizikovosti a očekávaném výnosu naleznete v příloze.

Nacházíte se tedy v experimentální situaci, ve které k modelování investičního rozhodování použijeme kontrakci (zrychlení) času. V průběhu experimentu Vám bude ve třech krocích poskytnutá zpětná vazba o vývoji Vaší investice- můžete si představit, že doba mezi jednotlivými kroky představuje 1 rok.

Průběh experimentu
Svých 10 000 Kč máte možnost rozložit mezi čtyři podílové fondy a hotovost. Pro sledování Vaší investice bude sloužit přiložená tabulka. Počáteční investici provedete tak, že rozložíte svůj kapitál v sloupci „1. investice".

Následně Vám bude poskytnuta zpětní vazba o změně hodnoty investice do každého fondu jako procentuální změna, podobně jako změny hodnoty, ke kterým u podílových fondů v čase dochází. Tuto procentuální změnu si prosím poznačte do sloupce „1. výsledek" a na jejím základě si do dalšího sloupce („Hodnota investice") poznačíte novou hodnotu Vaší investice.

Příklady
Investice 1000 Kč do „Smíšeného fondu"→ + 12% → Hodnota investice: 1120 Kč
Investice 2000 Kč do „Fondu evropských akcii" → - 8% → 1840 Kč

Dalším krokem bude sečtení aktuální hodnoty Vašich aktiv (v rámečku 1. součet) a rozložení 2. investice stejným způsobem jako na začátku. V tomto případě však už nemáte k dispozici 10 000 Kč, ale sumu z 1. součtu.

Stejným způsobem pak proběhne oznámení 2. výsledku, provedení 3. investice a výpočet 3. výsledku a součtu.

Děkujeme za účast v experimentu a přejeme hodně štěstí.

LIST B

Renomovaná mezinárodní banka
RMB ASSET MANAGEMENT- NABÍDKA FONDŮ

1. Korunový peněžní fond
Fond investuje prostředky do korunových instrumentů s pevným úročením, zejména státních pokladničních poukázek. Fond je vhodný pro konzervativní investory a investory, kteří chtějí mít možnost v krátkodobém horizontu a při velmi nízkém riziku dosáhnout vyššího výnosu než nabízejí terminované vklady.

Výkonnost:

1 rok	5 let	od založení
1%	10%	17%

2. Korunový dluhopisový fond
Fond investuje především do dluhových cenných papíru denominovaných v českých korunách nebo zabezpečených proti měnovému riziku. Hlavní část portfolia tvoří státní dluhopisy České republiky nebo společností s vysokým ratingem. Cílem je maximalizace výnosu v střednědobém horizontu.

Výkonnost:

1 rok	5 let	od založení
- 1%	17%	41%

3. Smíšený fond
Smíšený fond nabízí investorům možnost zhodnocení aktív ve vyšší míře než při korunových nebo dluhopisových fondech, při jenom mírně vyšší míře rizika. Portfolio investuje prostředky do akcii (25%), státních dluhopisů (40%) a instrumentů peněžního trhu (35%). Cílem je maximalizace hodnoty portfolia v dlouhodobém horizontu.

Výkonnost:

1 rok	5 let	od založení
5%	41%	98%

4. Fond evropských akcií
Fond je určen pro investory, kterých cílem je dlouhodobé zhodnocení aktiv prostřednictvím společností obchodovaných na evropských akciových trzích. Hlavní část portfolia fondu tvoří především akcie evropských společností s vysokou kapitalizací a vysokým ratingem. Dočasný pokles hodnoty portfolia by měl být vyvážený vyšším dlouhodobým výnosem.

Výkonnost:

1 rok	5 let	od založení
14%	- 3%	229%

LIST C

Počáteční kapitál: 10 000 Kč

	1. Investice	*1. výsledek (% změna)*	*Hodnota investice*	*2. investice*	*2. výsledek (% změna)*	*Hodnota investice*	*3. investice*	*3. výsledek (% změna)*	*Hodnota investice*
Korunový peněžní fond									
Korunový dluhopisový fond									
Smíšený fond									
Fond evropských akcii									
Hotovost									
Součet (10 000)			1. součet			2. součet			3. součet

1. Která z informací o fondu byla pro Vás při rozhodování kam investovat nejdůležitější?

2. Co kromě uvedených informací bylo podkladem pro Vaše rozhodnutí do kterého fondu investovat?

TRIAL MATERIALS FOR SUBJECTS (sheets A, B, and C), English translation
(Note: a working translation from Czech original; English version not used)

SHEET A

We would like to ask for your participation in a research on investment behavior. You have been awarded a fictional capital of 10 000 CZK, which you can use to gain profit by investing in mutual funds. Mutual funds are a collective form of investing- by purchasing the shares of a fund, the individual investor can participate on investment in various assets. The current value of these assets then determines the increase or decrease in value of the sum invested.

