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**DECODING BEHAVIORAL FINANCE:
THE PRACTITIONER'S VIEW
(THREE ARTICLES)**

***DESCIFRANDO LAS FINANZAS
CONDUCTUALES: LA VISIÓN DEL
INVERSOR PROFESIONAL
(TRES ARTÍCULOS)***

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Author: Manuel González-Igual

Director: Doctora Dña. María Teresa Corzo Santamaría

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Manuel
González
Igal

Decoding Behavioral Finance: the Practitioner's View (Three Articles)



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To my father, Alvaro, my protector, my teacher and my dearest friend.

Thank you for being always with me.

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Resumen

Frente a la teoría financiera neoclásica fundamentada en el comportamiento racional del inversor, la eficiencia de los mercados y la correlación entre riesgo y beneficio, el campo de las Finanzas Conductuales puede suponer un cambio de paradigma basado en el comportamiento irracional del inversor que ha dado lugar a tres premios Nobel desde inicios del siglo XXI. No obstante, pese a las múltiples anomalías financieras identificadas y al desarrollo de reconocidas teorías psicológicas y modelos de comportamiento irracional del inversor, las Finanzas Conductuales carecen de un marco teórico homogéneo y estructurado.

El objeto de esta tesis es contribuir a la sistematización de las Finanzas Conductuales y a determinar sus implicaciones sobre el comportamiento del inversor y de los mercados financieros. La investigación se organiza en tres artículos de investigación y se basa en una exhaustiva revisión de la literatura y en la evidencia empírica proporcionada por una serie de encuestas a inversores profesionales.

En el primer artículo, titulado “*Exceso de Confianza, Aversión a Pérdidas y Comportamiento Irracional del Inversor: un Mapa Conceptual*”, desarrollamos un mapa conceptual de las Finanzas Conductuales, basado en la revisión y síntesis de la literatura. Identificamos el exceso de confianza, la aversión a pérdidas y el condicionamiento social como los principales sesgos irracionales y los relacionamos con las teorías psicológicas de la Representatividad y la teoría Prospectiva. Clasificamos además los modelos de comportamiento en base a los conceptos de creencias sesgadas y preferencias no convencionales. Finalmente abordamos las críticas y teorías alternativas a las Finanzas Conductuales, introduciendo el concepto de racionalidad irracional como elemento de investigación futura.

El segundo artículo, titulado “*Sesgos Predominantes y Perfiles de Inversor: una Encuesta a Inversores Profesionales*”, se basa en la evidencia empírica de una serie de cuatro encuestas a inversores profesionales con una media de 92 participantes.

Comparando la relevancia asignada con el nivel de educación en Finanzas Conductuales, encontramos un claro déficit de formación entre los inversores debido a la falta de claridad y homogeneidad de la teoría, según los propios encuestados. Analizamos además los principales sesgos irracionales e identificamos, de nuevo, la representatividad, la aversión a pérdidas y el condicionamiento social como los más relevantes según los inversores. Por otra parte, analizamos el comportamiento de infra y sobrerreacción ante diferentes escenarios, destacando la prevalencia de la sobrerreacción en la mayoría de casos. Concluimos el artículo con la clasificación de los perfiles de inversor y cliente según el modelo de Bailard, Biehl y Kaiser, destacando el exceso de confianza como el sesgo predominante entre inversores y hallando una clara falta de concordancia entre los perfiles del inversor y cliente.

El tercer artículo, titulado “*Impacto de la Educación, la Edad y el Género en el Comportamiento del Inversor: Modelizando la Confianza*”, se basa en una nueva encuesta completa a 106 inversores profesionales, con objeto de analizar el impacto de las variables de educación, edad y género sobre el comportamiento irracional del inversor y su nivel de confianza. En primer lugar, la investigación confirma varios de los hallazgos previos, incluyendo el gap existente entre la falta de formación y la relevancia de las Finanzas Conductuales para los inversores, así como la divergencia entre los perfiles de inversor y cliente. Respecto al impacto de la educación, nuestra investigación se centra en la acreditación de *Chartered Financial Analyst* (CFA) y las horas de aprendizaje en Finanzas Conductuales. Los Analistas Financieros Autorizados (*CFA Charterholders*) tienen un mayor nivel de formación en la materia y admiten estar particularmente influenciados por el condicionamiento social. Con respecto al género, las mujeres indican tener un mayor nivel de educación en este campo y destacan por su mayor propensión al análisis racional y la aversión al riesgo, lo cual es consistente con la literatura. En relación a la edad, los inversores más

jóvenes destacan unánimemente la relevancia de las Finanzas Conductuales y reconocen estar más influenciados por sesgos tanto cognitivos como emocionales.

Finalmente, desarrollamos un modelo para determinar el nivel confianza de los inversores, evidenciando que las mujeres y los inversores más experimentados tienen un mayor nivel de confianza entre los profesionales. Por el contrario, la acreditación CFA y el mayor nivel de formación en Finanzas Conductuales no tienen un impacto significativo en el índice de confianza del inversor, lo que implica que el conocimiento de esta teoría no evita el comportamiento irracional por parte del inversor.

Abstract

In contrast to neoclassical finance theory that is based on investors' rational behavior, the efficiency of the markets and the correlation between risk and return, the field of Behavioral Finance entails a paradigm shift in assuming irrational investor behavior. This field, furthermore, has produced three Nobel prizes since the beginning of the 21st century. However, despite the multiple identified financial anomalies and the development of flagship psychological theories and models of irrational investor behavior, Behavioral Finance lacks a homogeneous and structured theoretical framework.

The aim of this thesis is to contribute to further systematization in the field of Behavioral Finance and to determine its implications for investor behavior and the functioning of financial markets. Our research is based on a comprehensive literature review and on evidence provided by a series of surveys to professional investors.

In the first article, entitled "*Overconfidence, Loss Aversion and Irrational Investor Behavior: a Conceptual Map*", we develop a conceptual map of Behavioral Finance, based on a review and synthesis of the literature. We identify overconfidence, loss aversion and herding as the main behavioral biases and we relate them to the psychological theories of the Representativeness Heuristic and the Prospect Theory. We also classify behavioral models based on the concepts of biased beliefs and unconventional preferences. Finally, we address the critics and alternative theories, and introduce the concept of irrational rationality as a topic for further research.

The second article, "*Prevailing Behavioral Biases and Investor Profiles: a Survey of Professional Investors*", is based on empirical evidence from a series of four surveys of professional investors with an average of 92 participants. First, we compare the relevance and level of education in Behavioral Finance, finding a significant lack of formal training among practitioners due to the lack of clarity and homogeneity of the theory, as attested by the participants in our surveys. Next, we analyze the prevailing

behavioral biases and identify again representativeness, loss aversion and herding as the most relevant ones from the point of view of practitioners. Moreover, we evaluate investors' under- and overreactions under different financial scenarios, highlighting the prevalence of overreactions under most circumstances. We conclude the article by classifying investors' and clients' profiles according to the Bailard, Biehl and Kaiser model. We identify overconfidence as the predominant bias among practitioners and find a clear lack of alignment between the two.

