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Cognitive biases and instability of preferences in the portfolio choices of retail investors

Policy implications of behavioural finance

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COGNITIVE BIASES AND INSTABILITY OF PREFERENCES IN THE PORTFOLIO CHOICES OF RETAIL INVESTORS

Policy implications of behavioural finance

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Abstract

Classical financial theory assumes that individuals are perfectly rational and act by using complete and homogeneous information sets. For a long time, this has been used both on descriptive and normative grounds. However, empirical research has shown that investors systematically commit reasoning or preference errors hard to reconcile with the rationality assumption. These errors are reflected in "behavioural anomalies" that lead retail investors to low participation in the equity market, perception errors of the risk-return relationship, poor portfolio diversification and excessive trading. This paper surveys and discusses the insights of behavioural finance that help us to understand observed anomalies using the theoretical apparatus of cognitive psychology and experimental evidence. These insights, by providing a review of the real perceptions of phenomena and the psychological and irrational components at the basis of individual choices, may be helpful to strengthen the efficiency of financial regulation and supervision. In particular, financial education in a behavioural vein can be used to improve investors' capacity to judge and to raise their understanding of the most serious behavioural "traps". The contents and presentation format of disclosure on the characteristics of financial products also lay themselves open to be geared to the prescriptions of behavioural finance. Finally, financial advice is an indispensable supplement for guiding investors to make decisions that best serve their interests and for strengthening the efficiency of financial regulation; financial advisors should therefore endeavour to help customers to contain the most common behavioural errors. The purpose of this work is to stimulate debate on the behavioural analysis of the above mentioned policy issues, in order to strengthen the efficiency of instruments made available to investors to understand the characteristics of financial products.

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* Consob, Divisione Studi Economici. The opinions expressed in this work are those of the author and may not necessarily reflect the views of Consob.

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1. Introduction

The traditional finance theory on portfolio choices and price setting on the financial markets assumes that individuals are perfectly rational and act by using complete and homogeneous information sets. For a long time, it has been used both to define optimal behaviours and to explain actual behaviours.

However, empirical research denied the assumption of efficient markets and of investor rationality. On the contrary, it seems that investors regularly commit reasoning and preference errors hard to reconcile with the rationality assumption of choices. The empirical and experimental research brought to light the limits of the classical theory in describing an investor who not only is not able to use all the information available but is even subject to errors of perception and processing of the information itself.

Behavioural finance explained these errors using the theoretical apparatus and experimental evidence of cognitive psychology, i.e. the study of information processing methods. Even though presented in contrast with classical financial theory, behavioural finance is on a different epistemological level, aiming at explaining (rather than establishing norms for) behaviours (Rigoni, 2006). Moreover, there is an increasingly shared view that the two strands of the literature – classical and behavioural – should be used in a complementary fashion for a greater understanding of individual choices and of aggregate economic phenomena.[1]

Behavioural finance explored several issues: the first concerned the assumption of efficient financial markets, later followed by investigations on the equity premium puzzle, on the forward-discount bias reported on foreign-exchange markets and on the volatility trend of the option and commodity futures market. Most recently the analysis focused on corporate finance and, in particular, the distribution of dividends, acquisitions and IPO underpricing. At microeconomic level, behavioural finance concentrated upon the choices of institutional and retail investors and of financial analysts.[2]

This work reviews the contributions of behavioural finance to the analysis of retail investors' portfolio choices, by evaluating at the same time the instruments that may be useful for correcting, or at least for containing the most common behavioural errors. More specifically, after mentioning briefly the deviations from rationality observed in the behaviours of retail investors (§2), the errors reported by the scholars of behavioural finance and the main descriptive theories of the individual's decision-making process (§ 3) are reviewed. We discuss below how observed anomalies and risk perception by retail investors

[1] See, for example, the Financial Times of 4 January 2010, "*More respect for behavioural studies*", which underlines, among other things, the need to give a significant drive to behavioural finance for the purposes of an appropriate integration with the classical theory approach.

[2] For a survey of behavioural studies see Barberis and Thaler (2003).

can be explained through the framework of behavioural finance (§ 4). Paragraph 5 analyses the main correction tools of cognitive biases, both with regard to investor education and transparency, as implemented by financial markets regulators, and with regard to the development of a financial advising activity consistent with the suggestions of behavioural finance. Paragraph 6 concludes.

2. Anomalies in the choices of retail investors

Empirical research showed several departures of investors' behaviour from the prescriptions of classical theory. First, the participation rate in the financial market, and more precisely in the equity market, is lower than that predicted by normative portfolio choice models: this departure cannot be easily explained even when individual risk aversion, socio-economic factors (income, financial market entry and transaction costs) and macro-economic factors, such as financial crises, are taken into account. Moreover, individuals owning financial assets tend to hold portfolios which are strongly biased towards a specific type of asset, issuer or geographical area.

The asset allocation puzzle is another of the most documented deviations from the prescriptions of the standard theory (Canner *et al.*, 1997). According to the mutual-fund separation theorem, given the three main classes of financial assets corresponding to cash (risk free), bonds and stocks, individual risk aversion should affect only the portfolio share held in riskless assets but not the composition of risky assets, which should be the same for all investors. Financial advisers, however, tend to recommend a higher ratio of bonds to stocks as risk aversion and the reference time horizon increase. This behaviour cannot be explained after removing the most restrictive assumptions at the basis of the theory, i.e. after introducing a multiperiod horizon, the possibility of short selling and the assumption that all assets are risky.

Under-diversification is a further feature conflicting with the standard framework. An extensive body of evidence shows that poor diversification results from the application of extremely simple rules, such as equally allocating the portfolio to each of the n available options or increasing the number of securities held rather than choosing very different, and hence slightly correlated, securities.[3] This phenomenon exhibits a certain stability over time, even if the progressive decrease in average correlation among securities and the reduction of transaction costs have increased the advantages of diversification (Rigoni, 2006).

Household portfolios are also "home biased" (French and Poterba, 1991; Baxter and Jermann, 1997) since they are mainly concentrated on domestic securities; such a bias is even stronger for those investors allocating most of their wealth to their own company stocks

[3] See Benartzi and Thaler (2001), Goetzmann and Kumar (2005) and Polkovnichenko (2005).

(Hubermann, 1999). This behaviour is inconsistent with the normative implications of the traditional theory and with the empirical evidence showing the greater efficiency of internationally diversified portfolios.

Another deviation from the rationality assumption arises from excessive trading: investors sell too quickly the securities with positive performance (winners) and hold for too long the securities with negative performance (losers; Barber and Odean, 2000). This attitude, called disposition effect by Shefrin and Statman (1985), still holds when the circumstances that can justify trading – such as liquidity needs, the need to re-balance the portfolio composition or tax factors – are taken into account, nor does it reflect the investors' expectations on the prospective trend of securities, given that – for a long period after the sale – winners record better performances than the losers kept in the portfolio (Odean, 1998a).[4] More active traders, bearing on average a return below that of the standard benchmarks, are also those who acquire more information (Odean, 1998b). Moreover, gender differences seem to be significant since men are more prone to trading than women (Biais *et al.*, 2005).

Evidences of the mentioned anomalies were collected also with reference to the Italian case: Guiso and Jappelli (2006) examine the portfolio performance for a sample of accounts at an Italian intermediary and find that the most informed individuals who traded more frequently held less diversified portfolios and underperformed. Alemanni and Franzosi (2006) focus on the behaviour of traders on line and find evidence of losses due to inefficient portfolio choices and excessive trading.

3. Behavioural finance

Decision-making under uncertainty, including investment decisions, is based on the estimate of the probabilities of all the possible outcomes, the comparison among such outcomes and the choice of the "best" alternative. The standard economic paradigm predicts that individuals, when making such decisions, behave as if all the information was acquired and processed according to the probability theory (rationality of perceptions), preferences were pre-existent, stable and consistent (rationality of preferences) and the cognitive process led to maximise preferences subject to market constraints (rationality of process; McFadden, 1999). Such approach, however, cannot explain the anomalies documented by empirical and experimental data, whereas behavioural finance manage to do it by taking into account the cognitive biases, as well as removing the assumptions of rationality of preferences and of the decision-making process.

[4] Ferris *et al.* (1988) were among the first to document the disposition effect, by analysing the volumes of purchases and sales of a group of stocks exchanged on the NYSE and on the American Stock Exchange from 1981 to 1985. The authors verified that for a given time span the sale volumes were abnormal for securities that had recorded a positive return during the previous period.

3.1. *Cognitive biases*

Contrary to the assumption of rationality of preferences, individuals seem to acquire and process information by using a limited number of intuitive or heuristic rules; these rules, although reducing the complexity of the problems, can cause systematic and significant errors (Kahneman e Tversky; 1974).

As shown by the extensive experimental evidence, information gathering is often carried out on the basis of the heuristics of availability, whereas information processing is guided by the heuristics of representativeness and anchoring (Table 1).

TABLE 1

INFORMATION GATHERING AND PROCESSING

<table>
<tr><td rowspan="4">RATIONALITY OF PERCEPTIONS</td><td rowspan="3">STANDARD MODEL</td><td colspan="3">BEHAVIOURAL FINANCE</td></tr>
<tr><td>Information gathering</td><td colspan="2">Information processing</td></tr>
<tr><td>Availability</td><td>Representativeness</td><td>Anchoring</td></tr>
<tr><td rowspan="2">All the available information is correctly acquired and used for the estimation of probabilities according to a Bayesian process.</td><td>Familiarity</td><td rowspan="2">Probability estimates are formulated on the basis of stereotypes and familiar situations.</td><td rowspan="2">An initial assumption or an important information acts as an anchor, retaining the following adjustments.</td></tr>
<tr><td>Ease of retrieval</td></tr>
</table>

The heuristics of availability refers to the fact that individuals are influenced by the ease with which the information can come to mind. Therefore, the representation of the frequency of a certain event lays itself open to misinterpretation due to familiarity (ease of recall bias)[5], ease with which scenarios can be constructed (ease of retrieval) and presumed associations among independent events (induced correlation; Table 2).

