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INDIVIDUAL INVESTORS' BEHAVIORAL BIASES

Excerto da Lição de Síntese das Provas de Agregação

Margarida Abreu

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1. Introduction

Behavioral finance studies the impact of psychological phenomena on financial behavior. In the center of the debate is the way people make decisions. In the course of making decisions people generally make observations, process data and arrive at judgments. In finance, these judgments and decisions pertain to the composition of individual portfolio, the choices of the securities, the expectations, the investment style, the horizon of investment, the turnover of the portfolio, the way investors react to news. As all human beings, individual investors use heuristics in the making of those judgments and decisions.

In psychology, heuristics are simple, efficient rules, learned by experience, that have been proposed to explain how people make decisions, come to judgments, and solve problems, typically when facing complex problems or incomplete information.

Heuristic methods can be viewed as mental short cuts used to ease the cognitive load of making a decision or finding a satisfactory solution (not an optimal one) for a problem. Examples of this method include using a rule of thumb, an intuitive judgment, or common sense. These rules work well under most circumstances, but in certain cases lead to systematic errors or cognitive biases. Cognitive biases is a pattern of deviation from rational behavior in judgment that occurs in specific situations. In a context where those specific situations occur, behavioral biases are therefore predictable and that's why, according to behavioral finance, human beings may be considered as predictably irrational decision makers. Therefore, behavioral finance suggests a new framework to think about investors' behavior. In the neoclassical

framework, financial decision makers possess Von Neumann-Morgenstern preferences over uncertain wealth distributions and use Bayesian rules to make appropriate statistical judgments using all available data. According to behavioral finance economists not only people do not behave according to Von Neumann-Morgenstern preferences and Bayesian rules, but they also systematically depart from the standard rational behavior.

Much of the work of discovering heuristics in human decision-makers was done by the Israeli psychologists Amos Tversky and Daniel Kahneman (2002 Nobel prized), but the knowledge has been developed dramatically in the last two decades.

According to Hirshleifer (2001), most known judgments and decision biases have three common roots: heuristic simplification, self-deception and emotional loss of control.

A first source of biases comes from heuristic simplification. Heuristic simplification happens when cognitive resource constraints (like read limited attention, processing power, and memory) force the use of heuristics to make decisions.

Self-deception is a second source of bias and arises indirectly from cognitive constraints. Self-deception is a process of denial or rationalizing away the opposing evidence and logical arguments. It involves convincing oneself of a truth (or lack of truth) so that one does not reveal any self-knowledge of the deception. One deceives oneself to trust something that is not true as to better convince others of that truth.

The biologist Trivers (1991) suggested that deception plays a significant part in human behavior and communication (as in animal behavior in general). According to Trivers, self-deception has evolved so that one can have an advantage over another: the ability to read subtle cues such as facial expression, eye contact, posture, tone of voice, and speech tempo to infer the mental states of other individuals. In Trivers' self-

deception theory, individuals are designed to think they are better (smarter, stronger, better friends) than they really are because truly believing this helps the individual fool others about these qualities.

A third source of bias is that we are subject to emotions that can overpower reason. An evolutionary rationale for a lack of self-control is that emotions such as love and rage can act as mechanisms that allow credible commitment or threat toward potential allies and enemies (Hirshleifer 1987, Nesse 2001).

Regardless of the behavioral biases' roots, I present hereafter the most important behavioral errors that may affect the behavior of individual investors in financial markets, organized into five main categories¹:

- Perception and Processing
- Framing and Mental Accounting
- Representativeness
- Emotions
- Combining Effect: Overconfidence

2. Perception and Processing Biases

Since time and cognitive resources are limited, a person cannot analyze all the available data. Limited attention, memory, and processing capacities force a focus on subsets of the available information. On the other hand people also make unconscious

¹ Different authors propose different groupings. Kahneman and Tversky (1974) differentiate three families of errors: a) availability, b) anchoring and c) representativeness. A different organization is proposed by Hirshleifer (2001) who identifies four types: a) perception, memory and processing, b) narrow framing, mental accounting and reference effects, c) representativeness and d) belief updating and combining effects. Shefrin (2002) split the heuristic driven biases into seven groups: availability, representativeness, regression to the mean, gambler's fallacy, overconfidence, anchoring and adjustment and aversion to ambiguity.

associations which create selective focus on a subset of information (Hirshleifer 2001). For instance, experiments reveal that giving verbally possibly irrelevant information to subjects triggers associations that influence judgments (Gilovich 1981). Selective triggering of associations causes availability effects (Kahneman and Tversky 1973), the most widely recognized cognitive heuristic related to perception and processing.

2.1. Availability Biases

Availability refers to the fact that a decision maker relies upon easily available knowledge rather than on all the relevant information.

Because of the availability bias, events that are easily called to mind are believed to have a greater likelihood of occurring. Although frequency and ease of recall should be correlated (in fact, the easiest an event is recalled the higher is the probability that this event actually occurs), the reality is that the ease of recall can be influenced by other factors.

As an illustrative example of availability I recall the one presented by Shefrin (2002): when asked to answer which is the most frequent cause of death, homicide or stroke, the majority of people's answers depends on the events that come readily to mind. And because people recall better glamorous causes of death than ordinary causes and also because glamorous causes are better covered by the media, they will probably answer "homicide" although the right answer is "stroke".

The availability bias contributes to understand the phenomena reported in financial markets of overreaction of stock prices to a series of good or bad news. According to the market efficiency theory, new information should more or less be reflected instantly in a security's price. Good news should raise a business' share price accordingly, and

that gain in share price should not decline if no new information has been released since. Reality, however, tends to contradict this theory. According to De Bondt and Thaler (1985), quite often participants in the stock market predictably overreact to new information, creating a larger-than-appropriate effect on a security's price.

Furthermore, it also appears that this price surge is not a permanent trend - although the price change is usually sudden and sizable, the surge erodes over time. De Bondt and Thaler (1985) examine returns on the New York Stock Exchange for a three-year period. They separate the best 35 performing stocks into a "winners' portfolio" and the worst 35 performing stocks were added to a "losers' portfolio". They then track each portfolio's performance against a representative market index for three years. The authors found that the "losers' portfolio" consistently beats the market index, while the "winners' portfolio" consistently underperforms. In other words, it appears that the original "winners" would become "losers", and vice versa, because in the short horizon investors essentially overreact. In the case of loser stocks, investors overreact to bad news, driving the stocks' prices down disproportionately. The exact opposite is true with the "winners' portfolio". According to the availability bias, people tend to heavily weight their decisions towards more recent information, making any new opinion biased towards that latest news.

2.2. Perception and Processing Related Biases

Four important biases are directly related to our limited perception and limited capacity of processing: the salience bias, the halo effects, the cue competition and the familiarity bias.

i. Saliency biases

Saliency refers to any aspect of a stimulus that, for any of many reasons, stands out from the rest. Because humans cannot pay attention to more than one or very few items simultaneously, they are faced with the challenge of continuously integrating and prioritizing different influences. Saliency detection is often studied in the context of the visual perception where it arises from contrasts between items and their neighborhood, such as a red dot surrounded by white dots, a flickering message indicator of an answering machine, or a loud noise in an otherwise quiet environment. However, saliency may be the result of emotional, motivational or cognitive factors and is not necessarily associated with physical factors such as intensity, clarity or size. The error related to saliency is that we tend to over-estimate the causal role (saliency) of information we have available to us. An example of the saliency bias in finance is provided by Barber and Odean (2006), who show that individual investors are net buyers of attention-grabbing stocks (for example, stocks in the news). According to the authors, attention-driven buying is the result of the difficulty that investors have searching amongst all the available assets they can potentially buy.

Although the errors driven by saliency are the most common errors of perception and processing, we have to consider other behavioral biases also related to perception and processing: the halo effect, the cue competition and the familiarity bias.

ii. Halo effects

The halo effect is a type of cognitive bias in which our overall impression of a person influences how we feel and think about his or her character. Our overall

impression of a person ("He is nice!") impacts our evaluations of that person's specific traits ("He is also smart!").