The third article, "*Impact of Education, Age and Gender on Investor's Behavior: Modeling Confidence*", is based on a new comprehensive survey of 106 professional investors, with the aim of analyzing the impact of education, age and gender on investors' irrational behavior and level of confidence. First, the research confirms several previous findings, including the gap between lack of education and the relevance of Behavioral Finance, as well as the divergence between investor and client profiles. Regarding the impact of education, our research focuses on the Chartered Financial Analyst (CFA) accreditation and on the hours of learning in Behavioral Finance. CFA Charterholders have a higher level of training and admit to being particularly influenced by herding behavior. Concerning gender, female investors have a higher level of education, view themselves as more driven by rational analysis and are more risk-averse, which is consistent with the literature. Regarding age, younger investors unanimously highlight the relevance of Behavioral Finance and acknowledge being more influenced by both cognitive and emotional biases.

Finally, we develop a model to determine investors' confidence, with female and more experienced investors exhibiting higher levels of confidence. In contrast, the CFA accreditation and the level of training in Behavioral Finance do not have a significant impact on investors' confidence, which suggests that knowledge of the theory does not prevent irrational behavior by practitioners.

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1. Introduction

“Traditional economics is based on imaginary creatures sometimes referred to as “Homo Economicus.” I call them Econs for short. Econs are amazingly smart and are free of emotion, distraction or self-control problems. Think Mr. Spock from “Star Trek”.”

Richard H. Thaler, 2009

Modern or neoclassic finance theory was intensively developed between the decades of the ‘50s and the ‘70s of the 20th century along with the Expected Utility theory (Von Neumann and Morgenstern, 1944), Modern Portfolio Theory (Markowitz, 1952), the Capital Asset Pricing Model (Sharpe, 1964; Lintner, 1965; and Mossin, 1966), and the Efficient Markets Hypothesis (Fama, 1970), among other theories.

Such theories, defined by Gómez-Bezares (1995) as “the Paradigm of the Seventies”, form a solid body of doctrine characterized by comprehensive quantitative economic models and based on the definition of investors as rational agents (Miller and Modigliani, 1961).

The rational agent is usually referred to as “*Homo Economicus*”, a concept initially introduced by Stuart Mill (1836), defined as a being “concerned with him solely and who desires to possess wealth, and who is capable of judging the comparative efficacy of means for obtaining that end”. In classical finance theory, investors are considered to be rational agents in two ways (Thaler, 1999): they make unbiased predictions about future outcomes, and they subsequently make decisions according to the expected utility theory.

However, the impact of psychological biases on decision-making and the deviations from economic rationality has been present since the birth of micro and macroeconomic theory. In “the Theory of Moral Sentiments” (1759), Adam Smith proposed psychological explanations of individual behavior, arguing that social psychology is a better guide to moral action than reason. Two centuries later, in “the General Theory of Employment” (1936), John Maynard Keynes introduced the well-known term of “animal spirits” to describe the instincts and emotions that influence human behavior, which can be measured, for instance, by consumer confidence. According to Keynes, “most probably, our decisions to do something positive [...] can only be taken as a result of animal spirits – a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities”.

Corzo, Prat and Vaquero (2014) identify the first academic reference to irrational investor behavior as early as 1688, in Joseph de la Vega’s “*Confusión de Confusiones*” which is considered the oldest book about the stock exchange and shareholder behavior. Joseph de la Vega describes the stock business as an “enigmatic” “game of chance”, often driven by overconfidence, excessive trading and herding behavior.

Today, the qualifying adjectives “bullish” and “bearish” are widely used to describe the financial market sentiment, whereas “hawkish” and “dovish” are used in connection to macroeconomic policy. These terms are good examples of how the “animal spirits” govern the financial and economic markets and how professional investors and economists act on instincts as opposed to rational calculation.

There are in fact numerous examples of “irrational exuberance” in the financial markets that contradict the traditional economic and financial theory, such as the Tulipmania in the 1630s (Mackay, 1841), the October 1929 Crash (Shiller, 2003) and the recent 2007-2008 global financial crisis. In addition to bubbles, there is evidence of multiple anomalies such as the Equity Premium Puzzle (Mehra and Prescott, 1985), the lack of correlation between risk and return (Fama and French, 1992) or the Momentum Effect (Jegadeesh and Titman, 1993), to name a few.

These irregularities of financial markets along with the psychological theories of irrational behavior (Tversky and Kahneman, 1974 and Kahneman and Tversky, 1979) have given rise to a new framework called Behavioral Finance, which traces its origins back to the 1970s. According to this theory, investors deviate from rationality for two main reasons (Barberis and Thaler, 2003): i) they are subject to biased beliefs, meaning that they do not properly apply Bayes rule of probability; and ii) given their beliefs, their preferences diverge from that prescribed by the theory of expected utility (Von Neumann and Morgenstern, 1944).

Behavioral Finance may represent a paradigm shift in the field of finance; a shift that has been recognized by three Nobel prizes awarded in the twenty-first century (Daniel Kahneman, Robert J. Shiller, and Richard H. Thaler). However, despite the relevance of the field, there is “no general consensus on the presence and importance of Behavioral Finance” (Van der Sar, 2004, p 427) as it lacks sufficient structure and homogenization (De Bondt et al. 2008). According to Jeffrey and Putman (2013), Behavioral Finance is still “an ad hoc collection of concepts and factors that are basically disconnected stand-alone concepts”. Fama (1998) refers to Behavioral Finance as the “anomalies literature” due to the lack of a comprehensive theoretical

framework and indicates that most of the “long-term return anomalies are fragile or statistically marginal”.

1.1. Objective and Methodology of the Research

The aim of our research is to contribute to further systematization and homogenization in the field of Behavioral Finance, assess its relevance according to professional investors and determine its ability to explain the functioning of the financial markets.

First, we performed a systematic literature review, focusing on keywords and the most relevant journals identified in Behavioral Finance. Based on a subsequent bibliographic literature review and our knowledge of the most relevant authors, we identified what we consider to be the most impactful articles in Behavioral Finance. As a synthesis of the literature, we developed a conceptual map of Behavioral Finance and drew the following hypothesis to be validated by our surveys of professional investors:

- The practitioner’s decision-making model is not driven predominantly by a risk and profitability analysis of the assets.
- The investor decision-making model is conditioned by bounded rationality and duality in behavior (rational / irrational).
- Professional investors exhibit a series of cognitive and emotional biases and are unable to process all information rationally.
- Investors tend to underreact to specific news (presentation of results) and overreact to a series of bad or good news.
- Investors tend to consider a specific event as typical or representative, ignoring the laws of probability (Representativeness Heuristic).