[5] When asked to indicate the longest of two lists of names (for example of listed companies), people indicate the list including famous names despite the fact that they include the same numerb of items.

TABLE 2

HEURISTICS AND COGNITIVE BIASES

Heuristics	Biases	Example
Availability		
Familiarity (ease of recall bias)	Individuals assess the frequency, probability, or likely of an event by the degree to which instances or occurrences of that event are vivid or recent or personally experienced, thus being readily "available" in memory.	Individuals tend to purchase stocks that have higher media coverage, or that have experienced high trading volumes or significant price fluctuations (Gadarowski, 2002; Barber and Odean, 2008). Regular Surveys show that expectations on market trends are affected by the most recent trends.
Ease of retrievability/ Construction	When the event cannot be easily retrieved, scenarios have to be constructed, with the possibility of incurring in procedural errors (the structure of memory affects the process).	The likelihood of success subjectively ascribed to an industrial plan depends on the ease with which strong and weak points can be represented. Those that can be imagined with greater intensity and immediacy can determine estimation errors.
	Individuals may judge two independent events as correlated when probability assessment is based on available memories.	When considering the default probability of a company that shows certain symptoms, an analyst can try to recall cases of bankrupt companies with the same symptoms, ignoring companies that showed the same symptoms but did not go bankrupt.
Representativeness		
	It entails looking at an event and assess as to how closely it corresponds to other events as found in the general population. It implies the tendency to ignore objective frequencies.	If a detailed description of an individual's personality matches up well with one's own experiences with people of a particular profession, people tend to significantly overestimate the actual probability that the given individual belongs to that profession (see note 8).
	Tendency to ignore the sample size. The statistical properties of the law of big numbers are wrongly assigned also to small samples (the so-called gambler fallacy).	In gambling, individuals maintain that a casual event is more likely to occur if it has not occurred for a certain time.
	Tendency to ignore the regression to the mean and maintain that extreme consequences should correspond to extreme assumptions.	Expectations on stocks' trend tend to be optimistic (pessimistic) for stocks that overperformed (underperformed) the market index for a certain time.
	Conjunction fallacy. Inferring probabilities of a conjunction of two events on the basis of representativeness or availibilty heuristics can lead to overestimate the probability of the conjunction itself with respect to the probability of either of its constituents (although the probability of a conjunction cannot exceed the probability of either of its constituents).	A famous experiment considers two bets paying the same stake. In the first bet wins who draws a red ball from a box that contains 50 red balls and 50 black balls; in the second bet wins who draws in succession 7 red balls from a box containing 90 red balls and 10 black balls (after each drawing the ball returns to the box). More than 70% of the participants prefer the second to the first bet (respectively, 48 and 50% winning probability).
	Overconfidence (overestimation of one's knowledge and ability to control events) and optimism (individuals believe that the outcomes of events are better for them than for others).	Presumption to beat the market; medium-term extrapolation from short-term trends; illusion of control; under or overreaction to new information.
Anchoring		
	Conservatism	Financial analysts underreact to the new information (Shefrin, 2000).
	Overconfidence	Presumption to beat the market; medium-term extrapolation from short-term trends; illusion of control; under or overreaction to new information.
	Conjunction fallacy	See the experiment mentioned above on conjunction fallacy induced by representativeness.

Heuristics	Biases	Example
Heuristics and errors committed after making a decision		
Confirmation bias	After making a choice, the individual tends to seek evidence that confirms their existing beliefs and to ignore information that denies them.	The new information is ignored if it does not confirm the goodness of the investment made.
Hindsight	Tendency to think that one would have known actual events were coming before they happened, overestimating the possibility of preventing the events occurred. Hindsight bias lead to judge events as more predictable than they really are.	The analyses of stock-market trends tend to make any event seem predictable, even if it was actually determined by casual factors.
Endowment effect	Tendency to assign an already owned asset a value greater than the one assigned to it before taking possession of it.	Reluctance to sell portfolio securities.
Emotions		
Regret	Regret of omission: it is related to an action that the individual could have carried out but did not. Regret of commission: it is related to an action that was carried out. Often, inactivity is preferred because regret of omission is less painful than the regret of commission.	Disposition effect: selling a winning security and making a profit causes satisfaction (pride), whereas selling security at a loss causes regret (one must acknowledge that the choice was wrong). The level of satisfaction depends on the difference between what was done and what could have been done (importance of the reference point).
Attribution bias	Tendency to claim more responsibility for others for the outcomes of a wrong choice than an outside observer would. Tendency to adjust one's own opinions and choices to those of the majority in order to feel safer and to avoid conflict.	A negative return on one's own portfolio causes less dissatisfaction if it can be attributed to the financial adviser or to the general market trend.
Mental accounting		
	Economic choices are mediated by a system of mental accounts. The ways in which individuals face the various possible alternatives meet the assumption of topical account and framing effect. Accounts are closed with a frequency that distorts the measurement of gains and losses.	Separate mental accounts for purchasing different durable goods (for example, holiday home and car) can make the individual get into debt for purchasing one of them by bearing a cost greater than the return obtained on the savings that will be channelled to the other.

Representativeness heuristic describes the individuals' propensity to estimate probabilities on the basis of stereotypes and familiar situations. It can lead to neglect relevant base rates (or prior probabilities)[6] and to other cognitive biases such as insensitivity to the

[6] The most cited experiment in this regard asks two groups of subjects to indicate the profession of two individuals, A and B, respectively. As regards A, the persons interviewed must choose among the following professions: farmer; merchant; pilot; librarian; doctor. As regards B, the persons interviewed must choose among the following professions: lawyer and engineer. Only one group of persons interviewed also receives the description of some features of A and B. In particular, individual A is defined as very shy and reserved, extremely kind but not very social; a humble soul, a person who needs order and certainties, with a true passion for details. Individual B is 30 years old, married without children; very talented and passionate, very promising in his field and all his colleagues are fond of him. In general, most of the persons interviewed who received the description chose the profession of librarian for A and of engineer for B; this result does not change significantly if the frequency of the different professions in the population to which A and B belong is communicated. In the absence of descriptions, most of the persons interviewed change their own opinion after being informed about the distribution of the population per profession.

sample size; wrong application of the law of large numbers (the so-called gambler fallacy), that is the tendency to believe that future probabilities are altered by past events[7]; neglect of the phenomenon of the regression to the mean, often implying the definition of a non-existent causality between (presumed) inputs and (presumed) consequences.[8]

Finally, anchoring identifies the habit of making forecasts starting from a either a piece of information or an initial estimate, which is considered salient and therefore acts as an anchor in subsequent adjustments. This generates underreaction to new information and events. It may also result in the conjunction fallacy, that is the probability of two events occurring together (in "conjunction") is estimated to be higher than the probability of either one occurring alone (although the probability of a conjunction cannot exceed the probability of either of its constituents). Anchoring also affect the definition of the subjective probability distribution about a quantity, that is the judge of proper confidence intervals: as shown by the experimental evidence, the estimated confidence intervals are usually excessively narrow thus reflecting more certainty than is justified by the actual knowledge of the assessed quantities (so-called miscalibration).

The heuristics may also generate overconfidence and optimism. In particular, the former implies that the subjective confidence in one's own judgments is reliably greater than the objective accuracy; it derives from the apparent ease with which a forecast can be made on the basis of memories (availability), commonplaces (representativeness) and external reference points (anchoring). Overconfidence can occur in different ways: it can determine an overestimation of the variability of a phenomenon (the above mentioned miscalibration); it can foster the belief to be better than the average (better than average effect); it can cause the so-called illusion of control, that is the tendency to disregard the importance of the case when the role of personal skill is believed to be prevailing. Related to overconfidence is optimism, leading to systematically upward-biased forecasts.

Apart from the biases affecting the estimates of the probabilities and of the potential outcomes, errors invalidating the *ex post* assessment of the consequences of a decision may also occur. The confirmation bias is the tendency for people to emphasise the evidence that confirms their beliefs and to neglect or underrate the information that would lead to opposite conclusions. The hindsight bias corresponds to the retrospective analysis of the events, regarded as an easily predictable result of a series of facts (Rigoni, 2006). Finally, the endowment effect consists in the discrepancy between the value placed to a good which is owned and the value of the same good if it is to be purchased; as shown by the experimental evidence, this attitude derives from the tendency to disregard the opportunity cost of the good

[7] Kanehman and Tversky (1974) coined the expression "law of small numbers" to indicate this cognitive bias. See also Shefrin (2000).

[8] Such a bias may result in the definition of a causal relationship between the past and the future. For example, projections on stock trends tend to be optimistic for stocks that overperformed the market index for a certain time and vice versa (De Bondt and Thaler, 1985).

owned (that is the cost that should be borne for purchasing it)[9]. An alternative interpretation refers to the so-called loss aversion, which makes the regret related to the loss of an owned object greater than the satisfaction experienced through the purchase of the same object (see the following paragraph)[10].

Factors related to the emotional sphere play also an essential role in investing. The feeling of regret that the subject may experience for having made a wrong choice can lead to inactivity. Indeed, individuals strongly dislike complaining on the consequences of a wrong choice (regret of commission); as shown by the experimental evidence, this regret seems to be greater than the so called regret of omission arising from keeping off an action that would have been better to carry out[11]. Related to regret is the so called cognitive dissonance, that is the mental conflict occurring when individuals face evidence denying their beliefs. To prevent this dissonance and preserve their prejudices, individuals can adopt irrational behaviours, such as avoiding any new information, or resorting to tortuous reasoning (McFadden, 1999).[12] Linked to regret aversion is also the attribution bias, that is the tendency to over credit external factors or bad luck for bad outcomes. This also explains the attitude to follow the behaviour of the majority, in such a way as to reduce dissatisfaction and the complaints that would derive for having made wrong decisions alone.