Halo effects happen especially if the perceiver does not have enough information about all traits, so that he makes assumptions based on one or two prominent traits. These one or two prominent traits "overshadow" other traits, similar to the radiation of light in optical halo effects or halos in iconography (rings of light around someone's head). Edward L. Thorndike (1920) was the first psychologist to support the halo effect with empirical research²². Attractive people are often judged as having a more desirable personality and more skills than someone of average appearance.

According to Schneider et al. (2012), the halo effect is most likely the most common bias in performance appraisal. In fact, when a supervisor evaluates the performance of a subordinate, she or he may give prominence to a single characteristic of the employee, such as enthusiasm, and allow the entire evaluation to be colored by how she or he judges the employee on that one characteristic. Even though the employee may lack the requisite knowledge or ability to perform the job successfully, if the employee's work shows enthusiasm, the supervisor may very well give him or her a higher performance rating than is justified by knowledge or ability.

iii. Cue competition

The cue competition effect refers to the situation when increasing the validity of one cue subjectively decreases the validity of another cue, even though the two cues

²² In a psychology study published, Thorndike (1920) asks commanding officers to rate their soldiers. He found high cross-correlation between all positive and all negative traits. People seem not to think of other individuals in mixed terms; instead we seem to see each person as roughly good or roughly bad across all categories of measurement.

are independent. The cue competition bias occurs in prediction tasks, i.e., when people have to predict future events on the basis of past experience with the current situation. For example, individual investors must forecast future economic trends on the basis of current economic indicators. If the effect of one cue on prediction is attenuated by increasing the validity of another cue, important errors may occur in the predicted scenario. Busemeyer et al. (1993) demonstrate empirically that increasing the validity of one cue decreases the effectiveness of another cue in a linear prediction task, even though the two cues were statistically independent.

iv. Familiarity bias

Familiarity bias is another shortcut the mind uses to filter information and make decisions which consists in the tendency to believe in and prefer things that are already familiar to us. It's not a conscious decision. People believe that the familiar company is actually better and that investment in the familiar has a lower risk and/or higher yield returns. This explains the widely studied home country bias which affects most investors' behavior (French and Poterba 1991, Abreu et al. 2011). Even professional investors are known to allocate a larger fraction of their investments to domestic stocks than they should if they were adhering to standard portfolio theories that advocate diversification. Strong and Xu (2003), for example, find that investors are more optimistic towards their home markets than they are about foreign markets.

Familiarity bias also explains why so many people invest so heavily in the companies they work for, even though this generally represents a very risky investment strategy. In fact, if both the job and financial assets are tied to one

company, this represents tying all future returns to the success of one single firm (Coval and Moskowitz, 1999).

3. Framing and mental accounting

The second subcategory for heuristic simplification pertains to narrow framing, mental accounting, and related biases.

Framing is a cognitive heuristic in which people tend to reach conclusions based on the 'framework' within which a situation is presented. Quoting Shefrin (2002), "the term frame dependence means that the way people behave depends on the way that their decision problems are framed."³ Accepting the influence of framing means rejecting the rational theory of choice which assumes description invariance: equivalent formulations of a choice problem should give rise to the same preference order. In fact, there is much evidence that framing of options in choice problems systematically yields different preferences. People have different perspectives and come up with different decisions depending on how a problem is framed.

Prospect theory, which is not discussed here in detail, is at the center of this subcategory, and is particularly important to explain some of the behavioral biases related to this category like the isolation effect, loss aversion, and reference points.

From a financial point of view, frame dependence manifests itself in the way that people form attitudes towards gains and losses. People make one decision if a problem is framed in terms of losses, but behave differently if the same problem is framed in terms of gains.

³ Shefrin, Hersh (2000), p.29.

The effects of framing in decision making may be organized considering four different dimensions of the impact of framing in individual evaluation and decisions: frame and accessibility, anchoring and adjustment heuristic, framing and evaluation of outcomes according to prospect theory, and mental accounting.

3.1. Frame and Accessibility

Accessibility is the technical term for the ease with which mental contents come to mind. Accessibility changes with the framing of the decision problem. For example, the wording of an idea makes different thoughts accessible (Kahneman 2003). The statements “Asset A is a better investment than asset B” and “Asset B is a worse investment than asset A” convey the same information, but because each sentence draws attention to its grammatical subject, they make different thoughts available.

Accessibility also reflects temporary states of associative activation. For example, the mention of a familiar social category temporarily increases the accessibility of the traits associated with the category stereotype (Fiske 1998). Moreover, accessibility is influenced by one’s emotional state. High emotional states greatly increase the accessibility of thoughts that relate to the immediate emotion and reduce the accessibility of other thoughts (Loewenstein 2000). An effect of emotional significance on accessibility was demonstrated by Rottenstreich and Hsee (2001), which shows that people are less sensitive to variations of probability when valuing chances to receive emotionally loaded outcomes (kisses and electric shocks) than when the outcomes are monetary.

Thus, the effect of framing on accessibility is very important and has different dimensions. Perhaps the most impressive example is presented by Kahneman (2003).

An ambiguous graphic symbol is shown in two contexts. It is perceived as the letter “B” within a sequence of letters, and is instead seen as the number “3” when placed within a sequence of numbers. Another important point that this example illustrates is the complete suppression of ambiguity in conscious perception. When the two graphic representations are shown separately, observers will not spontaneously become aware of the alternative interpretation. They “see” the interpretation of the object that is the most likely in its context, but have no subjective indication that it could be seen differently. Ambiguity and uncertainty are suppressed in perception.

3.2. Anchoring and Adjustment Heuristic

The anchoring and adjustment heuristic was first theorized by Tversky and Kahneman (1974). Anchoring and adjustment is a psychological heuristic that influences the way people intuitively assess probabilities. More precisely, anchoring is a cognitive bias that describes the common human tendency to rely too heavily, or "anchor," on one trait or piece of information when making decisions. According to this heuristic, when one has to make a guess or an estimation, we start with an implicitly suggested reference point (the "anchor") and make adjustments to it to reach our estimate.

Because we are better at relative thinking than absolute thinking (Kanheman 2011) we tend to base estimates and decisions on known ‘anchors’ or familiar positions, with an adjustment relative to this starting point. The initial value, or starting point, may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, adjustments are typically insufficient. That is, different starting points yield different estimates, which are biased towards the initial values.

Tversky and Kahneman (1974) present a clear example of the bias induced by this heuristic. Subjects were asked to estimate the percentage of African countries in the United Nations. The subjects were instructed to indicate first whether that number was higher or lower than a specific percentage and then to estimate the value of the quantity by moving upward or downward from the given number. Different groups were given different starting percentages, and these arbitrary percentages had a marked effect on estimates. The median estimates of the percentage of African countries in the United Nations were 25 and 45 for groups that received a reference percentage of 10 and 65, respectively. Many other clear experiments of anchoring and adjustment heuristic are reported by Ariely (2008).

3.3. Framing and evaluation of outcomes according to prospect theory

Prospect theory⁴ distinguishes two ways of choosing between alternative prospects: by detecting that one dominates another or by comparing their values. The frame of a choice problem, which is the manner in which the choice problem is presented, has a great influence on the individual choice.

The value function in prospect theory (which replaces the utility function in expected utility theory) has three key aspects that exacerbate the importance of the frame with which the choice problem is presented:

- The value is assigned to gains and losses relatively to a starting point rather than to final assets (as the level of wealth);

⁴ For a deep understanding of prospect theory see Kahneman and Tversky (1979) and Tversky and Kahneman (1992).

- People exhibit risk aversion in the positive domain and risk seeking in the negative domain except for very low or very high probabilities (so the value function is generally concave in the positive domain and convex in the negative domain);
- People manifest loss aversion; the displeasure of losing a sum of money exceeds the pleasure of winning the same amount (the value function is steeper for losses than for gains).

The importance of the framing of outcomes in finance is illustrated in the following experiment by Tversky and Kahneman (1981).

Problem 1: Choose between a) a sure gain of 240 u.m. and b) a 25% chance to gain 1000 u.m. and 75% chance to gain nothing.

Problem 2: Choose between a) a sure loss of 750 u.m. and b) a 25% chance to lose nothing and 75% chance to lose 1000 u.m..