- Investors are generally overconfident and prone to overestimate their ability to forecast future outcomes.
- Investors are more sensitive to losses than profits (Prospect Theory).
- Social conditioning or herding acts as an amplifier of the abovementioned biases (overconfidence and loss aversion) due to a "contagion" effect among investors.
- Investors lack sufficient education in Behavioral Finance.
- Investor's behavior and confidence are conditioned by a series of socio-demographic variables such as gender, age and education.

Based on the aforementioned hypotheses, we composed a questionnaire to be used in our surveys of professional investors. The surveys consist of six filter questions, followed by seven questions regarding the investor's sentiment, used to determine the Institutional Investor Confidence Index (Shiller, 2000). Finally we asked twenty questions concerning the practitioner's view of Behavioral Finance, including his own perception of his prevailing behavioral profile (Bailard, Biehl and Kaiser, 1986) and behavioral biases.

The research is based on five online anonymous surveys conducted during 2015, 2016 and 2017 involving an average of approximately one hundred professional investors from the Spanish market associated to Funds People monthly publication and the CFA Society Spain.

We have discretized all our variables to represent simplified information and have empirically contrasted our findings using different parametric and non-parametric statistical tests, thereby fulfilling the required conditions (normality, equality of variances or large sample of data).

1.2. Outline and Content of the Thesis

The research is organized in three research articles. In the first article, “*Overconfidence, Loss Aversion and Irrational Investor Behavior: a Conceptual Map*”, published in the *International Journal of Economic Perspectives* (2017), we develop a conceptual map of the field of Behavioral Finance by a comprehensive review and synthesis of the literature. We analyze the empirical evidence of financial market anomalies related to overreaction and underreaction and provide an overview of the main psychological theories that explain irrational investor behavior: the Representativeness Heuristic and the Prospect Theory.

We identify overconfidence, loss aversion and herding as the main behavioral biases and classify the different behavioral models based on the concepts of biased beliefs and unconventional preferences. Based on the literature, we draw a conceptual map that shows the links among the psychological theories, the prevailing biases and the referred behavioral models.

To conclude our first article, we address the limits of Behavioral Finance, several alternative theoretical frameworks and future areas of research, introducing the concepts of rational irrationality and the impact of the time variable as key factors in the analysis of irrational investor behavior.

The second article, “*Prevailing Behavioral Biases and Investor Profiles: a Survey of Professional Investors*”, published in the *Journal of Wealth Management* (2017), is based on empirical evidence provided by four surveys of professional investors with an average of 92 participants. The aim of this article is to assess the relevance of Behavioral Finance according to practitioners and to identify their predominant profiles and behavioral biases.

We first analyze the practitioners' level of awareness and education in Behavioral Finance and find a significant gap between their learning experience and the relevance assigned to the field. According to professional investors, this is due to the lack of homogenization and structure in the field, which is consistent with our review of the literature.

Also, in line with the literature, professional investors identify representativeness, loss aversion, and herding as the most relevant biases in their decision-making process. Moreover, we analyze the practitioners' behavior under different financial scenarios and find evidence of the prevalence of overreaction versus under-reaction and lack of ability to anticipate the market.

To conclude the second article, we classify investors according to their investment profile, applying the BB&K five-way model (Bailard, Biehl and Kaiser, 1986). We identify overconfidence as being a predominant bias among practitioners and find evidence of a clear disconnect between investors and their clients: investors tend to describe themselves as Individualists and Adventurers yet predominantly perceive their clients as Guardians.

Lastly, the third article, *“Impact of Education, Age and Gender on Investor’s Behavior: Modeling Confidence”* is currently in the process of publication. The research is based on a new complete survey of 106 professional investors conducted in 2017, aimed at analyzing the impact of education, age and gender on investors' irrational behavior and confidence level.

The research confirms several of the findings of the second article: in particular, the gap between the relevance of Behavioral Finance for practitioners and their lack of training in this field, as well as the divergence between investor and client profiles.

Regarding the impact of education, our research focuses on the Chartered Financial Analyst (CFA) accreditation and the hours of learning in Behavioral Finance. CFA Charterholders have a higher level of training in the field and admit of being particularly influenced by herding or social conditioning. However, consistent with the literature, having the CFA accreditation and a higher level of education in Behavioral Finance does not have a significant impact on the investor's profile and behavioral biases.

Regarding age, despite their lack of experience, younger practitioners unanimously recognize the relevance of Behavioral Finance and acknowledge being more influenced by both cognitive and emotional biases.

Concerning gender, female investors report having a higher level of training in Behavioral Finance and acknowledge being more driven by rational analysis and risk aversion, which is consistent with previous literature.

To conclude our third article, we develop a model to determine institutional investor's confidence index according to different socio-demographic variables. We find evidence that women and more experienced investors have a higher level of confidence among professionals. However, the CFA accreditation and the hours of training have no impact on the practitioner's confidence. This finding is consistent with previous studies (Menkhoff and Nikiforow, 2009), indicating that the level of education in Behavioral Finance does not eliminate nor reduce investors' irrational behavior.

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2. Overconfidence, Loss Aversion and Irrational Investor Behavior: a Conceptual Map

Manuel Gonzalez-Igual and M. Teresa Corzo-Santamaría, 2017*

“Most of us view the world as more benign than it really is, our own attributes as more favorable than they truly are, and the goals we adopt as more achievable than they are likely to be.”

Daniel Kahneman, 2011

Abstract

This paper develops a conceptual map in the field of Behavioral Finance related to asset pricing, through a review and synthesis of the literature. We analyze the empirical evidence of financial market anomalies related to overreaction and underreaction and present an overview of the main psychological theories that describe irrational investor behavior: the Representativeness Heuristic and the Prospect Theory. We go on to describe and classify the behavioral models based on overconfidence, loss aversion, herding and other irrational biases that explain the lack of correlation between risk and return in the financial markets. To contribute to further systematization in the field, we categorize behavioral models into three distinct groups and draw a conceptual map showing the relationship between these models and the referred psychological theories. Finally, we address critics and alternative theories and identify issues for further research, introducing, among others, the concepts of rational irrationality and the time variable as key factors in the analysis of irrational market behavior.