Another bias entering into investing is the so called mental accounting, referring to the tendency for people to separate their money (income and wealth) into separate accounts based on a variety of subjective criteria, like the source of the money and the purpose for each account (Thaler, 1985 and 1989). This conflicts with the fact that money is fungible regardless of its source or of its utilisation. In particular, experimental evidence shows that

[9] It could be objected that the endowment effect is also related to the emotional value that individuals could assign to the good owned. Kahneman, Knetsch and Thaler (1990) carried out an experiment that allowed to isolate the "pure" endowment effect from the emotial value. In particular, a class of freshmen was randomly split in two groups on the day they arrived at the college. Each student of the first group found a cup in his/her room, accompanied by a note saying that it was a gift and that he/she could purchase other similar cups at the university shop for 4 dollars. The freshmen of the second group did not find any cup in their room. Shortly after, the two groups were gathered together and the students were asked to negotiate freely the cups between each other, with the purpose of checking how many dollars on average would the owners of the cup request to sell the object that they had received only one hour before, and how many dollars would the students without a cup be willing to pay on average to purchase a cup from a student who already owned it. On average, the owners of the cup were not willing to sell for less than 5.25 dollars. Students without a cup were not willing to pay an average price greater than 2.75 dollars. The mere ownership of the good seemed therefore to be enough for eliciting a value which was almost twice than that placed by the people who did not own it.

[10] The endowment effect is different from the disposition effect since it derives from the belief that the value of the asset is much higher than any price offered, regardless from the fact that a gain or a loss is realised at that price.

[11] Loomes and Sugden (1982) formalise the regret theory as an alternative theory of rational choice under uncertainty. The authors assume that individuals, when making a decision, anticipate the rejoicing and the regret they will feel if the decision turns out to be correct or wrong, respectively; they show that, although seemingly irrational, the resulting behaviour is actually consistent with the assumption of rationality.

[12] Cognitive dissonance is facilitated by the so-called focusing, that is the tendency to search only information relevant to the options taken into consideration and to ignore possible alternatives. Focusing reduces cognitive dissonance ex-post since it prevents from considering the options that could have been better (Legrenzi, 2006).

individuals make decisions after allocating money to different mental accounts. The most common approach seems to be the so-called topical account, according to which alternatives are ranked depending on their impact as to a reference point (such as current income, for instance) rather than, as predicted by the classical theory with respect to the overall economic situation (current and future income, for example, according to the so called comprehensive account approach).[13]

Individuals would separate their money into consumption accounts, related to expenses, income accounts, to which revenues are assigned, and wealth accounts, referring to the different forms of wealth held (Thaler, 1999). As regards the former, especially in the event of consumption involving combined outcomes and/or small expenditures that give pleasure, the coding of expenses can be significantly biased, since people tend to segregate them in order to maximise utility (so-called hedonic framing[14]). The origin of income is also important for the decision-making process: people seem to be prone to spend more on uses regarded as frivolous windfall income rather than regular revenues. The stock of wealth tends also to be divided in mental accounts and to be treated differently according to the liquidity of the wealth itself: cash on current accounts is prone to be spent quite easily, whereas it is more difficult for consumption to be financed by current wealth (including saving accounts and/or financial instruments), home equity or future income (even when borrowing is feasible).

Individuals assess the outcomes of their decisions more or less frequently as they close the mental accounts of reference. As shown by experimental evidence, the closure of the accounts does not follow a frequency laid down by objective and rational principles but rather mental rules which can bias the measurement of actual gains and losses. This aspect is particularly important in the context of sequential risky decisions, as investment choices, for two reasons: the frequency of the closure of the account may not be optimal[15]; moreover, the results of the previous decisions can affect the risk attitude in subsequent choices. In particular, gains may lead to an increase in risk seeking, especially when profits are perceived as a windfall (house money effect). In case of loss, risk aversion could increase; however, very significant prior losses can boost risk taking with a view to fully recover and restore the initial wealth (break even effect; Thaler and Johnson, 1990).

The theory of mental accounting provides an explanation to the "pyramid-like" approach which individuals as well as financial advisers seem to apply in portfolio choices. The pyramid of investments includes various layers, each of these corresponding to a specific goal (security, potential, etc.) and to a certain type of financial products. The lower the layer

[13] Mental accounting is consistent with Prospect theory, that, as will be detailed in the following paragraph, assumes that expected gains and losses are valued as to a reference point. In particular, Kahneman and Tversky (1984) tested experimentally that individuals tend to decide according to the topical account approach.

[14] People seem to prefer a sequence of small gains to one larger gain and, vice versa, a large loss to several small losses.

[15] For example, as we will see more in detail later, accounts relevant to equity investments tend to be closed approximately on an annual basis, which is a too short time horizon.

the safer the investment; the riskiest investments are placed at the top. Such a portfolio allocation mirrors the individuals' attitude to separate their investments between a safe and a speculative portfolio, in order to prevent the negative impact that speculative investments may have on the entire portfolio. As documented also by the experimental evidence, most of the individuals prefer to concentrate first of all on safety and then on the potential (Shefrin, 2000). Even if this approach helps to contain the losses that could derive from very risky investments thus undermining the resources allocated to essential needs, it conflicts with the standard theory prescribing a simultaneous and global optimisation process of the entire investment portfolio.

3.2. *Errors of preferences and of process*

Classical theory assumes that preferences are well behaved, defined over final wealth and independent of the way a problem is presented. Individuals are therefore able to choose the best alternative among those available; they also exhibit a constant risk attitude, that is invariant across the states of the world, being either risk seeking, risk averse or risk neutral (Table 3).

However, experimental evidence reported different violations of the assumption of rationality of preferences and of the decision-making process. In the following, the violations attributable to the certainty effect, reflection effect and framing effect will be detailed.

Individuals assign an enormous value to certainty, as shown by the experiments in which the reduction of the likelihood of a given outcome produces a greater psychological impact if the outcome is initially certain compared to the case in which it is initially only probable. In other terms, passing from a 100% probability to a 90% probability is more significant than passing from 50 to 40%. The preference for certainty induces individuals to consider extremely improbable events as impossible and extremely probable events as certain; this is also related to the difficulty in understanding the difference among probability values regarded as contiguous (events with a probability of 70, 80, 90% respectively can all be perceived as uncertain but probable events, all the same)[16]. The preference for certainty also underlies the tendency to weigh more the elimination of the risk *tout court* rather than its mere reduction[17]. Moreover, individuals tend to overrate the impact of very moderate changes in probability values at the extremes of the interval (0, 1) and to underrate the same changes in all other cases.

[16] On aggregate, the certainty effect may fuel speculative bubbles leading individuals to purchase overvalued securities, that are deemed to experience a further price rise and that they are sure to be able to sell at the right moment before the market collapses (that is, finding a greater fool).

[17] During an experiment, Kahneman and Tversky (1979) proposed the purchase of an insurance policy that would cost half of an "ordinary" policy but that, had the accident occurred, would have refund only in 50% of the cases (a premium rebate was contemplated in case of no settlement). Almost all the participants choose to buy the ordinary policy.

Due to the certainty effect, therefore, objective probabilities are weighed with weights varying along the interval (0, 1). In particular, very small probabilities are systematically overrated, with the consequence that events in the tails of the probability distribution, corresponding either to huge losses or to huge gains, have a disproportionate role in the decision-making process (overweighing of small probabilities can explain, for instance, why the same individual purchases both an insurance policy and a lottery ticket). Therefore, the certainty effect introduces a bias in the decision-making process that is different and additional to the one deriving from probability calculation errors, in that it occurs even when probabilities must not be estimated but are known.

TABLE 3

CHOICES UNDER UNCERTAINTY

	STANDARD MODEL	OBSERVED BEHAVIOURS
RATIONALITY OF PREFERENCES	The investor is rational: - gains and losses are valued with respect to total wealth (broad frame); - the "law" of diminishing marginal utility holds (non-satiation assumption); - as risk attitude, the investor can be risk-neutral, risk-averse or risk-seeking.	- The probability assessment is not linear (certainty effect) - The risk attitude is variable (reflection effect). - Influence of the format of presentation (framing effect). - Utility defined on gains/losses and not on the final wealth. - Tendency to strongly prefer avoiding losses to acquiring gains (loss aversion).
RATIONALITY OF THE DECISION-MAKING PROCESS	The investor maximises his/her utility, given his/her risk aversion, by choosing a portfolio on the efficient frontier.	Investment choices may be suboptimal compared to those prescribed by the classical theory.

In the negative domain, however, the certainty effect seems to fail given that individuals prefer a probable loss to a sure loss even if with a higher expected value. Therefore, while risk averse in the region of gains, individuals become risk-seekers in the region of losses. In other words, contrary to the standard theory predictions, gains and losses are not considered in the same way: a reflection effect causes the reversing of risk aversion/risk seeking in case of gains or losses. Moreover, risk attitude seems to change not only depending on the outcome (gains versus losses) but also depending on the result of prior decisions: whereas for classical finance, choices are related only to current wealth and not to its sources (prior losses or gains), empirical and experimental evidence show that the risk appetite may increase after a profit and decrease after a loss.

Loss aversion is related to the variability of risk attitude: it implies that given the same variation in absolute value, losses have a bigger impact than gains (according to an estimated proportion of about 2:1, as the experimental evidence points out).This aversion explains, for

instance, the refusal to accept symmetrical bets that allow to win or loose the same amount[18], or the so called taxi-driver paradox, that is the tendency to link labour supply to a target earning level (fixed in advance) which brings individuals to work longer on days of losses or insufficient gain (so as to compensate them) and to lower efforts when the state of affairs is more favorable so to allows them to optimize their earnings.Linked to loss aversion is the so-called myopic loss aversion, that is the attitude to focus on short-term outcomes, which may be regarded as safer, even when making long term decisions: this bias and the fear of suffering losses lead to allocate a sub-optimal portfolio share to those financial instruments (such as stocks) which, although more volatile in the short, would be more profitable in the long period[19].