As implied by prospect theory value function, the majority of people choose a) in problem 1 and b) in problem 2. In problem 1, a riskless prospect is preferred to a risky prospect of even greater expected value. In problem 2, the majority of people chose b) which is consistent with risk seeking.

The different frames with which the alternative choices are presented have a substantial effect on preferences because people behave differently in the domain of gains and in the domain of losses. In the domain of gains people are risk avert and in the domain of losses people are risk seeking.

3.4. Mental accounting

Individuals need to record, summarize, analyze, and report the results of transactions and other financial events. Mental accounting is a description of the ways we do these things. More precisely, mental accounting, a concept first named by Thaler (1980) and developed by Tversky and Kahneman (1981), attempts to describe the process whereby individuals divide their current and future assets into separate, non-transferable accounts. The concept of mental accounting was later developed by Thaler (1999) who identifies three components. The first captures how outcomes are perceived and experienced, and how decisions are made and subsequently evaluated. A second component involves the assignment of activities to specific accounts. The third component of mental accounting concerns the frequency with which accounts are evaluated (daily, weekly, yearly, and so on). Each of the components of mental accounting violates the economic principle of fungibility (money in one mental account is not a perfect substitute for money in another account).

Applied to financial behavior the theory considers that individuals assign different levels of utility to each asset group, and this affects investor's investment decisions and other behaviors. Rather than rationally viewing every monetary unit as identical, mental accounting helps explain why many investors designate some of their funds as "safety" capital which they invest in low-risk investments, while at the same time treating their "risk capital" quite differently. Mental accounting is also related to narrow framing in Finance. An investor is said to suffer from narrow framing if he/she seems to make investment decisions without considering the context of his/her total portfolio, either by neglecting the other assets in the portfolio or by ignoring previous choices in a sequence of investment decisions. Shefrin and Statman (1993) describe how

brokers promote the sale of calls making them more attractive to their clients by framing the cash flow of the calls into three mental accounts corresponding to three different sources of profit: the call premium, the dividend, and the capital gain on the stock.

3.5. Framing and mental accounting related biases

Biases associated with this subcategory are largely related to oversimplification of a decision task, perhaps because time and cognitive resources are limited. In addition to the anchoring and adjustment heuristic bias already presented, there are a lot of other biases in this subcategory.

We may differentiate three related groups of behavioral biases: biases directly related to prospect theory, which is at the center of this subcategory; biases motivated by prospect theory; and biases directly connected to financial market errors. In each category I present the most relevant biases to understand individual investors' behavior.

3.5.1. Biases directly related to prospect theory

i. Reference points

Peoples' valuations of prospects depend on gains and losses relative to a reference point. This reference point is usually the status quo or current wealth. In a problem choice where the final result is the same in all alternative choices, but the starting point differs, people will evaluate the alternatives differently because those alternatives won't be perceived as carrying equivalent gains/losses. The following

decision problem is an example of the reference point bias (from Tversky and Kahneman 1986).

How would you choose in the following problem?

Decision 1) Assume yourself richer by 300 u.m. than you are today. Then choose between a) gain 100 u.m. for sure and b) a 50% chance of gaining 200 u.m..

Decision 2) Assume yourself richer by 500 u.m. than you are today. Then choose between a) losing for sure 100 u.m. and b) a 50% chance of losing 200 u.m..

Although the two decisions are effectively the same in terms of final wealth (in both cases the decision is between a) 400 u.m. for sure and b) 50% chance of 500 u.m. or 50% chance of 300 u.m.) most respondents choose 1a) and 2b). This problem illustrates that people evaluate an outcome based on the gain or loss from a reference point, in this case the current wealth.

ii. Loss aversion

Loss aversion is a concept of social psychology as much as economics. It is not the reality of loss that matters, but the perception. People seem to feel more strongly a loss than a gain of equivalent absolute value. The loss aversion idea is central in prospect theory and has been demonstrated by Tversky and Kahneman (1992) with the following experiment: What value of x would make you indifferent between a) zero gain and b) 50% chance of gaining x and 50% of losing 25 u.m.? a) represents the status quo. The typical person requires a gain of 61 u.m. to be indifferent between accepting or rejecting the gamble. The risk neutrality implies $x = 25$ u.m., the upside has to be more than two times the absolute value of the downside in order to induce indifference between the choices. Loss aversion is the term that describes the fact that

losses loom larger than gains. Loss aversion must be differentiated from risk aversion. While people also prefer a sure thing to a gamble with only positive outcomes when the expected values are identical, their aversion to such gambles is much weaker than when one of the outcomes pushes them into the loss domain, as in this choice problem.

3.5.2. Biases motivated by, or associated with, prospect theory

i. House money effect

The house money effect, proposed by Thaler and Johnson (1990), describes the effect of prior outcomes on risky choices. Agents that exhibit the house money effect consider large or unexpected wealth gains to be distinct from the rest of their wealth, and are thus more willing to gamble with such gains than they ordinarily would be. Gamblers call this “playing with the house’s money.” Since they don’t yet consider the money to be their own, they are willing to take more risk with it. The house money effect predicts that investors who have experienced a gain or profit are often willing to take more risk. The house money effect is an example of mental accounting, in which agents mentally keep quantities of money in artificially separate “accounts.” Barberis et al. (2001) use the house money effect, along with first order risk aversion, to explain the high volatility of asset prices and the equity premium puzzle.

ii. Regret

Regret is the pain of mind on account of something done or experienced in the past, with a wish that it had been different. Regret means looking back with

dissatisfaction or with grief or sorrow, especially if this dissatisfactions results from the loss of some joy, or advantage.

iii. Endowment effect

The term endowment effect reports the fact that the value of one good increases once a person owns it. Loss aversion was first proposed as an explanation for the endowment effect by Kahneman et al. (1990). In fact, the endowment effect is consistent with prospect theory since losses (giving up the good) are felt more strongly than gains (receiving the good). However the authors also demonstrate that in some experiments loss aversion was not a sufficient explanation.

iv. Status quo bias

The status quo bias is a cognitive bias for the status quo. In other words, it refers to the fact that people tend not to change an established behavior unless the incentive to change is compelling. This tendency should be distinguished from rational preference for the status quo. The finding has been observed in many fields, including political science and economics. According to Ackert and Deaves (2010) the endowment effect and the status quo bias are equivalent heuristic errors. Kahneman et al. (1990) attribute it to a combination of loss aversion and the endowment effect, two ideas relevant to prospect theory. The authors created experiments that could reliably produce this effect. According to new research in psychology this individuals' tendency to prefer to remain at the status quo is stronger when the decision is complex. Ariely (2008) provides a few experiments demonstrating that the more difficult the decision we face, the more likely we are not to act.

3.5.3. Biases directly connected to financial market errors

Beyond the already presented mental accounting bias, which has obvious consequences on investors' behavior, two other cognitive errors steaming from framing are of particular importance in finance: money illusion and the disposition effect.

i. Money illusion

In economics, money illusion refers to the tendency of people to think of currency in nominal, rather than real, terms. In other words, the numerical face value (nominal value) of money is mistaken for its purchasing power (real value). Money illusion is another form of heuristic simplification. Nominal prices provide a convenient rule of thumb for determining value and real prices are only calculated if they seem highly salient (e.g. in periods of hyperinflation or in long term contracts). This is an error because modern fiat currencies have no inherent value and their real value is derived from their ability to be exchanged for goods and used for payment of taxes.

Money illusion conveys an old debate in monetary theory. The term was coined by John Maynard Keynes in the early twentieth century, and Irving Fisher wrote an important book on the subject, *The Money Illusion*, in 1928. The existence of money illusion is disputed by monetary economists who contend that people act rationally (that is, think in real prices) with regard to their wealth. However, Shafir et al. (2012) provides compelling empirical evidence for the existence of the effect and it has been shown to affect behavior in a variety of situations. Money illusion has been proposed as one reason why nominal prices are slow to change even where inflation has caused real prices or costs to rise.

But more important, money illusion can also influence people's perceptions of outcomes. Experiments have shown that people may perceive a 7% cut in nominal income as unfair, but see a 5% rise in nominal income where there is 12% inflation as fair⁵, despite them being almost rational equivalents.