Keywords: Behavioral Finance; Overconfidence; Loss aversion; Irrational behavior

JEL classification: G02, G11, G14, G17

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2.1. Introduction

After the 2007-2008 global financial crisis, the Dow Jones index changed from a 50% drop in the period between July 2007 and March 2009 to a 165% upswing over the subsequent five years, a variation in value equivalent to approximately 20% the GDP of the United States. Meanwhile, in the same period, the NASDAQ index experienced an initial 50% drop and a subsequent 220% upswing. However, the annual variation in the GDP of the United States during the financial crisis did not exceed an annual rate of 3.1%.

This evolution suggests that financial markets tend to swing widely, often overreacting to economic circumstances and showing a lack of correlation with the real fundamentals. Contrary to the traditional theory based on the efficiency of financial markets, the rational investor, and the correlation between risk and return (Markowitz, 1952; Sharpe, 1964; Lintner, 1965, Black 1972) there is ample empirical evidence of market anomalies, for instance, the lack of correlation between risk (β) and profitability in the period 1963-1990 (Fama and French, 1992). These abnormalities, along with theories of irrational behavior in decision-making processes (Tversky and Kahneman, 1974 and Kahneman and Tversky, 1979) have led to the development of an alternative theoretical framework known as Behavioral Finance. This new conceptual framework may represent a change of paradigm in the theory of finance. However, “within financial economists, there is no general consensus on the presence and importance of Behavioral Finance” (Van der Sar, 2004, p 427).

The aim of this article is to draw a conceptual map in the area of Behavioral Finance based on a literature review, in order to contribute to further systematization in the

field, determine its ability to explain the functioning of the financial markets and identify new lines of research.

Nevertheless, the authors acknowledge that the field is far too large and not systematized and does not constitute a unified theoretical body so far. Therefore the aim of this research paper is not to cover everything related to Behavioral Finance. In particular, we do not address the limits of arbitrage in our analysis. The main objective is to address the phenomena of overreaction and underreaction, from the standpoint of empirical evidence, psychological theories and behavioral models that attempt to explain the impact of irrational investor behavior on asset pricing. Investors can overreact (conversely underreact) mainly in two different ways, reacting disproportionately (too moderately) 1) to new information (public or private) or 2) to past performance of a given security.

An initial systematic review was conducted, focusing on the most relevant terms in the field of study and the leading journals. This methodology was combined with a bibliographic review starting with the works of Subrahmanyam (2007) and De Bondt et al. (2008) and complementing it with recent works on the subject.

First, we shall describe the research methodology used to identify key scientific texts on the subject. The literature review, in turn, is divided into three sections. In the first section, we refer to the empirical evidence, identifying the main financial anomalies detected. We go on to analyze the theoretical framework of psychology regarding irrational behavior on the part of the individual. Third, we describe and analyze the implications of the main behavioral models and categorize them according to biased beliefs and unconventional preferences. Based on the literature review and to position the research in the field, we draw a conceptual map that shows the link between the

psychological theories and the referred models. Finally, in an attempt to map the limits and future areas for research, we identify various recent critical and alternative theoretical frameworks concerning the investor's behavior and decision-making.

2.2. Research Methodology

First, a systematic review of the literature was conducted, focusing on the keywords and the most relevant journals identified in Behavioral Finance.

To identify the top twenty journals, three sources of information were combined: ISI Web of Knowledge, SCImago Journal & Country Rank (Scopus), and the Combined Journal Guide in the areas of finance, psychology and economics. In the case of the ISI Web of Knowledge, we took into consideration the subject (business finance) and the Impact Factor (number of citations/number of articles) for the journal. In the case of SCImago, we looked at the proportionate Impact Index, while for the Combined Journal Guide, the quartile was considered (see appendix A, which contains a list of the main journals). Of the twenty selected journals, 16 contain financ* as part of their name. This criterion was used to perform a systematic search.

The most relevant words in the area of Behavioral Finance were identified as follows: Behavioral Finance, overconfidence, overreaction, loss aversion, bias, irrational, and cross-section. The search was performed using the academic search engine EBSCO. The databases used were Academic Search Complete, EconLit, Business Source Complete, and E-Journals. The formulae used for the research, based on Boolean operators (combining criteria with the *Or* and *And* operators) and the two spellings of "Behavioral Finance" (including the British one "Behavioural Finance") were as follows:

(behavior* financ*) and (overconf* or irrational* or loss-aversion or overreact* or bias or cross-section)	Text
behavior* financ*	Abstract
financ*	Source

(behaviour* financ*) and (overconf* or irrational* or loss-aversion or overreact* or bias or cross-section)	Text
behaviour*financ*	Abstract
financ*	Source

A total of 420 articles and 80 articles were found. The first ones to appear in the search results were identified as both helpful as a starting point for a literature review: *Behavioral Finance: Quo Vadis?* (De Bondt et al., 2008) and *Behavioural Finance: a Review and Synthesis* (Subrahmanyam, 2007).

Based on the aforementioned articles and the knowledge of the main authors (Barberis, Daniel, De Bondt, Hirshleifer, Fama, French, Grinblatt, Kahneman, Shiller, Subrahmanyam, Thaler, Tversky...), a literature review was performed, identifying the most relevant articles in Behavioral Finance. The subsequent reading of the articles, and particularly those of Fama and French (1992), Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (2007), resulted in a total of 53 items selected, 16 of which had been published in the *Journal of Finance*, 7 in the *Journal of Financial Economics*, and the remainder in a total of 21 other journals. Most of the articles used were ultimately derived from the literature review. Appendix B includes a list of the selected articles, indicating in each case the number of citations according to Google Scholar (November 2015). Obviously, the most recent articles have a lower number of citations. Several books were also consulted, for the classical theories and for Behavioral Finance: Black et al. (1972), Fama (1976), Shiller (2000) and Barberis and Thaler (2003).

2.3. Literature Review

2.3.1. *Empirical Evidence: Financial Anomalies*

The traditional model for asset pricing and the analysis of financial markets is based on rational investor behavior, market efficiency, the correlation between risk and return, and the evaluation of assets using the CAPM (Capital Asset Pricing Model) method developed by Sharpe (1964), Lintner (1965) and Mossin (1966). According to the theory of diversification and market efficiency developed by Markowitz (1952), the expected return for a stock is a linear function of β (slope of regression between stock return and market return). Black, Jensen and Scholes (1972) provided empirical evidence of the positive relationship between average return and beta in the pre-1969 period. According to the efficient market hypothesis (EMH) developed by Fama (1970), stock prices reflect all known information and immediately change in response to new information.

However, ample evidence of anomalies in financial markets has been detected, thereby challenging previous theories. A financial anomaly is defined as “a documented pattern of price behavior that is inconsistent with the predictions of traditional efficient markets and rational expectations asset pricing theory. That theory has two characteristic features. First, investors are assumed to have essentially complete knowledge of the fundamental structure of the economy. Second, investors are assumed to be completely rational information processors who make optimal statistical decisions” (Brav and Heaton, 2002, p 575).