Another phenomenon contradicting the assumption of rationality of preferences and of the decision-making process is the so-called framing effect (Kahneman and Tversky, 1979): preferences and choices vary according to the way by which the information is formulated (worded, pictured, described, categorised etc.). Framing can be carried out by the decision maker or by a third party providing the information (media, financial advisers, etc.).[20] It can derive from logical or reasoning errors, prior beliefs, wrong and/or incomplete information, overly selective analysis models that induce to adopt a single point of view, that is to say a simplistic and "selected" representation of the alternatives under scrutiny. This has some relation with the heuristics of representativeness, which brings to take simplified stereotypes as models, and availability, which relies on the first perception/interpretation of reality. The framing effect leads to narrow the definition or the presentation of an issue by focusing only on those aspects considered important (the so-called "isolation"), or to divert the attention towards an intentionally highlighted specific or one-sided interpretation (the half empty or half full glass), or to take a narrow approach of what are the objectives and criteria at stake in the issue (an investment decision can be different if the analysis focuses on the loss prospects or on the contrary on the gain prospects). With respect to investment choices, framing results in a short term bias, which may explain, for example, the inadequacy of retirement saving rates. Framing can also affect risk attitude: in particular, emphasising potential gains induces

[18] Samuelson reported his colleague's refusal to accept a bet that would have allowed him to win 200 dollars or loose 100 dollars with the same probability and his willingness to accept a sequence of 100 such bets, since the regret deriving from the loss would have been greater than the rejoicing related to the win. However, accepting the series of bets is not rational: even if the probability of a net loss decreases (without disappearing completely) as the series grows, potential loss increases. In other words, if the single lottery does not have an expected positive utility, no sequence of lotteries can have it (Rigoni, 2006).

[19] Although risk aversion is sometimes considered as a subcategory of loss aversion, some researchers underline that the first one is actually an absolute concept, leading to prefer a certain gain to a probable gain with a higher expected value, whereas the second one is a relative concept that describes the tendency for an individual (asked to choose among alternative gambles combining a potential loss to a potential gain) to request an increasing potential gain at a growing rate in connection with a constant increase in potential losses.

[20] As an example of the biases caused by framing, McNeil *et al.* (1982) is often cited. The authors presented two different descriptions of the same statistical result relevant to a surgical operation. They stated that the mortality rate in the six months thereafter a certain intervention was 10% or, in other terms, that the survival rate in the six months thereafter the intervention was 90%. Patients and doctors tended to avoid the surgical operation if the result was described in terms of mortality instead of survival.

risk aversion; vice versa, emphasising potential losses determines risk appetite and loss aversion (for a detailed analysis of these issues, refer to §5).[21]

3.3. *Descriptive theories*

Behavioural finance scholars developed different models explaining the anomalies in investment choices documented by field and experimental evidence. The prospect theory by Kahneman and Tversky (1979) breaks down choices under uncertainty in two stages: editing, when the presentation format (frame) of the options at stake plays a crucial role, and evaluation of the options (Table 4). Editing allows making the problem more tractable[22]; this stage relies on some heuristics and is prone to cognitive biases and errors of preferences which distort the perception of probabilities and of potential outcomes. As shown by the experimental data, decision-makers tend to combine the probabilities of options that they regard as basically identical; eliminate the elements common to several alternatives; simplify, often by rounding the probabilities and consequently by removing the events characterised by extremely low probabilities. These operations together with the certainty effect lead to a non-linear weighting of probabilities of which the prospect theory gives account through a properly defined weighting function. Moreover, during the editing stage, potential outcomes are ordered in terms of gains or losses depending on whether they are respectively larger or lower than a reference point previously set. Such a reference point may correspond to the purchase cost, to a previous estimate of the market value, to a target return or to any point resulting from anchoring: therefore, it may be affected by cognitive biases and by framing.

[21] In this regard, the experiment most cited in literature is the one carried out on two groups of individuals who must choose between two alternative medical programs aimed at dealing with an epidemic that runs the risk of killing 600 people (the so-called "Asian disease dilemma"). The wording with which these programs are presented to the two groups is different. More precisely, the first group is asked to choose between A that allows to save 200 persons and B that allows to save 600 persons with a 1/3 probability (but with a 2/3 probability that no one can be saved). In this wording, most of the people choose A. The second group is asked to choose between C, with which 400 persons die, and D with which no one dies with 1/3 probability (but with a 2/3 probability that all 600 can die). In this alternative wording, most of the people choose D. A and C are equal and imply a certain result; B and D are equal and imply the same expected result of A and C. A and B evoke gain prospects , in respect of which the subjects show risk aversion and prefer the certain result; C and D evoke loss prospects in respect of which the subjects are risk seeker.

[22] According to the authors, editing can be divided into six operations: coding, in which the possible results are valued as to a reference point (purchase price, for example); combination, which implies that equal results with different probabilities are combined; segregation, which allows, if possible, to separate the risk-free component from the risky one; cancellation, which leads to the elimination of components common to problems; simplification, due to which the subjects tend to round off probability and value of the results.

TABLE 4

BEHAVIOURAL FINANCE THEORIES

PROSPECT THEORY	CUMULATIVE PROSPECT THEORY	MOTIVATIONAL APPROACH
Two stages of the decision-making process: - **Editing**. It can radically bias the perceived probabilities. - E**valuation**. It ranks the potential outcomes with respect to a reference point. **Value function**: - it is defined on wealth changes compared to a reference point (i.e. losses and gains) and not on absolute wealth (narrow frame). - It is concave in the region of gains and convex in the region of losses. - It is steeper in the region of gains than in the region of losses (loss aversion). **Weighting function:** weighs the probabilities. Its properties are consistent with the observed errors of preference.	The main difference as to the prospect theory consists in the properties of the weighting function. In particular, the weighting function is assumed to: - apply the cumulated probability distribution instead of the probabilities of each outcome; - be different for gains and losses.	Decisions are influenced: - by a dispositional factor, which reflects the individual's risk attitude depending on the underlying motives which lead people to strive for security or for exploiting potential; - by a situational factor, that is the situations, the needs and the opportunities affecting the individual's aspiration level (the target outcome). In addition to the average value, individuals pay attention to the cumulated distribution of losses and gains. The need for security induces to focus on the worst outcomes which may occur; the desire for potential induces to focus on the best outcomes. Individuals' preferences toward risk result from the interplay of the dispositional and the situational factors.
Differences with expected utility theory		
Perceived probabilities, as resulting from the editing stage, can be completely different from objective probabilities. Probabilities are non-linearly weighed by means of the weighting function. The outcomes are assessed as a difference compared to a reference point (or *status quo* such as, for example, wealth at the moment of decision) and not in terms of absolute wealth. The properties of the value function are different from those of the utility function.		Risk-averse individuals are not structurally different from risk-seeker individuals. The desire for safety and for potential is common to all; the first one prevails over the second one even if the context carries out an important role. Whereas in the standard model risk depends on the probability distribution, according to the motivational approach the reference is the cumulated probability distribution function.

In the second phase of the decision-making process, that is evaluation, the alternative with the highest value is chosen. This value is computed (or at least people behave as if it were computed) through the so-called value function, corresponding to the utility function of the standard approach, whose properties reflect the most common behavioural features experimentally observed, such as the reversion of risk attitude with respect to gains and

losses[23]. In particular, the function accounts for the fact that individuals treat gains and losses differently, being (broadly speaking) risk averse in the region of gains and risk seeker in the region of losses.

A version of the prospect theory is the cumulative prospect theory which weighs cumulative probabilities by using two separate weighting functions, one for probabilities of gains and one for probabilities of losses. The theory can accommodate a variety of risk attitudes. In particular, it captures the tendency for individuals to be risk averse when potential gains are very small and very probable (as is often the case of financial investment returns) and risk lover when potential gain are large and less likely (as in the case of lotteries). Conversely, in the loss domain, the theory describes risk aversion with respect to very large and low probable losses (against which insurance can be bought) as well as risk seeking in the case of low and comparatively more probable losses.

An alternative approach emphasizing the motivations underlying individuals' choices was proposed by the psychologist Lopes (1987) and applied also with reference to portfolio choices within the Behavioural portfolio theory. According to this approach, individuals do not simply have a set risk attitude nor do they decide by taking into account the satisfaction deriving from a given outcome. Rather individuals preferences about risk, as well as the target outcome they strive for, would result from the interplay of dispositional factors (need for security and for potential) and of situational factors (the distribution of the potential outcomes). Decisions turn out to be a compromise between the desire of maximising the outcome and the need for choosing the alternative which does not engender failure or disappointment. In the investment choice framework, the behavioural efficient portfolio frontier does not coincide with the standard mean-variance frontier since return is not paired with the standard deviation but with the probability that the final wealth is lower than the set aspiration level. Unlike the mean-variance frontier, therefore, the behavioural portfolio frontier depends not only on the expected returns but also on individual aspirations (hence subjects having the same expectations can have different frontiers); moreover, expected returns can be those that individuals perceive on the basis of their state of mind[24]; finally, if aspirations are too high, no portfolio is optimal (since no portfolio can ensure that the target will be reached).

[23] The value function accommodate this behavior being concave in gains and convex in losses (both defined as wealth changes with respect to a reference point); moreover, it is steeper in losses, representing the bigger impact of losses with respect to gains having the same size (loss aversion).

[24] The desire for security induces to overstate the weight of losses; vice versa, the desire for potential induces to give more importance to gains.