For individual investor's behavioral analysis, money illusion means nominal changes in price can influence demand, even if real prices have remained constant.

ii. Disposition effect

The disposition effect is one of the most important, because costly, behavioral biases in finance. In fact, investors who show this bias usually hold poorly diversified portfolios and end up making bad financial decisions that are contrary to rational models of investment. Labeled by Shefrin and Statman (1984), the disposition effect describes the tendency that investors have to sell securities whose price is rising, the so-called winners, while keeping in portfolio securities whose price is declining, the losers.

Three rational motives may justify the disposition effect: portfolio rebalancing, trading costs, and tax-related motives for selling stocks at a loss. However Odean (1998a) found disposition effect even after accounting for portfolio rebalancing and trading costs, and Lakonishok and Smidt (1986) consider that the disposition effect dominates tax-related motives for selling stocks at a loss. Several other empirical papers have documented the existence of disposition effect (Grinblatt and Keloharju 2001, Shapira and Venezia 2001, Dhar and Zhu 2002).

⁵ Cf. Tversky and Kahneman (1986), p.S261-S262.

Much of the behavioral finance literature relates the disposition effect to loss aversion. Investors value a title gain or loss relatively to a reference point, usually the purchase price of the asset. When transactions are carried in the financial market, agents will evaluate their portfolio and whether the assets have appreciated or depreciated relative to the purchase price. Combining the analysis of the reference point with the fact that investors are risk averse in the domain of gains and risk seekers in the domain of losses, it is easy to understand that if the asset price falls and remains below the reference point, investors, who value loss much more than a gain, will be averse to sell that asset for a loss, causing a reduction in the supply of potential sellers. The intuition behind how loss aversion can explain the disposition effect is that a winning stock is considered a gain, and as individuals are risk-averse in this domain, they will sell the stock. On the other hand, a losing stock would be considered a loss and being risk-seeking in this domain would cause the investor to hold the stock. The aversion to losses by investors is so strong that the impact of a loss on the usefulness (or value function) of individuals is estimated at about two times and a half higher than the impact of an equivalent gain. Thus, investors tend to avoid the realization of losses.

Other behavioral finance explanations have been added to explain the disposition effect. Barberis and Xiong (2009) concludes that the investors' tendency for selling winning stocks too early and holding losing stocks too long depends on the success of past investments. If past investments were set at a gain, the agents will be progressively less risk averse and will show more disposition effect. Muermann and Volkman (2007) focuses on how anticipating regret and pride in a dynamic setting may cause investors to optimally follow a strategy in which they sell winning stocks and hold losing stocks; that is, on how anticipating regret and pride can help explain the disposition effect.

4. Representativeness

Representativeness is the third class of heuristic simplification and is used when making judgments about the probability of an event under uncertainty. Representative heuristic is a cognitive bias in which an individual categorizes a situation based on a pattern of previous experiences or beliefs about the scenario. The term proposed by psychologists Tversky and Kahneman (1982) is defined as "the degree to which [an event] (i) is similar in essential characteristics to its parent population, and (ii) reflects the salient features of the process by which it is generated".

Like the other heuristic simplifications, representativeness often provides reasonable answers when trying to make a quick judgment or decision, but sometimes it leads to stereotypes, inducing errors. When people rely on representativeness to make judgments or decisions, they are likely to judge wrongly because of the fact that something is more representative does not make it more likely. The typical result is probability judgment error: thinking some event is more (or less) likely than it actually is (based on an inappropriate understanding of the situation). This error in the assessment of probabilities has different dimensions.

4.1. Base rate neglect

It happens when one evaluates the likelihood that a particular description of a subject belongs to an engineer rather than to a lawyer, by the degree to which this description was representative of the two stereotypes, with little or no regard for the

prior probabilities of the categories, that is the percentage of engineers and lawyers in the sample (Tversky and Kahneman 1974).

4.2. Insensitivity to sample size

To evaluate the probability of obtaining a particular result in a sample drawn from a specified population, people typically assess the likelihood of a sample result by the similarity of this result to the corresponding population. Because the similarity of a sample statistic to a population parameter does not depend on the size of the sample, the judged probability of a sample statistic will be essentially independent of sample size. For example, we assess the probability that the average height in a random sample of ten men will be 1.8 meters, by the similarity of this result to the average height in the population of men.

4.3. Misconception of chance

People expect that a sequence of events generated by a random process will represent the essential characteristics of that process even when the sequence is short. In considering tosses of a coin for heads (H) or tails (T), for example, people regard the sequence of H-T-H-T-T-H heads to be more likely than H-H-H-H-H, which does not represent the fairness of the coin.

4.4. Insensitivity to predictability

It has been shown that people tend to believe that there is more predictability than is usually the case (Kahneman and Tversky 1973). For example, when people are

asked to predict the future value of a company and are given a very favorable description of the work environment in the company, they tend to believe there is a positive relationship, and a very high profit will appear most representative of that description. This mode of judgment violates the normative statistical theory. When predictability is nil, for example because the description of the company provides no information relevant to profit, then the same value (such as average profit) should be predicted for all companies.

4.5. Representativeness related biases

Two behavioral biases are particularly associated with representativeness: the Gamblers' fallacy and the Hot hand fallacy.

i. Gambler's fallacy

The "Gambler's fallacy" is the belief that if deviations from expected behavior are observed in repeated statistical independent trials of a random process, then these deviations are likely to be evened out by opposite deviations in the future.

For example, if a fair coin is tossed repeatedly and tails comes up a larger number of times than is expected, a gambler may incorrectly believe that this means that heads is more likely in future tosses. Chance is commonly viewed as a self-correcting process in which a deviation in one direction induces a deviation in the opposite direction to restore the equilibrium. In fact, deviations are not "corrected", they are merely diluted.

Tversky and Kahneman (1971) interpret this to mean that people believe that short sequences of random events should be representative of longer ones,

specifically in that deviations from average should balance out. This is to misunderstand the law of large numbers, where a large number of random events, such as coin tossing, will closely approach the natural distribution (in the example, 50% heads and 50% tails).

There is evidence from empirical works that the gambler's fallacy is also present in the stock market. Andreassen and Kraus (1990) found that investors exhibit gambler's fallacy in the presence of modest stock price fluctuations.

ii. Hot hand fallacy

The hot hand fallacy includes the assumption of a run of luck, where because one's have won several times we feel we are more likely to continue winning. The hot hand fallacy also includes the opposite assumption of luck running out and being on a losing streak. Those fallacies can appear as a contradiction of the gamblers' fallacy, where a run of success (or a run out of success) is assumed to continue. In fact, they both represent errors of misconceptions of chance. People generally look for rational explanations of their own experiences (as in attribution theory) and gamblers are no different. They are thus willing to accept theories about why they are winning or losing based on luck and their own skill.

There is evidence from experiments and from surveys that stock market investors extrapolate trends in forecasting price movements. Andreassen and Kraus (1990) finds that in the presence of a strong trend of prices, stock investors' exhibit hot hand fallacy. DeBondt (1993) reports that non-expert investors are optimistic in bull markets and pessimistic in bear markets, thus expecting the continuation of past trends in prices.

The hot hand fallacy encourages people to take risks by telling them they are lucky or on a 'winning streak'.

5. Emotions

Although emotional states have an undeniable influence on human actions and decisions, this influence has largely been neglected in economics. Damásio (2011) provides remarkable evidence that decision-making suffers without emotions. He clearly demonstrates that the neural systems for reason and emotion cannot be separated. Thus, decision making and emotions are interconnected. Psychologists generally agree on what emotions there are, and on what emotions are. Among the states that are unambiguously qualified as emotions there are social emotions (like anger, guilt, shame, pride); emotions generated by thoughts about what might have happened but didn't (like regret, rejoicing or disappointment); emotions generated by the thought of what may happen (like fear and hope); emotions generated by good or bad things that have happened (like joy and grief); emotions triggered by the thought of the possessions of others (like envy and jealousy). According to Elster (1998), an emotion may be defined by six observable features: cognitive antecedents (beliefs trigger an emotional response), intentional objects (emotions about a person or situation), physiological arousal (hormonal and nervous system changes trigger emotional responses), physiological expressions (emotions can be accompanied by physical expressions), valence (emotions can be rated on a scale with positive and negative feelings), and action tendencies (when one's feel an emotion, we often feel an urge to act).