Reinganum (1981), in an early work, finds a lack of correlation between profitability and risk (β). Shiller (1981) finds empirical evidence of an excessive variation of stock prices as a function of dividends, and attributes this anomaly to irrational market

functioning. Later, Reinganum (1983) analyzes the January effect, according to which small firms obtain exceptionally large returns during the first trading days of the year. There is ample empirical evidence of seasonality and calendar effects inversely related to the size of the company, comprising, for instance, abnormal returns at the turn of the month (Keim, 1983).

Foster, Olsen and Shevlin (1984) find empirical evidence of the earnings momentum effect related to the underreaction to earnings announcements and leading to the subsequent drift in returns. Based on a sample of 56.000 observations, they analyze this anomaly over the period 1974 to 1981 and conclude that, over the following two months to an earnings announcement, a long position in stocks with unexpected earnings in the highest decile, combined with a short position in the lowest decile can lead to “abnormal” returns of approximately 25%. Bernard and Thomas (1989) also studied “post-earnings-announcement drift” and confirm that a delayed price response to information occurs but fail to find a rational explanation for this phenomenon.

De Bondt and Thaler (1985) find that when stocks are classified according to three to five years past returns, previous losers tend to be future winners, and vice versa. They justify these long-term reversals through investors’ overreaction. To some extent, investors tend to place too much emphasis on the past performance and too little to the fact that stocks tend to revert to their fundamental value. Hence, overreaction to past performance would be a clear anomaly to the traditional theory of market efficiency.

Fama and French (1992) analyze the evolution of the return for companies quoted in the United States stock market during the 1963-1990 period, and find no evidence of a correlation between capital gains and risk (β). Instead, they identify that the variables

“firm size” and “book-to-market ratio” (book value divided by a company's market capitalization) can explain stock returns in the period. Specifically, they find that the smaller the company is and the higher the book-to-market ratio is, the higher is the expected return. They also identify that there is a positive autocorrelation of returns in the short run, and a negative one in the long run. Their conclusion is therefore that two easily measurable, straightforward variables allow for characterizing stock returns in a simple and powerful way. As a possible explanation, they point to the irrational behavior of markets and the phenomenon of overreaction. Nonetheless, they also propose an explanation that is more coherent with traditional financial theory, indicating that book-to-market ratio and firm size may be a good approximation of the risk offered by a company. Specifically, they state that when the book-to-market ratio reaches high values, this indicates a risk of bankruptcy (“distress”) for the company.

Jegadeesh and Titman (1993) find empirical evidence that in the short term (less than 12 months) stock prices underreact to information. According to this anomaly, stocks that strongly increased in the past will probably keep outperforming in the near future. However, in the long run, share prices tend to overreact and be overvalued, leading to a subsequent reversal after this period. This is known as the price momentum effect and shows that over one-year periods, past winners tend to remain winners. Conversely, beyond that period, momentum is most likely followed by lower profitability.

Shiller (2000) analyzes the excess volatility of financial markets and discusses the creation of speculative bubbles and the "irrational exuberance" of financial markets. This term was previously used by Alan Greenspan, Chairman of the Federal Reserve of the United States, in 1996, triggering a very negative impact on the markets themselves at a global level. Shiller anticipated what is known as “the dotcom bubble”

of the year 2000, bringing to light arguments that justify that several technology companies were overvalued. He also indicates that the crisis of 2000 was the result of an irrational and unjustified increase in the volume of investment in the stock market, driven by the increased advertising of financial markets. Later, in 2005, he published a second edition in which he predicted the housing bubble in the United States, noting that the value of assets did not reflect the fundamentals of the sector, nor was it justified by the profitability thereof. Real estate assets peaked a year later, leading, from 2007 onwards, to the now notorious financial crisis.

Grinblatt and Keloharju (2001), based on empirical data of the capital market in Finland, analyze how distance, language and culture condition investor behavior. They find that it is more likely for investors to buy and sell shares of Finnish companies that are based close to investors, which communicate in the same language and which have a top management with a similar cultural background. Once again, this constitutes an anomaly in terms of the rational investor behavior theory.

In the same year, Barber and Odean (2001) analyzed a sample of 35,000 investors and found that men were 45% more likely to invest in stock than women. In both cases, investment led to negative returns. The authors conclude that investors deviate systematically from rationality and that financial models based on behavior and in particular overconfidence, would explain such anomalies. Previously, Powell and Ansic (1997) also provided evidence of gender differences among investors. The authors performed two surveys concerning financial decisions linked to insurance coverage (126 participants) and currency market decisions (101 participants), with the aim of evaluating investor risk preferences. According to their experiments, females are less risk-seeking than male, and gender differences were found to be significant.

Hirshleifer and Shumway (2003) examined the relationship between morning sunshine and index returns in 25 countries and over a 15 year period (1982 and 1997). They find evidence of a significant positive correlation between sunny weather and stock returns. Their results are coherent with formal psychological studies showing a positive impact of sunny weather on people's mood.

Grinblatt and Keloharju (2009) analyzed the role of two psychological attributes (sensation seeking and overconfidence) on the evolution of capital markets and professional investors' behavior. Based on data from Finland, they concluded that investors with greater self-confidence and heightened sensation-seeking traits are the most involved in the market, even though on average this results in negative returns. The authors concluded that certain behavioral attributes play a fundamental role in the behavior of financial markets, and note that a high level of trading is in itself an anomaly.

Therefore, there are multiple anomalies that reveal irrational investor behavior diverging from the traditional theory based on the efficiency of financial markets, leading to what is known as "irrational exuberance". Earnings and price momentum, excess volatility and size and book-to-market effects are among the main anomalies found in this literature review. There are also other anomalies related to the cultural background and investors' gender, or to external factors such as calendar and weather effects. Moreover, the referred studies find that trading activity is higher than rationally expected.

In brief, as the empirical evidence shows, the evolution of the market value of assets cannot be explained based on the classical criteria of profitability and risk. In contrast,

there are psychological, personal or cultural traits of investors that condition their investment decisions.

2.3.2. Psychological Basis: the Theory of Irrational Behavior

According to the theoretical framework of Behavioral Finance, “investors suffer from cognitive biases and cannot process available information rationally” (Brav and Heaton, 2002, 576). Most of the psychological basis underlying such theories was developed prior to the identification of anomalies in financial markets and to financial theory based on investor irrationality. As described by Barberis and Thaler (2003), investors deviate from rationality for two main reasons: i) they are subject to biased beliefs, meaning that Bayes rule of probability is not properly applied; and ii) given their beliefs, their preferences diverge from the theory of expected utility (Von Neumann and Morgenstern, 1944). More concretely, the main pillars of this psychological framework are the Representativeness Heuristic (biased beliefs) and the Prospect Theory (unconventional preferences), which are underlying most of the biases that lead to irrational behavior. Research papers from Kahneman and Tversky on these matters are in fact the most cited research papers of this literature review, with approximately 35.000 citations each, according to Google Scholar, more than double the third most quoted research paper. Conservatism and Social interaction (herding) also play a key role in explaining investor behavior.