4. Behavioural finance and investment choices

4.1. *Anomalies in investment choices in the light of behavioural finance*

Behavioural finance explains most of the documented anomalies in individual investment choices. The low participation rate in the equity market was analysed by Benartzi and Thaler (1995), within the debate about the equity premium puzzle.[25] By applying the prospect theory and the mental accounting framework, the authors explain why loss averse investors tend to hold a low share of portfolio in stocks. Investors seem to evaluate their portfolios too frequently (about once a year): given that in the short term returns on stocks are much more volatile than returns on bonds, loss averse individuals prefer non-equity investments (myopic loss aversion). Investors would not be averse to the great variability of the stock return, but rather to the loss they could ascertain when checking the outcomes of their investments. Given that over a one year period shares can show a yield lower than that of bonds, loss averse investors tend to ask for a "anomalously" high equity premium. This also means that investors are more sensitive to fluctuations in the stock prices than to the uncertainty related to the possibility of achieving below the target returns.

The findings of Benartzi and Thaler were applied to a multiperiod model by Barberis and Huang (2001), who in addition to assuming that the representative investor is loss averse, hypothesise that individuals follow a mental accounting rule which amplifies the negative impact of a current loss whenever the initial investment recorded negative returns. Such a dynamic aspect in the assessment of risky choices helps to accommodate the observed pattern in the average stock extra return.

Benartzi and Thaler (2001) found also that investors raise the portfolio share they are willing to hold in stocks once they are provided with information on the long term returns of stocks rather than the short term ones. In particular, the authors report that participants in 401(k) plans declared to be favourable to hold on average 80% of their retirement savings in equity funds after being shown a chart representing one-year returns for a 30-year investment in equity and bond funds, twice as much as the portfolio share chosen after being presented with a yield chart reporting annual rates of return over the same 30-year time span.

The propensity to hold poorly diversified portfolios can be interpreted in the light of the cumulative prospect theory. According to this theory, as mentioned before, the approach to risk changes depending on the probability of gains and losses; in particular, risk appetite increases with regard to high probable prospects whereas aversion prevails with regard to prospects with a very low probability of occurrence. Portfolio diversification eliminates the extreme and less probable events precluding also the chance (even if very low) of making

[25] The equity premium puzzle refers, as known, to the fact that the average extra return of stocks against short-term treasury bills observed over the last century is too large (about 5%), thus suggesting an apparently excessive risk aversion by investors (see the seminal paper by Mehra and Prescott, 1985).

significant returns. Therefore, the application of the cumulative prospect theory could explain why sometimes subjects do not diversify. This is confirmed by the study of Polkovnichenko (2005), who, by using the 1926-1996 yearly returns, simulates the returns of different hypothetical portfolios consisting respectively of a listed stock, a mutual equity fund and a short-term Treasury bill in order to compare the portfolio which would be chosen by an expected utility maximiser with the optimal portfolio under the cumulative prospect theory. According to the classical theory, the portfolio including only the equity fund is optimal; whereas the portfolio chosen under the cumulative prospect theory would allocate 15% to the equity fund, 60% to the short-term Treasury bill and 25% to stocks. The last portfolio is close to the observed choices, which on average overweigh the bond investment and include direct investment in stocks.

Poor diversification can also be explained by the Behavioural portfolio theory (Shefrin and Statman, 1997). According to this theory, given a certain goal aimed at a global level, individuals construct their portfolios with a layer-by-layer approach which combines low-risk assets in the lower layers (that, while satisfying the need for protection, do not allow reaching the goal set at a portfolio level) with extremely risky investments in the higher layers (that increase the likelihood to exploit the potential). This approach may lead to poor results being its main weakness the fact that it ignores covariances among layers.

The behavioural approach helps also to understand the home bias. Experimental evidence shows that investors use the familiarity heuristic when choosing between domestic and foreign securities, maintaining at the same time to be more competent for the former, in respect of which they exhibit optimism and overconfidence (Kilka and Weber, 2000).

Excessive trading is led by the presumption of beating the market, which in turn is fostered by overconfidence, illusion of control and optimism. The available evidence is contrasting, though: as shown by Haigh and List (2005), American professional managers do not obtain better market performances once transaction and risk costs are accounted for; moreover, with reference to different time horizons, the few managers who beat the market are not always the same; finally, past performances are not a useful indicator of future performances. This holds also with reference to retail investors: subjects who trade more obtain positive gross extra-returns that are however negative if adjusted for transaction costs and risk (Barber and Odean, 2000). Also with reference to the Italian case, the tendency for traders on line to overestimate their capability, and, as a consequence, to weigh less risk was highlighted (Alemanni and Franzosi, 2006).[26]

Overconfidence would also be at the basis of the individuals' habit to overestimate the precision of their knowledge. Odean (1998b) worked out a theoretical model in which the

[26] More clever day traders manage to obtain positive extra-returns, also net of transaction costs (Coval *et al*., 2002; Barber *et al*., 2005). However, this result is circumscribed to a very small group of most active investors (2.84% of day traders considered in the work of Barber *et al*., 2005).

expected utility of overconfident traders is lower. Guiso and Jappelli (2006) find evidence supporting this conclusion with respect to a sample of customers of an Italian intermediary. The authors estimate that the portfolios of more informed subjects record a lower performance than the portfolios of non-informed subjects; moreover, the gathering of more information turns out to be related to excessive trading, to a lower diversification and to a lower propensity to resort to a financial adviser (due to the tendency to underrate the skill and the value of the information held by others). This evidence conflicts with the classical theory, according to which more informed subjects obtain better returns given that the acquisition of information is carried out to the point at which relevant marginal costs are equal to the incremental expected benefits.

In principle, the negative results due to overconfidence should debias the individual's attitude to rely too much on his own judgment, foresight and abilities. However, according to behavioural finance scholars, this does not occur for various reasons. First of all, in case of losses, regret aversion induces to underrate one's own responsibility by attributing the mistakes to an external cause and by an *ad hoc* accounting of losses and gains. Vice versa, if the decision turned out to be profitable, it is very likely that individuals assume all the credit. Hence overconfidence increases following positive outcomes more than it decreases following negative outcomes. As a result, experience does not mitigate overconfidence that, on the contrary, tends to increase in time.

Overtrading often leads to the already mentioned disposition effect, which can be accommodated within the prospect theory. In particular, risk aversion prevails with respect to winners: therefore, investors may decide to sell even if prospects remain unchanged. On the other hand, with respect to losers the subject might be risk seeker and keep the asset even if he/she would not purchase it ex novo. Moreover, deferring the sale allows postponing the realisation of accrued losses (loss aversion): also for this reason, investors may decide not to close the mental account corresponding to the non-profitable investment.[27] This behaviour conflicts with the standard theory for two reasons: first, losses are treated differently depending on whether they are only accrued or realised; second, sunk costs, related to already made and irreversible choices, affect future decisions while they shouldn't.

The sunk cost effect, loss aversion and mental accounting lead also to "mediate" accrued losses by means of additional purchases of the losers. If the subject allocates

[27] The disposition effect can be explained also by referring to regret aversion. Investors try not to put themselves in a situation of a regret, as it would occur if the loser rose after the sale. Conversely, liquidating a winner allows to be proud. The self-control principle identifies another interpretation of the disposition effect. According to Thaler and Shefrin (1981), self-control arises from the conflict between two individual components: the rational part, the planner, and the irrational part, the doer. Investors keeping stocks on which are losing money for a long time in order to postpone regret (and selling the winners too quickly in order to be proud) act more as doers rather than as planners. Vice versa, in the opposite case, individuals show self-control and rationally minimise losses by disposing of losers. Finally, Weber and Welfens (2008) argue that the disposition effect actually results from two separate behavioural anomalies: the best securities are sold too quickly because individuals prefer to monetise the accrued gains; vice versa, the worst securities are sold too late due to loss aversion.

investments in different accounts (according to the topical account logics), he/she will be inclined to calculate accrued losses with reference to the wealth invested in the losers, rather than to the overall wealth, by also deeming it convenient to liquidate winners (realising the accrued gains) in order to purchase other losers (thus mediating the corresponding losses). This reasoning can penalise portfolio performances compared to the case in which the subject invests only on the basis of expectations on future trends and in a global portfolio perspective.

4.2. *Risk perception and risk-taking*

Risk-taking is related to risk tolerance and to risk perception. Whilst the classical financial theory assumes that risk is an objective quantity describable through symmetric measures (weighing potential gains and losses in the same way, such as variance), behavioural finance argues that risk and uncertainty are not only mathematical and statistical concepts, but also psychological constructs. The risk perception is led by emotional reactions or feelings (that often diverge from cognitive evaluations) as well as heuristics; other determinants are overconfidence and illusion of control, the level of financial literacy, positive and negative associations recalled by the financial products, trust in financial advisers and framing.

Therefore, individuals' perception are seldom aligned to objective measures and may turn into a representation which involves a biased perception of the risk-return relationship (Mertz, Slovich and Purchase, 1998; Slovich, 2000). In particular, it seems that the measures that better represent the perceived risk are asymmetric because, as made explicit also by the loss aversion feature, for most individuals risk is related to the probability of loss or to its potential maximum value rather than to the positive profile of volatility of returns. The symmetric risk measures proposed by the literature, such as variance, may therefore be not aligned to the subjective perception.[28]

As documented by the experimental evidence, the perceived risk shows a low correlation with the variance of returns, whereas it is perfectly and negatively correlated to the degree of understanding of the products declared by the subjects. Products are rated as easy-to-understand when there are familiar or prevalent: for example, as shown by Wang *et al.* (2009), individuals may consider purchasing a house less risky than investing in a real-estate fund. Therefore, while poor financial literacy can lead to overestimate the risk, the opposite can occur when people perceive to be knowledgeable. A survey carried out with reference to a panel of 2000 Dutch households shows that portfolio choices are guided mainly by

[28] Rigoni (2006) cites different asymmetric measures of risk, such as lower partial moments (LPMs) and Value-at-risk (VaR). The first measures are obtained by considering only below-the-target returns (being the target a null return, a given benchmark or the risk free rate); these indicators are not consistent however with the assumption of risk seeking. VaR, which, as known, estimates the maximum loss which can occur with a certain level of confidence over a given time span, captures a tail of the cumulated distribution of probability and, in this sense, is more consistent with what is maintained by the motivational approach (see §3.3).

asymmetric risk measures rather than by variance (Veld and Veld-Merkoulova, 2007). More precisely, consistently with the documented loss aversion, most of the individuals seem to act as if they appraised risk first on the basis of the semi-variance and, secondly, the probability of loss; the amount of the expected loss and variance followed. The (implicit) sensitivity to a specific risk measure seemed to depend on the type of financial products, being semi-variance mainly related to investments in stocks and the loss probability to investments in bonds. The study also documented the misalignment between the benchmark declared by the investors, used for assessing the investment carried out, and the one implied in the observed choices. The declared benchmarks are the initial value of the investment, the risk-free rate and the return of a market index. The ranking of the "actual" benchmarks, however, gives more importance to the market index return, followed by the initial value of the investment and by the risk-free rate; anyway, the initial value is the first indicator for larger investments.