How does emotion impact how individual investors make financial decisions and behave in financial markets?

5.1. The effect of mood

Although it is frequently not obvious how to separate the role of emotions from that of fundamentals, empirical and experimental works make clear that emotions impact on how individual investors make decisions in a very direct way. No matter how experienced, all financial agents suffer the influence of their own emotions in their judgments and decisions in financial markets. According to Shiller (2000) the emotional state of investors when they decide on their investments is no doubt one of the most important factors causing the bull market in the late 1990s.

Some recent research indeed seems to confirm that anomalous financial behavior can be explained by investors' mood. Hirshleifer and Shumway (2003) examines the relation between morning sunshine at a country's leading stock exchange and market index stock returns that day at 26 stock exchanges internationally from 1982-97. They found that sunshine is strongly significantly correlated with daily stock returns. A sunny day makes people more optimistic and so more likely to buy stocks. Consequently the authors find that positive (net-of-transaction costs) profits can be made from substantial use of weather-based strategies.

Edmans et al. (2007) finds that the outcomes of soccer games are strongly correlated with the mood of investors. They report a significant market decline after soccer losses. For example, a loss in the World Cup elimination stage leads to a next-day abnormal stock return of -49 basis points. This loss effect is stronger in small stocks and in more important games. They also report an equivalent loss effect after international cricket, rugby, and basketball games.

However, the effect of mood in risk taking behavior is less clear. Some researchers⁶ suggest that happier people are more optimistic in general and so more optimistic about their likelihood of winning with their financial investments and consequently more prone to take on more risk. Other research⁷ argues that more optimistic people are less likely to invest because they are more risk averse. People in a good mood are less likely to gamble because they do not want to jeopardize the good mood.

Emotions may also have an impact on trading behavior. Lo et al. (2005) uses a survey to construct measures of emotional states of day traders and correlate these measures with daily normalized profits-and-losses records. They find that subjects whose emotional reaction to monetary gains and losses was more intense on both the positive and negative side exhibit significantly worse trading performance.

5.2. Greed and Fear

Two common emotions are frequently associated with financial markets: greed and fear⁸. In fact, the fact that many people buy lottery tickets and, at the same time, buy insurance is difficult to explain disregarding the strong emotional content of those choices. Buying lottery tickets runs counter the prospect theory idea that people show loss aversion in the domain of gains. Also, buying those tickets has an expected negative return so it can hardly be understood as an investment. This choice may be interpreted by the desire to get rich quickly (greed), even though people know that the

⁶ Cf. Wright and Bower (1992).

⁷ Cf. Isen et al. (1988).

⁸ "Behind Greed and Fear" is precisely the title of one of the most well-known books in behavioral finance. Cf. Shefrin (2002).

probability that this happens is low. On the other hand, buying insurance, which runs counter the prospect theory idea that people show loss aversion in the domain of losses, and has also a negative expected return, is certainly related to fear, the fear of a great loss.

5.3. Emotions and the disposition effect

Besides greed and fear, other emotions are present in financial markets in many other different ways. The previously presented disposition effect is a clear example of that influence. Recent experiment by Summers and Duxbury (2012) favors emotion over prospect theory to explain the disposition effect. The authors claim that anticipated regret and rejoicing are necessary to generate behavior consistent with the disposition effect. The experiment reveals that the mere experience of a gain or loss, without the personal responsibility for the choice of the investment, doesn't induce the disposition effect. If the stock the investor owns but didn't choose performs poorly he/she experiences disappointment (but not regret) and when it performs well, he/she experience elation (but not rejoicing). Summers and Duxbury highlight that responsibility for an outcome leads to emotions with higher valence (regret and rejoicing) which are a prerequisite for the disposition effect. In the same line of reasoning, the experiment by Weber and Camerer (1998) confirms the importance of emotion on the disposition effect. The authors compare the function of common stock markets, in which selling a stock requires a deliberate action, with an 'automatic selling' market, in which all stocks are automatically sold at the end of each period and subjects have to rebuy the stocks (at the same price they were automatically sold for, with no transaction costs). A rational decision maker should behave identically in both

types of experiments. However the authors find that when the shares were automatically sold after each period, the disposition effect was greatly reduced. This finding is consistent with a role of emotions, because at the beginning of each period the negative feelings of regret and the positive feelings of rejoicing are suppressed.

5.4. Affect

Besides fear and regret, affect, a “faint whisper of emotion” (Slovic and Peters 2006), may also play a role in decision-making. Affect means the specific quality of “goodness” or “badness” experienced as a feeling state (with or without consciousness), as a result of a positive or negative stimulus. For instance, when negotiating a new financial investment, if we immediately dislike the seller, the outcome is probably affected by this first sentiment. Affective responses occur rapidly and automatically.

Affect may also be understood as a heuristic (Slovic et al. 2004), as a mental short-cut to access judgment or make a choice. Using an overall, readily available affective impression can be easier and more efficient than weighing the pros and cons of various reasons or retrieving relevant examples from memory, especially when the required judgment or decision is complex.

For Bracha and Brown (2012) the influence of affect on investors’ decisions is inconsistent with the independence of decision weights and payoffs found in models of choice under risk, such as the expected utility theory. To attest for the evidence suggesting that affect has an influence on agents’ financial decisions they propose an alternative model of risky choice, affective decision-making, where decision weights (which they label affective) are endogenous.

5.5. Hedonic motivation

Hedonic motivation refers to the classical motivational principle that people approach pleasure and avoid pain, and is gained from acting on certain behaviors that result from emotional feelings such as love, hate, fear, joy, etc. According to the hedonic principle, our emotional experience can be measured from bad to good and our primary motivation is to keep as close to good as possible. This pleasure-seeking motivation is also important to understand individual investors' behavior. Some people trade in financial markets only because they like to do so. Dorn and Sengmueller (2009) examine the hypothesis that entertainment motives drive trading by combining survey responses and transaction records for a sample of more than 1,000 clients at one discount broker in Germany. The authors conclude that although investors do not only trade for entertainment purposes, clients classified as potentially entertainment driven trade more than their peers. Also, entertainment-driven investors turn over their portfolio of stocks, bonds, funds and options at roughly twice the rate of their peers. In the same line of reasoning some authors argue that investors who are more prone to sensation seeking trade more frequently. According to Zuckerman (1994), "sensation seeking is a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take financial risks for the sake of such experience."⁹

As Grinblatt and Keloharju (2009) puts it, for investors prone to sensation seeking "the mere act of trading and the monitoring of a constant flow of 'fresh stocks' in one's

⁹ Cf. Zuckerman (1994), p.27.

portfolio may create a more varied and novel experience than a buy and hold strategy".¹⁰

Although some biases relate directly to specific heuristics, other biases stem from a variety of factors. Among the most important biases that do not stem directly from specific heuristics is overconfidence.

6. Combining effects: Overconfidence

Some biases stem from a variety of factors and not only from one type of heuristic simplification. Overconfidence and the overconfidence effect is a well-established and probably the most widely studied behavioral bias of this type. Overconfidence is the tendency for people to overestimate their knowledge, abilities and the precision of their information, as well as their capacity to estimate future events and their capacity to control it.

Overconfidence manifests itself in different forms: miscalibration, better-than-average effect, illusion of control and excessive optimism.

6.1. Miscalibration

Miscalibration is a bias in which someone's subjective confidence in their judgments is reliably greater than their objective accuracy, especially when confidence is relatively high (cf. Lichtenstein et al. 1982). The overconfidence manifests itself by the miscalibration of subjective probabilities. More precisely, if someone is asked to

¹⁰ Cf. Grinblatt and Keloharju (2009), p.556.

define a $x\%$ confidence interval for the correctness of the answers to a set of questions, then proper calibration implies that about $x\%$ of the times the answers are correct. Empirical tests show that the confidence intervals that individuals usually provide are too narrow, resulting in correct answers lying within the confidence interval less often than an accurate sense of one's limitation would imply. In the Fischhoff et al. (1977) study, events that individuals believe to be certain to occur actually occur only about 80% of the time, while events that people consider impossible to happen occur about 20% of the time.