According to the Representativeness Heuristics (Tversky and Kahneman, 1974), subjects tend to consider a certain event as typical or representative, ignoring the laws of probability. The theory substitutes “weighting” for “probability”, and “value function” for “utility function” derived from the theory of expected utility. The authors analyzed the behavioral reaction to news, detecting that when the strength of the story increases, while the weight remains constant (constant statistical evidence),

the reaction of the individual increases. This, in turn, generates the phenomenon known as overconfidence, meaning that investors tend to overestimate their knowledge and forecasting skills and therefore underestimate risk. Representativeness is also linked to the availability bias, which implies that individuals tend to overweight information that is readily available and are more likely to recall events with wide media coverage.

Along the same lines, Griffin and Tversky (1992) highlight how, in making forecasts, people pay too much attention to the strength of evidence and too little to statistical weight. Thus, the pattern of overconfidence and lack of confidence seen in the studies is explained by the hypothesis that people focus on the strength (intensity) of available evidence (signs of support in a letter of recommendation, or intensity of an effect) with insufficient consideration of the weight or credibility (credibility of the writer, or sample size). This results in overconfidence when strength is high and weight is low and in lack of confidence when strength is low and weight is high. They demonstrate, therefore, the prevalence of overconfidence in the decision model of the individual: “although overconfidence is not universal, it is prevalent, often massive, and difficult to eliminate”.

However, Conservatism (Edwards, 1968) indicates the slow pace of change in patterns of behavior in response to new evidence and helps explain the phenomenon of underreaction. According to this theory, people make much weaker inferences than Bayes' theorem would imply and generally process evidence too conservatively. As a consequence, some investors are subject to anchoring bias and tend not to properly update their decisions based on new information. De Bondt (1993) finds evidence that non-expert investors expect past trend in prices to continue, being bullish in rising markets and bearish in declining markets.

The Prospect Theory (Kahneman and Tversky, 1979) develops a decision model dominated by loss aversion, which can explain numerous violations to the utility function, considering symmetry between gains and losses. The analysis of behavior and decision-making for gambling shows that the individual evaluates the bets in terms of loss and gain, not of final wealth, and that, in turn, is more sensitive to losses than to gains. Thus, loss aversion is crucial in explaining attitudes toward risk. Paradoxically, aversion to loss and the desire to avoid it imply that the utility function of the individual is concave (risk averse) in relation to gains and convex (risk seeking) in relation to losses. Moreover, Prospect Theory and risk aversion are closely linked to regret aversion bias, which implies that investors seek to avoid losses that could have been predicted a priori. For instance, this allows to explain why some investors hold on to previous winners to avoid the regret of having sold too early.

The idea that investor behavior is preconditioned by previous results was also developed by Thaler and Johnson (1990). They conducted experiments in which individuals faced sequential bets and noted that they showed a greater willingness to undertake risk when they had previously obtained capital gains. They also found that losses are less painful for the individual if they occur after obtaining earnings than if they do after suffering losses. Thus, risk aversion decreases after obtaining earnings and reflects the behavior of the player who continues betting when “gambling with the house money”.

Grinblatt and Han (2005) determined that investors are subject to mental accounting bias, categorizing their investments on “separate accounts” and, in turn, apply Prospect Theory, being subject to loss aversion and ignoring the interactions between their different investments. According to the authors, this, in turn, generates overreaction in financial markets.

Finally, social interaction also has a significant impact on the investor's decision-making process. Most investors closely follow what others do and some even copy the main market participants. Prechter (2001) finds evidence of the herding behavior of large groups of financial professionals, whose activity responds to signals from the behavior of others. This imitation phenomenon is closely linked with market anomalies such as bubbles (Shiller, 2000) or momentum. However, this is not necessarily an irrational behavior, since some investors may have better information or better skills than others and therefore are likely to be followed by other players (De Bondt et al., 2013). Doing what others do may also provide personal comfort, to the extent that mistaken investors can argue that the entire market was also wrong. This is even more relevant in an environment where reputation is essential and compensation systems are usually linked to the returns versus market indexes.

In brief, according to the theoretical framework for investor psychology, the decision-making process is conditioned by several conflicting biases such as overconfidence, loss aversion, anchoring, availability bias, mental accounting or herding, among others. They are, in a way, opposing and conflicting forces that drive investors away from the statistical evidence (biased beliefs) and deviate them from their rational expected utility (unconventional preferences), leading them to undertake either excessive or insufficient risk, thus triggering phenomena such as overreaction and underreaction in financial markets.

2.3.3. Models of Irrational Investor Behavior

Following the evidence provided by Fama and French (1992) regarding the lack of direct connection between profitability and risk (β), and the underreaction and overreaction phenomena (Jeegadesh and Titman, 1993), several authors have applied,

among others, the psychological theories of Kahneman and Tversky (1974, 1979) to develop models of investor behavior with limited rationality.

To review the different models of investor behavior, we propose a classification based on the work of Barberis and Thaler (2003) and Hong and Stein (2007). We will draw a distinction between: i) representative-agent models with standard preferences but biased beliefs; ii) representative-agent models with rational beliefs but unconventional preferences, and iii) heterogeneous-agent models, where different agents have different beliefs and preferences.

2.3.3.a. Representative-agent Models with Standard Preferences but Biased Beliefs

Barberis, Shleifer and Vishny (1998) base their study on the empirical evidence that reveals two types of anomalies in rational investor behavior: underreaction to specific news such as earnings announcements, and overreaction to a series of bad or good news. The authors develop a model of behavior consistent with previous empirical findings, based on the assumption of one investor and one asset. The asset return follows a random walk, unknown to the investor, who therefore considers that the share price evolution can follow one of the two following regimes: one featuring a return to the mean (mean-reverting) or an alternative one that follows a trend. These findings are consistent with the results of Tversky and Kahneman (1974) on Representativeness, according to which subjects tend to view an event as typical or representative, ignoring the laws of probability. The model is also based on the theory of Edwards (1968), which establishes that people process evidence too conservatively, which in turn explains the phenomenon of underreaction. Among the limitations of this theory, it is notable that having considered only one investor and one asset, the model does not explain why arbitrage does not correct the error in prices.