Olsen (1997) pointed out that investors tend to emphasise the eventuality of obtaining a below-the-target return. In particular, the main risk attributes seem to be the possibility of heavy losses, the ability of managing losses and the level of financial literacy. Consistently with the predictions of the prospect theory, Olsen (1997) has also shown that when an investment decision is described in terms of potential gains, individuals are risk adverse and prefer financial assets with low volatility and lower returns. Vice versa, they are risk oriented when the same decision is described in terms of potential losses, since they are willing to accept a higher volatility that potentially allows obtaining higher profits.

Diacon and Ennew (2001) asked a sample of English investors to assess 20 different financial products. They found that the variability of risk perception was explained mainly by mistrust in financial advisers and/or in the issuers of the product, loss aversion, poor financial literacy and perception of low legal protection.

The perception of the risk-return relationship can also be biased by the heuristics and emotional factors. There is evidence that when judging the risk-return profile, investors formulate an overall "good/bad" opinion mainly on the basis of the feelings they have towards an asset. When they have positive feelings, they tend to rationalize their impression by considering the asset as highly beneficial and riskless; vice versa, when they have a negative attitude, they consider it as risky and offering few benefits.[29] Positive feelings seem to be guided especially by familiarity, which would stimulate an emotional reaction of appreciation. This reaction would be at the basis of the investors' global attitude towards assets on which they have no information but to which they have been "exposed" in some way (Ganzach, 2000). The sign of the risk-return relationship seems to be correctly judged when enough information is provided; in this case, it is the perceived risk and return which guide the global

[29] Experimental evidence shows also that the perception of a negative relation between risk and return becomes stronger if the subjects do not have much time to decide, because in this circumstance emotional and intuitive factors prevail over analytical and "rational" analysis (Wang *et al*., 2009).

attitude towards products (rather than the contrary). Similar findings were reported also by other studies (inter alias, Statman *et al.*, 2008).

Emotional factors can be a powerful basis upon which people gauge the worth of securities. For example, the pharmaceutical market sector can recall the concepts of healing or hygiene that, in turn, could stimulate a positive assessment of the securities belonging to that sector. The role of the imagery and affect was shown by MacGregor *et al.* (2000) who asked a group of students to take note of the first three images recalled by the names of 40 industry groups listed on the New York Stock Exchange, classify them on the basis of the yearly performance of the previous year and of the expected performance for the following year and assess the likelihood that they would invest in companies associated with each industry. Imagery and affective rankings were strongly related to the willingness to invest but not with the actual market performances.

There is also extensive evidence that shows significant differences between men and women in the way financial risk is perceived. Women exhibit a more conservative approach when making investment decisions and financial advisers offer them less risky products compared to those offered to male investors (Eckel and Grossman 2002; Merrill Lynch, 1996; Wang, 1994). This would derive from the fact that women are on average more risk averse (Jianakoplos and Bernasek, 1998) and, at the same time, less over-confident than men[30]; Gysler *et al.* 2002). The relation between gender and overconfidence has been long investigated, since Lewellen *et al.* (1977) who show that men spend greater resources in financial analysis, are less reliant on the opinions of their brokers, trade more and formulate more optimistic forecasts compared to women.

Also risk taking is affected by gender. Sunden and Surette (1998) report that when investing in pension funds, women tend to allocate most of their savings in low-volatility assets. With reference to professional investors, Olsen and Cox (2001) found out that the most important risks for women were downside risk (the chance of incurring a large loss) and uncertainty/ambiguity (uncertainty about the true distribution of possible future returns), whereas men seemed to be more sensitive to downside risk and the possibility of achieving a below-of-the-target return. The gender effect was also emphasised by Barber and Odean (2001): assuming that men are more overconfident than women, the authors show how the average turnover rate of the securities held by men is approximately one-and-a-half times that of women. Therefore men are more prone to overtrading and, as a consequence, suffer a more significant reduction in returns. Marital status seems also to be relevant: married subjects probably influence each other's investment choices given that in many cases, the person making the investment is not the person who opened the account with the broker.

[30] As found by Deaux and Farris (1977), gender differences in the perception of one's own competences is marked with reference to activities typically considered as male activities, like financial decisions (Prince, 1993). According to Lenney (1977), such differences tend to vanish when women can benefit from a clear and immediate comparison with male competences.

According to some authors, differences in gender tend to disappear in case of decision-making involving low risk options (Schubert *et al.*, 1999; Kruse and Thompson, 2002). In these circumstances, the gender influence seems to be related mainly to the tolerance of ambiguity which is lower for women; nevertheless, both women and men show a low tolerance for ambiguity when dealing with new and unfamiliar situations (Powell and Ansic, 1998).

Risk perception differ also between financial advisers (or, in general, financial professionals) and non-sophisticated investors. In particular, Roszkowski and Snelbecker (1990) found that expert investors may not be immune from the framing effect: when presented with scenarios emphasising potential losses, financial advisors exhibit a risk-seeking attitude; vice versa, subjects who were presented with the same options emphasising possible gains exhibited risk-aversion. Risk-taking behaviours turned out to be more moderate when advisers were asked to act on behalf of the customer rather than for themselves. Diacon (2004) reached similar conclusions after comparing the assessment of two separate groups of investors (professional and novice) as to 20 financial products available on the English market and characterised by different risk levels. Professionals mainly refer to quantitative measures of risk, whereas novice investors refer to a multi-attribute risk description (as mentioned before). Heuristics seem to bias the judgments of both groups, even with a few differences: for example, experts seem to be mainly affected by anchoring and therefore to be more inclined to under-react to new information (while novices are prone to over-reaction); moreover, professional investors seem less exposed to the certainty effect. Finally, small investors tend to consider riskier the products they know less, especially when they do not trust the adviser; on the other hand, expert investors seem to suffer the so-called affiliation bias since they tend to underestimate the risk of the products issued by the financial group for which they work.

5. Correcting anomalies in investment choices: Suggestions of behavioural finance and the policy issues

The observed anomalies in portfolio choices and their impact on individual well-being raise the question about the instruments which may help in debiasing behaviours. Scholars have investigated the role of several tools, providing insights on how investor education, financial disclosure and investment advice can be used, in a behavioural vein, to improve individuals' understanding of the traps of the decision making process.

As investment advice, even if within the limits that will be discussed in detail in paragraph 5.3, behavioural scholars argue that it is "*the prescriptive activity whose main objective consists in guiding the investors in the decision-making process in their best interests"* (Kahneman and Riepe, 1998). In principle, financial advisers may have the incentive to address their clients' cognitive biases in order to prevent misalignments between

customers' expectations and the actual outcomes obtained on the basis of a "correct" investment strategy (that is following the prescriptions of the standard theory), which in turn might undermine the adviser-customer relationship.

In practice, however, the market can be interested in exploiting investors' fallibility: as we will see more in detail later, empirical evidence arouses many doubts in this regard. Moreover, the unwillingness of individuals to change a decision that has already been made even when it is not satisfactory (*status quo bias*) weakens the competitive pressures coming from the demand side. For example, people rarely close their bank accounts after the worsening of terms and conditions applied, even if such worsening is fully disclosed. In general, inertia explains the commercial success of offers that contemplate particularly advantageous conditions for a limited period and right after the conclusion of the contract, and their replacement with more penalising conditions later on (de Meza *et al.*, 2008).

Because of cognitive biases, moreover, individuals are exposed to opportunistic practices whenever the operators obliged to fulfil disclosure obligations can choose (within the limits allowed by the rules) the contents and the format of presentation of the information they have to convey to the market. Studies on the so-called presentational impression management show that companies often tend to influence the perception of a certain phenomenon by resorting to appropriate graphical representation techniques of the accounting and financial information.

In the light of the above considerations, some authors upheld the need to combine the insights of behavioural finance with the analysis of the organisational and competitive features of the market, in order to identify measures that, in addition to defining rules (of transparency and of conduct) according to the behavioural approach, change the incentives motivating the operators' strategies. For example Barr *et al.* (2008), discussing possible reforms of the US legislation on home mortgages, credit card borrowing and bank account, suggest to change both the "rules of the game" (as disclosure regulation) and the "scoring of the game", that is "the payoffs a firm will receive for particular outcomes" (as rules on liability or fiduciary duty or tax incentives).

The debate investigated also the efficiency of the possible corrective mechanisms of cognitive anomalies. A stream of the literature maintains that among the alternative instruments (implementable both by regulators – as investor education, transparency and rules of conduct– and by market operators – as in the case of investment advice), the greatest efficiency must be acknowledged to paternalistic policies, directing individuals both by limiting the options available (also by banning products considered very risky), and by setting a costly-to-abandon default option.[31]

[31] Setting a default option has long been debated especially in the context of the investment of retirement savings. The main criticisms to such a policy refer to the fact that it implies the establishment of a compulsory rate of savings), which might be ineffective if subjects carried out "compensating" strategies. de Meza *et al.*

Prohibiting or restricting investment in the so-called structured products[32] is debated also by academics, having being shown that investment in such products is not consistent with the assumption of rational behaviour and that such products are seldom convenient (Fisher, 2007). In particular, some simulations carried out by Thorsten and Rieger (2009) with reference to structured products issued on the German and Swiss market as from 2007 show that only a limited subgroup of instruments is the optimal choice for a prospect theory utility maximiser. Most of the products are sub-optimal also for an expected utility maximiser, being consistent only with the assumption that investors systematically underestimate the probabilities of adverse scenarios, since they are not able to understand the payoff structure.