6.2. Better-than-average effect

In addition to faulty precision, overconfidence may also manifest by people's unrealistic tendency to believe that their abilities, knowledge and overall capacity to analyze available information are better than average.

Perhaps the most celebrated better-than-average finding is Svenson's (1981) finding that 93% of American drivers rate themselves as better than the median.

Cannell's (1989) survey on the American schools reported achievements described that 48 of the 50 US states scored above the national norm, while 90% of elementary schools and 80% of secondary schools exceeded the national norm. The frequency with which school systems claim their students outperform national averages has been dubbed the "Lake Wobegon" effect¹¹.

¹¹ Lake Wobegon effect is named after the fictional town with the same name used by Garrison Keillor in his famous radio show. In Keillor's weekly monologue the closing words are "Well, that's the news from Lake Wobegon, where all the men are strong, all the women are good looking, and all the children are above average."

According to Ackert and Deaves (2010)¹² the better-than-average effect is likely to be connected with motivational and cognitive mechanisms. On the motivational side, thinking ourselves better than average enhances self-esteem. On the cognitive side, the performance criteria that most easily come to mind are often those where we are the best.

6.3. Illusion of control

The illusion of control is the tendency for people to overestimate their ability to control events, for instance to feel that they control outcomes that they demonstrably have no influence over. In other words, the illusion of control is overestimating the role of skill relative to luck in the determination of outcomes. Accordingly, the Illusion of control effect describes the tendency for people to behave as if they might have some control over events or outcomes when in fact they have none. Along with the optimism bias, the illusion of control is one of the positive illusions.

The effect was named by psychologist Ellen Langer (1975) and has been replicated in many different contexts: laboratory experiments, observed behavior in familiar games of chance such as lotteries, and self-reports of real-world behavior.

Thompson (1999) provides a complete explanation of why illusion of control occurs. She argues that people use a control heuristic to judge their degree of influence over an outcome. More precisely people use a simple rule to reach an estimate of one's control over achieving an outcome with two elements: one's intention to achieve the outcome and the perceived connection between one's action and the desired outcome. If one intends an outcome and perceives a connection, then

¹² Cf. P.111.

perception of personal control is high. Like most heuristics this simple rule often leads to accurate judgments but can also lead to overestimations of control because intentionality and connection can occur in situations in which a person has no control. For example, gamblers playing the slot machines pull the handles with the intention of getting a winning combination. When this action is followed by the desired outcome, a connection is established (action – outcome) and gamblers raise their levels of illusion of control. The same may also apply to investment returns.

Besides this heuristic other factors contribute to the illusion of control. Personal involvement is essential for the illusion of control because otherwise the connection can't be established. Success-oriented tasks increase illusion (because they lead people to overestimate the connection), failure experiences and the focus on losing have the opposite effect.

Those different forms of overconfidence are interconnected. For example, people tend to be overconfident about both their abilities and their knowledge. People who are overconfident about their abilities overestimate their influence over outcomes. People who are overconfident about their knowledge tend to think they know more than they actually do. In particular, people who are overconfident about their knowledge tend to establish excessively narrow confidence intervals. Such people end up being surprised at their mistakes more often than they had anticipated. However these different manifestations of overconfidence don't measure the same thing and research seems to show that they don't induce the same errors in the financial behavior of individual investors.

6.4. Overconfidence and financial decision-making

The most widely recognized consequence of overconfidence is that it induces higher trading volume. Overconfident investors, because either they overestimate the precision of the information they have, or because they think they have above average investment skills, trade more than rational investors. For De Bondt and Thaler (1995) overconfidence is the key behavioral factor needed to understand the overtrading puzzle. Odean (1998b) argues that the high level of trading volume is the most important effect of overconfidence. Statman et al. (2006) presents empirical evidence for the US market and argues that trading volume is particularly higher after high returns, as investment success increases the degree of overconfidence. Barber and Odean (2000) investigates the performance of 60,000 discount brokerage investors. The authors split the sample into quintiles of portfolio turnover. Results show that those trading the most have lower average monthly return. The evidence reported by the authors suggests that the traders were often conducted by misinformation of overconfident investors.

Two different dimensions of overconfidence may have this impact on the trade behavior of individual investors. Investors may be overconfident in the sense that they underestimate the volatility of financial assets and as a consequence trade more. Those investors show a miscalibration bias. This approach is presented in Daniel et al. (1998) who models overconfidence as the degree of underestimation of the variance of information signals.

On the other hand, investors may also be overconfident regarding their investment skills, particularly investors with high past performance. The intuition behind this argument is that the accumulation of successful market investments makes

investors increasingly overconfident and consequently makes them trade more. Due to a self-attribution bias, investors think they are above average (better than average bias) regarding their investment skills. This finding is consistent with the hypothesis that a higher degree of overconfidence leads to higher trading volume if we accept that high past returns are positively correlated with overconfidence. This better than average trading effect has been documented empirically by Glaser and Weber (2007) who provide evidence of a higher trading propensity by overconfident investors when they identify overconfident investors as those who think they are above average in terms of investment skills or past performance. This finding is consistent with other recent studies (see Deaves et al. 2009, Graham et al. 2009). In the same line of research, Barber and Odean (2001) claims that overconfidence is much higher among men than among women and that explains why men trade more than women.

Beside this trading effect, overconfidence has also been associated with excessive risk taking. Empirical work by Dorn and Huberman (2005) and Nasic and Weber (2010) seems to indicate that overconfident investors are more prone to take on risk for which there is no apparent return benefit.

Overconfidence may also affect the impact of information on individuals' trading behavior. Forbes and Kara (2010) argues that individual investors' self-confidence mediates how investment financial knowledge influences investors' trading efficacy, and Abreu and Mendes (2012) find that the more overconfident and non-overconfident investors invest in information the more they trade, but the trading behavior is sensitive to the sources of information used. Overconfident investors trade less frequently when they collect information via friends and family, and non-overconfident investors trade more frequently when they use specialized sources of information. But Kirchler's

(2010) experimental results show the opposite conclusion: the persistent underperformance of weak informed investors is not due to overconfidence.

7. Concluding remarks

Throughout this section I have presented and discussed behavioral biases, with a special focus on financial markets. Those biases have already been studied empirically, but most of the existing empirical literature uses experimental economics and surveys, and only a handful of papers use real data from individual investors' trading activity. In the second part of this lesson I use data from a big Portuguese bank with information on trades by individual investors in financial instruments, spanning a 10-year period, and a survey from the CMVM to test whether non-rational motives did have any impact on individual investors' behavior in the Portuguese market for warrants.

References

Abreu, M. and V. Mendes (2010), "Financial Literacy and Portfolio Diversification", *Quantitative Finance* 10(5), 515-528.

Abreu, M. and V. Mendes (2012), "Information, Overconfidence and Trading: Do the Sources of Information Matter?", *Journal of Economic Psychology* 33, 868-881.

Abreu, M. and V. Mendes (2013), "The Investor In Structured Products: Marketing Driven or Gambling Oriented?", Working paper.

Abreu, M., V. Mendes, J. Santos (2011), "Home Country Bias: Does Domestic Experience Help Investors Enter Foreign Markets?", *Journal of Banking and Finance* 35(9), 2330-2340.

Ackert, L. and R. Deaves (2010), *Behavioral Finance: Psychology, Decision-Making, and Markets*, International Edition, South-Western Cengage Learning, 392 p.

Andreassen, P. and S. Kraus (1990), "Judgemental extrapolation and the salience of change", *Journal of Forecasting* 9, 347-372.

Ariely, D. (2008), *Predictably Irrational*, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions, New York, HarperCollins Publishers, 280 p.

Bailey, W., A. Kumar and D. Ng (2008), "Foreign Investments of US Individual Investors: Causes and Consequences," *Management Science* 54(3), 443-459.