Because mutual funds invest in various assets such as bonds or shares (the value of which changes in time), it is possible that the value of your investment will decrease for some time. Investing in mutual funds therefore carries a risk. However, various assets compensate for this risk by offering the possibility of higher returns than those offered by interest rates in regular bank accounts. Information on the funds offered, their estimated level of risk and expected returns can be found on the next sheet.

In this present situation, we will model investment behavior using a contraction ("speeding-up") of time. In the course of the trial, you will receive feedback on the development of the value of your investment in three steps- you can imagine, that the time in between each of these three steps in 1 year.

How will the trial be performed
You may divide your 10 000 CZK and invest it in any of the four mutual funds or keep a part in cash savings. The attached table will allow you to keep track of your investment. Your will perform your initial investment by dividing your capital in the column labeled "1st investment".

The results for the 1st investment will be announced as a percent change, just like the changes in value of mutual funds which occur in time. Please mark the percent change in the column labeled "1st outcome" and complete the resulting value of each investment in the adjacent column ("Value of investment").

Examples
Invested 1000 CZK in „Composite fund"→ +12% → Value of investment: 1120 CZK
Invested 2000 CZK in „European Shares Fund"→ -8% → 1840 CZK

The next step will be to calculate the current sum value of your assets (in the box "1st sum) and make a 2nd investment by dividing your current capital in the same way as in the beginning. In this case however, your available capital isn't 10 000 CZK, but the sum from the "1st sum" box.

Similarly, the 2nd outcome will be announced, a 3rd investment performed and the 3rd outcome and final sum calculated.

Thank you for your participation and good luck!

SHEET B

Renown International Bank

RIB ASSET MANAGEMENT- OUR OFFER OF MUTUAL FUNDS

1.Money-market Fund

The fund invests its capital in money instruments in CZK with a set interest rate, especially in state deposit certificates. The fund is suitable for conservative investors and investors who seek the possibility of a higher level of return than offered by various bank account products in a short-term period with a very limited level of risk.

History of returns:

1 year	5 years	since founded
1%	10%	17%

2. Bond Fund

The fund invests particularly in bond securities denominated in CZK or hedged against a currency risk. Chief part of the portfolio is composed of state bonds of the Czech republic or companies with high ratings. The fund aims to maximize returns in a medium-term time period.

History of returns:

1 year	5 years	since founded
- 1%	17%	41%

3. Composite Fund

The Composite Funds offers the possibility of higher valuation of assets than offered by money-market of bond funds at only a slightly higher level of risk. Portfolio includes shares (25%), state bonds (40%) and money-market instruments (35%). The fund aims to maximize the value of the portfolio in a long-term time period.

History of returns:

1 year	5 years	since founded
5%	41%	98%

4. European Shares Fund

Fund intended for investors who aim for a long-term valuation of their assets through companies traded on European stock markets. Chief part of the portfolio includes shares of European companies with high capitalization and ratings. A temporary decrease of portfolio value should be compensated by higher potential long-term returns.

History of returns:

1 year	5 years	since founded
14%	- 3%	229%

SHEET C

Initial capital: 10 000 Kč

	1st investment	*1st outcome (% change)*	*Value of investment*	*2nd investment*	*2nd outcome (% change)*	*Value of investment*	*3rd investment*	*3rd outcome (% change)*	*Value of investment*
Money-market fund									
Bond Fund									
Composite Fund									
European Shares Fund									
Cash									
Sum (10 000)			1st sum			2nd sum			3rd sum

1. Which piece of information was most important for you when deciding among the various funds offered?

2. Besides the information provided, what prompted you to choose the fund(s) you invested in?