The paternalistic approach can be too intrusive, though, especially if applied on a wide range of products and behaviours. Such policy can actually penalise those who do not suffer cognitive biases and errors of preference or, alternatively, relies on the capability of the regulator to distinguish among categories of investors in such a way as to identify those needing protection (Jolls and Sunstein, 2005). Moreover, when individual choices are suboptimal due to an overestimation of the risk, less invasive interventions can be preferable. Finally, limiting strongly the options available could preclude "endogenous" corrective mechanisms, even if activated by public interventions. For example, in the case of investment choices, prohibiting some products could stifle both financial innovation and the development of advisory services (Fisher, 2007).

The so-called "debiasing through law" can overcome the objections raised towards the paternalistic approach. In this context, debiasing is aimed at removing the premises of decision-making errors[33]. Investor education, for example, is a useful tool for increasing financial literacy and awareness of the behavioural traps, as well as strengthening the efficiency of information transparency. The implementable policies are moreover linked by a close mutually dependent relationship, in the sense that the limits of investor education can be overwhelmed by "complementary" protection measures, that is information transparency and advisory services, enforced within a behaviourally informed framework.

(2008) cite, in this regard, the Australian experience that recorded a decrease in voluntary savings following the introduction of a compulsory pension system at the beginning of the nineties.

[32] These products include a derivative component and imply an indirect exposure to the underlying financial assets through different mechanisms (such as, for example, indexation).

[33] Joll and Sunstein (2006) are aware of the fact that the public response to cognitive and behavioural biases can be affected by the same errors that it intends to limit and, in this sense, they admit that it would be naive to suppose that "(…) *strategies for debiasing through law will always be well-motivated and well designed. (...) Our claim is only that if people exhibit bounded rationality, debiasing though law may often be a promising response*" (p. 37). For a more wide-ranging discussion of the behaviours and errors of the so-called "behavioral bureaucrats" see Jolls *et al.* (1998).For an application to the financial market regulatory authorities see Choi and Pritchard (2003) and, with special reference to some European legislation, Morera (2009).

5.1. *Investor education*

According to behavioural finance, investor education can be directed to correct evaluation errors deriving both from poor financial literacy and from cognitive biases.

The traditional approach to investor education may be useful in addressing poor financial literacy by increasing the level of financial capability. Some evidence in this sense can be found with reference to the programs carried out in the USA for preventing household over-borrowing (Fanto, 1998). In particular, different initiatives were jointly implemented by the regulatory Authorities for financial markets, trade associations and schools aimed at informing individuals on the basic rules of borrowing cost calculation; in some circumstances, households were also obliged to refer to credit counselling service before signing a contract.

The traditional approach may however give poor results if cognitive biases are not taken into account. Education and information may in fact accentuate some behavioural fallacies, such as overconfidence, optimism and illusion of control. Individuals may be made aware of the errors which they may run into during the decision-making process through appropriate debiasing techniques. Fischhoff (1982), among the first to prompt these investigations, suggests a few techniques: warning, which just signals that an error is being committed; description of the error; feedback, which describes the impact of the error on the personal situation; and training, that is to say the application of the correct behaviour in several contexts.[34]

The effectiveness of the debiasing techniques is not sure: as anchoring, for example, warning only does not seem to produce significant effects (George *et al.* 2000), whereas the combination of several techniques and, in particular, feedback and training, seems to be more effective. Learning by doing is very incisive since it facilitates the understanding of the error, of its consequences and of the required corrective actions. Weber and Welfens (2008), using both experimental data and field data on portfolio trading of a sample of customers of a German broker, conclude that learning has an important role in mitigating the disposition effect: as experience increases, the percentage of winners sold too early decreases while sales of losers increase. Given the importance of learning by doing, some authors suggest to involve investors in interactive simulations designed through appropriate software tools (de Meza *et al.*, 2008; Weber and Welfens, 2008).

Another debiasing technique which has been widely investigated is the so-called "consider-the-opposite strategy", mitigating anchoring, confirmation bias and overconfidence (Hirt and Markman, 1995). Such "strategy" consists in asking individuals to consider all the

[34] For example, in a program correcting anchoring only by means of a warning subjects would be first asked to evaluate a good (such as a house) starting from an initial estimate (the market value of similar houses, for example); during the evaluation process, they would receive a warning each time the estimate did not differ significantly from the initial estimate (that is, falling within a defined confidence interval of the initial figure); the subject would decide when to end the process.

arguments that can show how groundless the information used as an anchor is (Mussweiler *et al.*, 2000). Also in the case of the so-called "hindsight" bias, stimulating the appraisal of several alternatives may be profitable, even if evidence in this regard is not unequivocal (Sanna and Schwarz, 2002).

Also "cognitive training" may play a significant role in the understanding and correction of behavioural anomalies: different studies indicate that properly trained individuals learn and apply the basic rules of the laws of probability, in place of the most common heuristics, on the occasion of recurring decision-making processes.[35]

However, investor education may turn out to be poorly effective in correcting the errors deriving from biases in the individual perceptions and from psychological traits. Alternative measures need therefore to be implemented, starting from the development of rules of disclosure in the behavioural vein.

5.2. *Disclosure on the characteristics of financial products*

Disclosure of the characteristics of financial products is one of the basic tools used by financial markets regulators to protect investors. However, as shown by behavioural finance, individuals make mistakes when gathering and interpreting information. This raises questions over the disclosure effectiveness especially when, for example, it is stated in a narrative and longwinded format.

Information overload, that is individual incapacity to process the information available (either because of lack of time or of competences),[36] makes it clear that a greater quantity of information does not mitigate the difficulties investors can have in understanding financial products.[37]

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[35] In particular, see Fong *et al.* (1986) with reference to different types of errors; Larrick *et al.* (1990) with regard to the sunk cost effect; Gigerenzer and Hoffrage (1995) with respect to the individuals' propensity to understand better frequencies rather than probabilities.

[36] In this regard, an often cited experiment is that in which two groups of persons are shown the picture of a blurred and unrecognisable object. The resolution is gradually increased in 10 passages for the first group and in 5 passages for the second group. In front of the same picture, the persons who were shown a smaller number of sequences recognise the represented object before the others. Information overload is related to the choice overload: when dealing with a high number of options, individuals prefer those they understand better (which are not necessarily the best ones). Iyengar and Kamenica (2007) report this behaviour in the asset allocation choices made by 800,000 participants in 401(k) pension plans: as the available funds increase, the share of wealth allocated to equity funds for monetary and bond funds decreases.

[37] According to some authors, detailed disclosure may be ineffective not only because of information overload, but also because it may encourage overconfidence and optimism (Willis, 2008). This effect has been reported, for example, for traders on line: subjects who devote more time to the acquisition of information, trade more and diversify less the portfolio, thus obtaining a lower return (Guiso and Jappelli, 2006).

Individuals may also be sensitive to presentation format, data aggregation and order preferencing. Researches on the impact of the disclosure of financial information of listed companies show that when presented with properly designed graphs professionals (such as auditors) improve the accuracy of their opinions and forecasts as compared to other formats (such as tables or a combination of graphs and tables (Desanctis and Jarvenpaa, 1989). However, there is also considerable evidence reporting that improper graphical representation may be misleading, thus altering choices (Penrose, 2008). This effect can be significant, given the already mentioned individuals' sensitivity to the frame.

Researchers investigated the framing effect by referring to three different types of frames (Levin *et al.*, 1998). The so-called risky choice framing, at the basis of the prospect theory, arises when individuals choose among options characterised by different risk levels which can be represented by emphasising either potential gains or potential losses (as in the Asian disease dilemma experiment mentioned above). Goal framing occurs when the behaviour to be carried out in order to reach a certain objective can be described either by pointing out the benefits related to it, or the negative consequences deriving from its omission (for example, the advantages of a medical check up or the disadvantages deriving from the fact that the check up was not carried out). Finally, the so-called attribute framing arises when a characteristic may be described in positive terms, or negative terms (for example, you can say that a vaccine is 70% effective or, equivalently, 30% ineffective).

The findings about the role of the attribute framing effect and its interactions with the biases due to presentational impression management prompted analyses of the so-called visual framing, that is the impact of the graphic format representing a certain variable.

Weber *et al.* (2005) provided two groups of individuals with the names of 16 domestic and foreign investment stocks and with 10-year historical return data. Respondents were asked the expected asset risk, returns and volatility and how these expectations related to asset choice. Historical returns were presented either as a bar graph or as a continuous density distribution. In this last case, individuals estimated a higher volatility, probably because the density distribution format underlines extreme returns (whereas the bar graph emphasises trends).

The importance of visual framing was also confirmed in a study on investment funds that, with reference to a sample of English investors, investigated whether the presentation format of past performances (histogram *versus* price index) and time interval considered (12 *versus* 45 months) affect investment choices and risk perception (Diacon and Hasseldine, 2007). The results of the experiment show that graphical format of past performances may be

important; to prevent any bias, the authors suggest providing several representations of the same phenomenon (even if they admit that this could generate information overload).[38]

As shown by the extensive evidence, therefore, written communication may feed behavioural biases which can seriously mislead investment choices. On the other hand, verbal communication is much more effective at guiding individual decisions (Prentice, 2002). This view is shared also by behavioural scholars who have long highlighted the role of financial advising in correcting cognitive errors.