Bailey, W., A. Kumar and D. Ng (2011), “Behavioral Biases of Mutual Fund Investors”, *Journal of Financial Economics* 102(1), 1-27.

Barber, B. and T. Odean (2000), “Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors”, *Journal of Finance* 55(2), 773-806.

Barber, B. and T. Odean (2001), “Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment”, *Quarterly Journal of Economics* 116(1), 261–292.

Barber, B. and T. Odean (2008), “All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors”, *Review of Financial Studies* 21(2), 785-818.

Barber, B., Y. Lee, Y. Liu, and T. Odean (2009), “Just How Much Do Individual Investors Lose by Trading?”, *Review of Financial Studies* 22, 609–632.

Barberis, N., M. Huang and T. Santos (2001), “Prospect Theory and Asset Prices”, *Quarterly Journal of Economics* 116(1), 1–53.

Barberis, N. and W. Xiong (2009), “What Drives the Disposition Effect? An Analysis of a Long-Standing Preference-Based Explanation”, *Journal of Finance* 64(2), 751-784.

Bernard, C., P. Boyle and W. Gornall (2010), “Locally-Capped Investment Products and the Retail Investor”, Working Paper, available at SSRN.

Bracha, A. and D. Brown (2012), “Affective Decision-Making: A Theory of Optimism Bias”, *Games and Economic Behavior* 75(1), 67-80.

Busemeyer, J., I. Myung and M. McDaniel (1993), "Cue Competition Effects: Empirical Tests of Adaptive Network Learning Models", *Psychological Science* 4(3), 190–195.

Calvet, L., J. Campbell and P. Sodini (2009), "Fight or Flight? Portfolio Rebalancing by Individual Investor", *Quarterly Journal of Economics* 124(1), 301–348.

Campbell, J. (2006), "Household Finance", *Journal of Finance* 61, 1553-1604.

Cannell, J. (1989), *How Public Educators Cheat on Standardized Achievement Tests: The 'Lake Wobegon'*", Friends for Education, USA, 112 p. ASIN: B0006ET5KQ. Christelis, D., T. Japelli and M. Padula (2010), "Cognitive Abilities and Portfolio Choice", *European Economic Review* 54, 18-38.

Christiansen, C., J. Joensen and J. Rangvid (2008), "Are Economists More Likely to Hold Stocks?", *Review of Finance* 12(3), 465–496.

Coval, J. and T. Shumway (2005), "Do Behavioral Biases Affect Prices?", *Journal of Finance* 60, 1-34.

Coval, J. and T. Moskowitz (1999), "Home bias at home: Local equity preference in domestic portfolios", *Journal of Finance* 54(6), 2045-2073.

Damásio, A. (2011), "O Erro de Descartes: Emoção, Razão e Cérebro Humano", *Temas e Debates*, Circulo de Leitores, Lisboa, Portugal, 380 p.

Daniel, K., D. Hirshleifer and A. Subrahmanyam (1998), "Investor Psychology and Security Market Under- and Overreactions", *Journal of Finance* 53(6), 1839–1885.

DaSilva, A. and C. Giannikos (2004), “Higher Risk Aversion in Older Agents: Its Asset Pricing Implications”. Paper presented at the Financial Management Association 2005 conference, Chicago. Available at SSRN.

Deaves, R., E. Lüders and G. Luo (2009), “An Experimental Test of the Impact of Overconfidence and Gender on Trading Activity”, *Review of Finance* 13(3), 555–575.

DeBondt, W. (1993), “Betting on Trends: Intuitive Forecasts of Financial Risk and Return”, *International Journal of Forecasting* 9, 355-371.

DeBondt, W. and R. Thaler (1995), “Financial Decision-making in Markets and Firms: A Behavioral Perspective”, in R. Jarrow, V. Maksimovic and W. Ziemba (eds.), *Handbooks in Operations Research and Management Science: Finance*, Amsterdam: Elsevier. Dhar, R. and N. Zhu (2002), “Up Close and Personal: An Individual Level Analysis of the Disposition Effect”, Yale ICF Working Paper 02-20.

Dorn, D. and G. Huberman (2005), “Talk and Action: What Individual Investors Say and What They Do”, *Review of Finance* 9(4), 437-481.

Dorn, D. and P. Sengmueller, (2009), “Trading as Entertainment?”, *Management Science* 55(4), 591–603.

Edmans, A., D. Garcia and O. Norli (2007), “Sports Sentiment and Stock Returns”, *Journal of Finance* 62(4), 1967–1998.

Elster, J. (1998), “Emotions and Economic Theory”, *Journal of Economic Literature* 36, 47-74.

Fischhoff, B., P. Slovic and S. Lichtenstein (1977), "Knowing With Certainty: The Appropriateness of Extreme Confidence", *Journal of Experimental Psychology: Human Perception and Performance* 3, 552–564.

Fiske, S. (1998), "Stereotyping, Prejudice, and Discrimination", in D. Gilbert, S. Fiske and G. Lindzey (eds.), *The Handbook of Social Psychology*, 4th Ed., Vol. 1. New York: McGraw-Hill, 357-411.

Forbes, J. and M. Kara (2010), "Confidence Mediates How Investment Knowledge Influences Investing Self-efficacy", *Journal of Economic Psychology* 31, 435–443. French, K. and J. Poterba (1991), "Investors' Diversification, and International Equity Markets", *American Economic Review* 81, 222–226.

Gilovich, T. (1981), "Seeing the Past in the Present: The Effect of Associations to Familiar Events on Judgments and Decisions", *Journal of Personality and Social Psychology* 40, 797-808. Glaser, M. and M. Weber (2007), "Overconfidence and Trading Volume", *Geneva Risk Insurance Review* 32, 1–36. Goetzmann, W. and A. Kumar (2008), "Equity Portfolio Diversification", *Review of Finance* 12(3), 433–463.

Goetzmann, W. and M. Massa (2003), "Disposition Matters: Volume, Volatility and Price Impact of a Behavioral Bias", NBER Working Paper 9499.

Graham, J., C. Harvey and H. Huang (2009), "Investor Competence, Trading Frequency, and Home Bias", *Management Science* 55(7), 1094–1106.

Grinblatt, M. and M. Keloharju (2001), "What Makes Investors Trade?", *Journal of Finance* 56(2), 589-616.

Grinblatt, M. and M. Keloharju (2009), "Sensation Seeking, Overconfidence, and Trading Activity", *Journal of Finance* 64(2), 549–578. Hirshleifer, D. (2001), "Investor Psychology and Asset Pricing", *Journal of Finance* 56(4), 1534-1597.

Hirshleifer, D. and T. Shumway (2003), "Good Day Sunshine: Stock Returns and the Weather", *Journal of Finance* 58(3), 1009-1032.

Hirshleifer, J. (1987), "On the Emotions as Guarantors of Threats and Promises", in J. Dupre (ed.): *The Latest on the Best: Essays on Evolution and Optimality*, MIT Press, Cambridge, Massachusetts, 384 p., ISBN: 0262040905.

Isen, A. T. Nygren and G. Ashby (1988), "Influence of Positive Affect on the Subjective Utility of Gains and Losses: It Is Just Not Worth the Risk", *Journal of Personality and Social Psychology* 55(5), 710-717. Kahneman, D. (2003), "Maps of Bounded Rationality: Psychology for Behavioral Economics", *American Economic Review* 93(5), 1449-1475.

Kahneman, D. (2011), *Thinking, Fast and Slow*, New York: Farrar, Straus and Giroux, 490 p.

Kahneman, D. and A. Tversky (1973), "On the Psychology of Prediction", *Psychological Review* 80, 237-251.

Kahneman, D. and A. Tversky (1974), "Judgment under Uncertainty: Heuristics and Biases", *Science, New Series*, 185 (4157), 1124-1131.

Kahneman, D. and A. Tversky (1979), "Prospect Theory: An Analysis of Decision Under Risk", *Econometrica*, 263-292.

Kahneman, D. and A. Tversky (1982), "Subjective Probability: A Judgment of Representativeness", in Kahneman, Slovic and Tversky (eds), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge: Cambridge University Press, 32-47.