Daniel, Hirshleifer and Subrahmanyam (1998) distinguish three types of anomalies: 1) predictable profitability based on events, 2) positive autocorrelation in the short term, and 3) long-term corrections (negative autocorrelation in the long run). They developed a model based on two psychological biases: overconfidence to private information, and the propensity to self-attribution (linked to self-complacency) that generates asymmetric shifts in investor confidence. Put simply, the model is based on the overreaction to private information because of overconfidence and on the underreaction to public information. On the one hand, overconfidence leads to negative autocorrelation and excess share price volatility; on the other, complacency adds positive short-lag autocorrelation (momentum). Thus, in contrast with standard theoretical models that relate positive (negative) autocorrelations to underreaction (overreaction) to new information, they show that positive autocorrelations can result from continuous overreaction, followed by a long-term correction. Therefore, short-term positive autocorrelations are consistent with long-term negative autocorrelations. Hence, they show that overconfidence about private information can explain most anomalies. However, they note that, in the long run, share prices tend toward their fundamentals.

Scheinkman and Xiong (2003) analyzed the behavior of asset prices, trading volume and price volatility in speculative bubble episodes. They present a continuous equilibrium model in which overconfidence generates disagreements among agents, in relation to the valuation of fundamentals. Agents can come to pay prices that exceed their own valuation of future dividends, as overconfidence leads them to think that there will be buyers willing to pay even more. This can cause significant bubbles. At equilibrium, bubbles are accompanied by high trading and price volatility. The authors specifically discuss the impact of restrictions on short positions (betting on a

fall in the price), showing that it increases the negative effect caused by overconfidence, thus increasing the risk of bubbles in financial markets.

Hirshleifer and Teoh (2003) modeled the different alternatives on the presentation of information and analyze the effects of results presentations on market prices when investors have limited attention and limited capacity to process information. They believe that people tend to underweight information of an abstract and statistical type (Tversky and Kahneman, 1974). Furthermore, because the more salient events are easier to recall, bias attention may affect beliefs. They recognize the evidence that markets react quickly to relevant news. However, this does not prove whether there is underreaction or overreaction in the initial response.

The models based on biased beliefs attempt to explain the phenomena of overreaction and underreaction, which have as their common denominator the excess or lack of confidence by the investor, and in turn generate positive and negative autocorrelations in asset value. As previously shown, these models are consistent with the Representativeness Heuristic (Tversky and Kahneman, 1974), according to which investors tend to deviate from statistical evidence. In particular, the overconfidence about private information and the limited capacity to process it are key factors that explain the investor's biased beliefs. According to theoretical models, overconfident investors trade more than rational investors. Glaser and Weber (2007) confirmed that hypothesis through an online survey of 215 broker investors, finding that investors who believe they have superior skills (despite not having better past performance) tend to have a higher trading volume.

2.3.3.b. Representative-agent Models with Rational Beliefs but Unconventional Preferences

Barberis, Huang and Santos (2001) consider that investors derive their utility from gains and losses. In particular, the authors start from the hypothesis that investors are loss averse and that their degree of loss aversion depends on previous investment performance. Therefore, their model of behavior is strongly influenced by prospect theory, based on the assumption that investors are more sensitive to losses than to gains. If the stock has had poor performance over a long period, the investor becomes more sensitive to the risk of further losses and uses a higher discount rate to value the stock. This leads to higher than expected subsequent returns and the corresponding value premium.

To perform their validation, Barberis, Huang and Santos considered one single risky asset. According to their findings, stock returns predicted by their model follow a very similar performance to the real one. In particular, returns for the typical individual stock appear to have a high mean and are excessively volatile. This model does not address momentum but the authors manage to explain the equity premium.

2.3.3.c. Heterogeneous Agent Models, where different Agents have different Beliefs and Preferences

The point of departure for Hong and Stein (1999) is marked by two empirical findings: 1) in the short term asset prices overreact, and 2) in the long term they revert to fundamentals. The authors modeled a market comprising two groups of investors subject to limited rationality: “newswatchers” and “momentum traders”. Each newswatcher observes private information, but cannot extract the information from other newswatchers through prices. Thus, since information is disseminated slowly,

prices underreact in the short term. The underreaction implies that momentum traders can benefit from chasing trends. However, if they are only able to implement simple and univariate strategies, the strategy must necessarily lead to overreaction in the long run. Thus, the goal of momentum traders, which takes advantage of underreaction, leads to a negative outcome: the initial reaction to prices is accelerated, leading to a possible overreaction to any news. Hong and Stein conclude that early momentum traders induce a negative externality on later ones. The model allows to unify the theories of underreaction and overreaction, establishing that the existence of underreaction plants the seeds for overreaction. Additionally, they underline three implications that are relevant to the behavior of financial markets: 1) the phenomena described have a greater impact on the stocks of companies for which information spreads more slowly, 2) initially there could be a greater overreaction to private rather than public information, and 3) there is a direct link between the time horizon of momentum traders and the autocorrelations.

Hirshleifer, Subrahmanyam and Titman (2006) developed a model in which irrational investors invest without taking the fundamentals into consideration. The main elements that define the model are: 1) feedback of stock prices to future cash flows: a higher capitalization helps attract customers and employees, provides cheaper financing for acquisitions, and means higher investment in complementary technologies; 2) the behavior of irrational investors cannot be anticipated by the rational ones, because there are several heuristic models of behavior, and irrational investors may have developed an ability to interpret irrelevant information; 3) irrational investors do not perform their analysis at the same time; and 4) there are irrational investors with information about future cash flows. Thus, because the very activity of investment affects market prices and the feedback of asset prices with

respect to cash flows, irrational investors affect the underlying cash flows. Consequently, irrational investors may in some cases obtain returns that do not correspond to the risk compensation and are higher than those obtained by informed rational investors. Moreover, the action of irrational investors can distort the fundamentals of investment, even if prices behave according to a random distribution (random walk).

Hong and Stein (2007) support the validity of disagreement models based on differences in investors' beliefs to explain the strong correlation between stock prices and trading volume. They first show the statistical evidence of the joint behavior of stock prices and trading volume. To do so, the authors analyzed the performance of glamour stocks (with high market-to-book ratio) and low-priced value stocks over a 20 year period (1986-2005), finding that higher-priced stocks are subject to a higher volume of trading. This evidence is further corroborated by the significant correlation between price performance and trading volume for the S&P Index over a 105 year period (1900-2005). To address this price-volume relationship, Hong and Stein propose a disagreement model, based on discrepancies among investors, mainly due to three factors: 1) gradual and asymmetric information flow to different types of investors, being more readily available to specialists than generalists; 2) limited attention of the agents creates disagreement related to the timing and the way the information is released; and 3) heterogeneous and biased beliefs among investors lead to different interpretations of the same information. According to their model, the momentum effect is stronger for companies with a higher trading volume. Finally the authors note the need for higher systematization and a global theoretical framework for Behavioral Finance to become a solid alternative to classic asset-pricing theory.