5.3. *Financial advice*

Financial advisers can help their clients to overcome the information overload, to correctly interpret information regardless of the frame, to pay attention to features of the investment choices that, even if very important and clearly represented, may slip the investor's perception. This seems to occur, for example, with respect to the fees charged by investment funds being the perception of fund fees apparently more intense when they are levied directly on the investor (such as entry fees) and less intense when they are charged on the fund assets (as management, distribution and communication fees). In the US, entry fees decreased over time whereas those charged on funds assets rose: however, investors do not seem to have reacted significantly to this trend, even though fund fees are subject to strict disclosure obligations. This evidence could support the assumption that investors weigh more entry commissions, most likely perceived as losses and hence with a strong psychological impact, compared to management fees, perceived as lower profit and hence with a less intense psychological impact. An alternatively, although not necessarily conflicting, explanation relies on the fact that US investors expect a positive correlation between costs and fund performance (Alexander *et al.*, 1998, and Elton *et al.*, 2004): such expectation might divert individuals' attention from fund expenses.

The development of a financial advisory activity aimed at serving the clients in their best interest is therefore an indispensable supplement for strengthening the effectiveness of financial regulation and the containment of the most common behavioural errors. Behavioural finance scholars enlightened how financial advisers should guide their customers, with a special reference to cognitive biases deriving from heuristics and emotions (Kahneman and Riepe, 1998).

First of all, the individual attitude to assess investment outcomes with respect to a reference point rather than absolute wealth requires for the adviser to identify such reference by taking into account not only wealth but also the investor's status. This latter can be defined

[38] Another feature documented by these studies concerns the subjects' attitude to extrapolate future outcomes from past returns, even when it is explicitly warned that this is not correct. This attitude is due to the heuristics of representativeness and availability which strengthen the framing effect.

according to social status, self-esteem and self-fulfilment; such elements determine two reference points (or benchmarks) leading investment decisions: the wealth benchmark, set by individuals also according to their life style and social, professional and family contexts; the benchmark return, set as to the past return, as to other investors' gains, etc. Even if advisers cannot easily intervene on the first benchmark, they can however guide the investor towards a reasonable target return, by identifying the reasoning errors that are at the basis of the definition of the target itself (for example, it may be too high because of the heuristics of representativeness).

The second important aspect concerns the cognitive biases deriving from the heuristics used either in the editing phase (as defined by the prospect theory), or when managing separate mental accounts. Advisers can present evidence denying the foundations of the wrong assessments; they can also try to amend preference errors (such as loss aversion, the non-linear weighting of probabilities, the certainty effect), even if this may turn to be quite a complex task (Rigoni, 2006).

Financial advice can however fail in correcting behavioural errors for various reasons. First of all, advisers themselves can commit cognitive and behavioural biases: they should strive to contain this, possibly by applying a few basic rules, as the ones laid down by some scholars (Table 5).

Secondly, subjects potentially more exposed to cognitive and behavioural biases may not resort to advisory services: as shown in Guiso and Jappelli (2006), traders on line, more prone than others to overconfidence, tend not to delegate investment choices.

The effectiveness of financial advice can also be compromised by inaccuracies in the estimation of clients' risk tolerance as well as of the information commonly acquired by advisers for classifying their customers in terms of knowledge of the products, financial situation and objectives of investment. Some authors argue that the questionnaires generally used do not really capture risk tolerance but rather measure the risk/return combination thought to suit the investor, and this measure is then used to select one of a standard set of asset allocation (Roszkowski *et al.*, 2008).

Moreover, the structural features of the brokerage sector and of the advisers' compensation may determine a conflict of interests between advisers and customers. This may lead to misselling unsuitable products, depending on the degree of competition of the brokerage industry, the internal organisation of a firm's sales process and the transparency of the commissions paid to the advisers (see, for all, Inderst and Ottaviani, 2009).

TABLE 5

COGNITIVE BIASES AND ERRORS OF PREFERENCE: SUGGESTIONS TO THE ADVISERS

Overconfidence	- Be conscious of your propensity for overconfidence when making statements to clients. Do not let clients project their own overconfidence onto you, otherwise this may create an unreasonably high standard of performance that will lead to short-lived client relationships.
Mental accounting and pyramid of investments	- Through mental accounting, customers can better enforce self-control or avoid stress from losing money from a "safe" account. Before contrasting it, therefore it is worth considering, on a case-by-case basis, if mental accounting is a strong or weak point. - When developing an investment policy, avoid the bottom up approach. Consider the investors' objectives simultaneously and propose a single policy fit for all the objectives. - Underline the benefits of adopting a broad frame. Reports must mainly focus on the global portfolio performance.
Optimism	- Keep a list of past recommendations you made that were not successful. - When presenting historical data or the characteristics of a product to clients, resist the natural tendency to linger over only on positive aspects.
Hindsight	- Ask the customer at regular intervals to estimate the probability of some events over a short-term period. Take note and at the end of the period ask the customer what he/she thought a few months ago. - The press contains countless and continuous examples of hindsight bias: to document it keep a series of newspaper articles.
Short-termism	- Many clients talk about long term and act short term. Pay more attention to how investors behaved in the past than what they say they'll do in the future. - Prevent account statements from strengthening short-termism. Prepare statements that give less emphasis to the most recent quarter, and more to what has happened over the lifetime of the account. In accordance with the customer, establish a procedure to be followed when the essential structure of the investment policy has to be changed.
Loss aversion	- Try to assess loss aversion. Do not be satisfied with a general measure of risk-aversion. - Do not recommend high-risk investments to loss-averse investors. They will accept them only if they underestimate the risk due to excessive optimism.
Disposition effect	- Take into account the reference point from which the investor calculates gains and losses. - Convince the customer that using the purchase price as a reference point may affect negatively the state of mind with which investments are made. In finance, only future prospects matter, not past performances. - If a customer does not want to liquidate an investment at loss, ask whether he/she would be willing to invest the current value of the investment in the security itself. - Provide the client with specific real-life examples of where it was better to "let winners run" and "cut losses". - Before any decision of investment, discuss the conditions under which a sale would be made.

Source: Rigoni (2006), pp. 156-158.

Empirical evidence on the role of financial advice in the correction of the most common behavioural errors is poor and controversial. Shapira and Venezia (2001) gave a very interesting contribution in this regard. The authors analysed the equity portfolio in a major brokerage house in Israel, making a distinction between those professionally managed and those referring to independent investors, in order to check whether financial advise allows to reduce the disposition effect, poor diversification and excessive trading. With regards to the first two phenomena, the authors found that the professionally managed portfolios are more consistent with the prescriptions of classical theory, since they exhibit a higher degree of diversification and a less pronounced disposition effect. Excessive trading is greater for professionally managed portfolios: however, the difference as to independent portfolios is not statistically significant and seems also driven by the different number of securities held in the two groups of portfolios.

However, more recent studies on a sample of German investors disagrees with these results, by showing that the performances of professionally managed portfolios are worse than those of independent investors; the same findings hold with reference to risk and excessive trading (Hackethal *et al*., 2009).

With a specific reference to the Italian case, advisory services seem to be not very common among households.[39] Gentile *et al.* (2006) show that the probability of delegating to professionals the portfolio management as an alternative to direct investment in risky financial instruments is positively related to the size of the portfolio and to risk aversion, whereas it does not depend on financial literacy; moreover, it is lower for households in the Southern Italy. Gentile and Siciliano (2009) analyse the impact of the advisory services on portfolio choices. Other factors being equal, households receiving advisory services have a higher probability of more than 20 percentage points of holding risky products; this probability further increases when investors trust their adviser and perceive the advise as a high quality service. This effect is almost entirely due to a greater probability of holding investment funds and insurance policies.[40] As a whole, households receiving advisory services hold a more diversified portfolio and are less prone to invest in deposits and treasury bills.

[39] According to the GFK-Eurisko sample data, analysed by Gentile and Siciliano (2009), it results that, although almost 2/3 of households declare using an adviser, it can be estimated that only about 20% actually receives advisory services. Moreover, about 60% of the households holding risky financial products or instruments (shares, bonds, investment funds, insurance policies and pension funds), do not resort to advisory services.

[40] More specifically, the work shows that, other factors being equal, households receiving advisory services invest about 9% more of their financial wealth in managed funds products and in financial policies and about 4% more in shares and bonds.

6. Conclusions

Financial market regulation is based on the classical theoretical paradigm of individual rationality, which requires, among other things, that investment choices be made after acquiring and processing all the available information, on the basis of pre-existent, stable and consistent preferences and by using a cognitive process of utility maximisation.

This theoretical apparatus underpin the measures enacted for investor's protection, based on rules of conduct and on very detailed disclosure obligations which the issuers of financial products and brokers have to apply so that investors can decide on an informed basis. Moreover, when advising on investments or portfolio management, intermediaries are obliged to acquire from the investors the required information on knowledge and experiences on investments, financial situation and objectives of investment in order to be able to recommend suitable products.

However, individuals do not act rationally, nor do they seem able to acquire and correctly process the available information. Vice versa, when choosing under uncertainty, they seem inclined to apply rules of thumb that allow simplifying problems. Moreover, preferences do not appear stable and well-defined, since they may change depending on whether prospects of loss or gains prevail and according to the presentation format. These factors lead to systematic evaluation errors as well as violations of the assumption of rationality.

The behavioural literature provide significant insights for strengthening the effectiveness of regulatory interventions, insofar as such interventions may be designed also by allowing for real perceptions of phenomena and for psychological and irrational components at the basis of individual behaviours. Investor education, transparency and customer-oriented advisory service identify, as it was thoroughly analysed in the previous paragraph, the areas in respect of which the rules of behavioural finance can be applied profitably in a close mutually dependent relationship.

The purpose of this work is to stimulate the debate on the behavioural analysis of the mentioned policy features, which is increasingly involving also financial market regulators[41], in order to strengthen the effectiveness of the tools available to investors for understanding the characteristics of financial products.

[41] See, for example, the review of the behavioral literature published in July 2008 by the Financial Services Authority that also expresses some considerations on specific interventions aimed at increasing the investors' financial capability (the so-called "Financial Capability"; de Meza *et al.*, 2008).

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