Kahneman, D., J. Knetsch and R. Thaler (1990), "Experimental Tests of the Endowment Effect and the Coase Theorem", *Journal of Political Economy* 98(6), 1325-1348.

Kirchler, M. (2010), "Partial Knowledge Is a Dangerous Thing – On the Value of Asymmetric Fundamental Information in Asset Markets", *Journal of Economic Psychology* 31, 643–658.

Lakonishok, J. and S. Smidt (1986), "Volume For Winners and Losers: Taxation and Other Motives For Stock Trading", *Journal of Finance* 41(4), 951-974.

Langer, E. (1975), "The Illusion of Control", *Journal of Personality and Social Psychology* 32, 311-328. Lichtenstein, S., B. Fischhoff and L. Phillips (1982), "Calibration of Probabilities: The State of the Art to 1980", in Kahneman, D., P. Slovic and A. Tversky (eds), *Judgment Under Uncertainty: Heuristics and Biases*, Cambridge: Cambridge University Press, 1982.

Lo, A., D. Repin and B. Steenbarger (2005), "Fear and Greed in Financial Markets: A Clinical Study of Day-Traders", NBER Working Paper 11243.

Loewenstein, G. (2000), "Emotions in Economic Theory and Economic Behavior", *American Economic Review* 90(2), 426–432.

Lusardi, A. and O. Mitchell (2009), "How Ordinary Consumers Make Complex Economic Decisions: Financial Literacy and Retirement Readiness", NBER Working Paper 15350.

Mendes, V. (2012), "The Investor in Warrants", CEFAGE-UE Working Paper 2012/19.

Mosteller, F. and J. Tukey (1977), *Data Analysis and Regression*, Addison-Wesley, Reading, Massachusetts.

Muermann, A. and J. Volkman (2007), "Regret, Pride, and the Disposition Effect", Pension Research Council of the Wharton School of the University of Pennsylvania WP 2007-03.

Nesse, R. (2001), "Commitment in the Clinic", in R. Nesse (ed.): *The Evolution of Subjective Commitment*, Russell Sage Press, New York.

Nicolaus, D. (2010), "Derivative Choices of Retail Investors: Evidence from Germany", Working Paper.

Nosic, A. and M. Weber (2010), "How Riskily Do I Invest? The Role of Risk Attitudes, Risk Perceptions, and Overconfidence", *Decision Analysis* 7(3), 282-301.

Odean, T. (1998a), "Are Investors Reluctant to Realize Their Losses?", *Journal of Finance* 53(5), 1775-1798.

Odean, T. (1998b), "Volume, Volatility, Price, and Profit When All Traders Are Above Average", *Journal of Finance* 53(6), 1887–1934.

Odean, T. (1999), "Do Investors Trade Too Much?", *American Economic Review* 89, 1279–1298.

Ofir, M. and Z. Wiener (2012), "Investment in Financial Structured Products From a Rational and Behavioral Choice Perspectives", Working paper, available at SSRN: <http://ssrn.com/abstract=2193282>.

Rottenstreich, Y. and C. Hsee (2001), "Money, Kisses and Electric Shocks: On the Affective Psychology of Risk", *Psychological Science* 12(3), 185–90.

Schmitz, P., M. Glaser and M. Weber (2009), "Individual Investor Sentiment and Stock Returns - What Do We Learn from Warrant Traders?", Working Paper, available at SSRN <http://ssrn.com/abstract=923526> .

Schneider, F., J. Gruman and L. Coutts (2012), *Applied Social Psychology* (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Seru, A., T. Shumway and N. Stoffman (2010), "Learning By Trading", *Review of Financial Studies* 23(2), 705-739.

SFC (2006). "Warrant Investor Survey," Securities and Futures Commission, Hong Kong. Available at:
http://www.sfc.hk/sfc/doc/EN/speeches/public/surveys/06/06pr43_report.pdf.

Shafir, E., P. Diamond and A. Tversky (2012), "Money Illusion", *Quarterly Journal of Economics* 112(2), 341-374.

Shapira, Z. and I. Venezia (2001), "Patterns of Behavior of Professionally Managed and Independent Investors", *Journal of Banking and Finance* 25(8), 1573-1587.

Shefrin, H. (2002), *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*, Oxford University Press, 368 p.

Shefrin, H. and M. Statman (1984), "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence", *Journal of Finance* 40(3), 777-790.

Shefrin, H. and M. Statman (1993), "Behavioral aspects of the design and marketing of financial products", *Financial Management*, 22, 123-134.

Shiller, R. (2000), *Irrational Exuberance*, Princeton University Press, Princeton, New Jersey, ISBN 0-691-05062-7, 344 p.

Slovic, P. and E. Peters (2006), "Risk Perception and Affect", *Current Directions in Psychological Science* 15(6), 322-325.

Slovic, P., M. Finucane, E. Peters and D. MacGregor (2004), "Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality", *Risk Analysis* 24(2), 311–322.

Statman, M., S. Thorley and K. Vorkink (2006), "Investor Overconfidence and Trading Volume", *Review of Financial Studies* 19, 1531–1565.

Strong, N. and X. Xu (2003), "Understanding the Equity Home Bias: Evidence From Survey Data", *Review of Economics and Statistics* 85(2), 307–312.

Summers, B. and D. Duxbury (2012), "Decision-dependent Emotions and Behavioral Anomalies", *Organizational Behavior and Human Decision Processes* 118(2), 226-238.

Svenson, O. (1981), "Are We All Less Risky and More Skillful Than Our Fellow Drivers?", *Acta Psychologica* 47, 143-148.

Taylor, S. and J. Brown (1988), "Illusion and Well Being: A Social Psychology Perspective on Mental Health", *Psychological Bulletin* 103, 193–210.

Thaler, R. (1980), "Toward a Positive Theory of Consumer Choice", *Journal of Economic Behavior and Organization* 1, 39-60.

Thaler, R. (1999), "Mental accounting matters", *Journal of Behavioral Decision Making*, 12, 183-206.

Thaler, R. and E. Johnson (1990), "Gambling With the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice", *Management Science*, 36(6), 643-660.

Thompson, S. (1999), "Illusions of Control: How We Overestimate Our Personal Influence", *Current Directions in Psychological Science* 8(6), 187-190.

Thorndike, E. (1920), "A Constant Error in Psychological Ratings", *Journal of Applied Psychology* 4, 469-477.

Trivers, R. (1991), "Deceit and Self-deception", in R. Robinson and L. Tiger (eds): *Man and Beast Revisited* (Smithsonian Press, Washington DC).

Tversky, A. and D. Kahneman (1971), "Belief in the Law of Small Numbers", *Psychological Bulletin* 76(2), 105–110.

Tversky, A. and D. Kahneman (1974), "Judgment Under Uncertainty: Heuristics and Biases", *Science, New Series*, 185(4157), 1124-1131.

Tversky, A. and D. Kahneman (1981), "The Framing of Decisions and the Rationality of Choice", *Science* 211, 453-458.

Tversky, A. and D. Kahneman (1986), "Rational Choice and the Framing of Decisions", *The Journal of Business* 59(4), Part 2: The Behavioral Foundations of Economic Theory, S251-S278.

Tversky, A., and D. Kahneman (1992), "Advances in Prospect Theory: Cumulative Representation of Uncertainty", *Journal of Risk and Uncertainty* 5, 297–323.

Weber, M. and C. Camerer (1998), "The Disposition Effect in Securities Trading: An Experimental Analysis", *Journal of Economic Behavior and Organization* 33(2), 167–184.

Wright, W. and G. Bower (1992), "Mood Effects on Subjective Probability Assessment", *Organizational Behavior and Human Decision Processes* 52(2), 276–291.

Zuckerman, M. (1994), *Behavioral Expressions and Biosocial Bases of Sensation Seeking*. Cambridge University Press, Cambridge, UK. ISBN: 9780521437707.

Departamento de Economia

ISEG/ULisboa

Rua Miguel Lupi, 20-1º - 1249-078 Lisboa

Tel.: (351) 21 392 28 23 – Fax: (351) 21 392 28 08

depeco@iseg.ulisboa.pt – <http://www.iseg.ulisboa.pt>