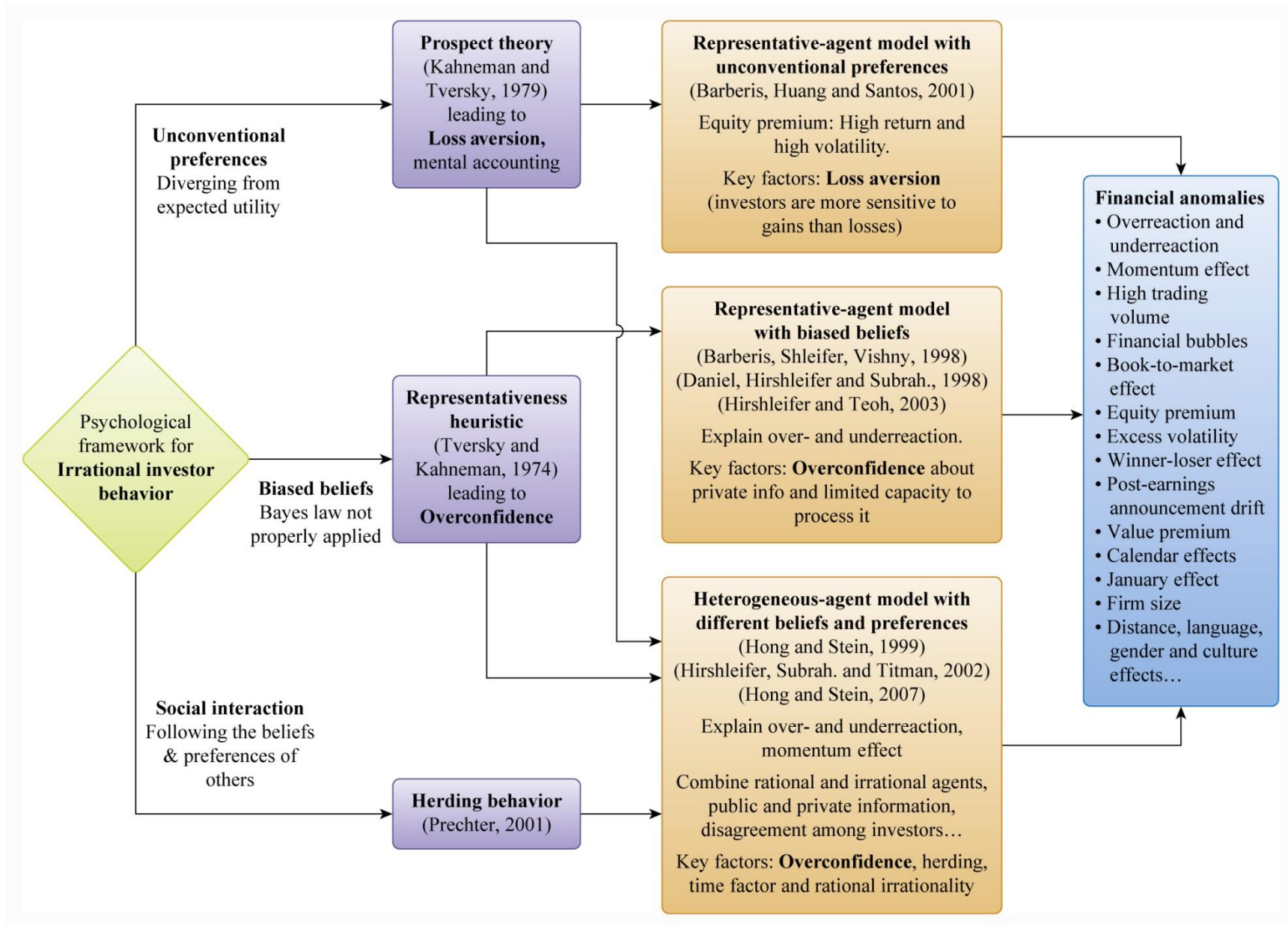
Hong, Stein, and Yu (2007) study the implications of learning in an environment in which the model of the world is multivariate, but where agents use univariate models. Therefore, if a model fails to work for a period of time, it is discarded in favor of an alternative simple model. The authors refer to information overload and the need to simplify in order to be able to forecast. The hypothesis in this model is that agents update their forecasts based on simple models, putting no weight on the more accurate, more complicated and real model for the world. In addition, even if simplifying is not necessarily negative (there are reasons that justify it, such as the cognitive costs of processing and storage), the true problem is that people behave as if the simple models provided a precise description of reality. This is a consequence of overconfidence and limited rationality. Thus, the research article begins with the assumption that agents use only part of the available information. However, as a novelty, they explicitly analyze the learning process and the model of change. As an empirical test, they construct a panel of 2,500 independent shares that are followed through 100 periods. The premise that agents use models that are excessively simple can explain the phenomenon of "underreaction". However, the major contribution is derived from the additional effects of the learning mechanism. Learning leads to 1) a Value-Glamour differential, or the book-to-market effect (Fama and French, 1992); 2) there is substantial variation in expected stock returns: for example, a high-priced share (of the glamour type) that recently received bad news (negative catalyst) is more liable to a paradigm shift that would lead to a decrease in profitability; and 3) revisionism: when there is a paradigm shift, agents downgrade their previous decisions.

2.4. Conceptual Map and Synthesis of Behavioral Models

As stated by Jeffrey and Putman (2013), Behavioral Finance is still “an adhoc collection of concepts and factors that are basically disconnected, stand-alone concepts”. Therefore, to facilitate the understanding to the reader and to contribute to further systematization in the field of behavioral finance, we provide a conceptual map (Figure 1) that links the psychological theories previously described with the most relevant models of irrational investor behavior, allowing us to explain the most relevant financial anomalies.

On the one hand, overconfidence and loss aversion are identified as the main critical factors underpinning these behavioral models. In addition, herding behavior and social conditioning act as an amplifier of individual irrational behavior, resulting in a wider deviation from the efficient market hypothesis and leading to financial bubbles and crashes in financial markets.

Figure 2.1. Conceptual map for behavioral finance and the models of irrational investor behavior



As described, most behavioral models are based on biased beliefs as the main driver of investor irrationality. Moreover, among the research papers associated with behavioral models, those related to biased beliefs have a significantly higher number of citations according to Google Scholar: nearly 2.700 citations/paper versus 850 average citations for the remainder. These models are closely linked to the Representativeness Heuristic. In particular, overconfidence about private information and the limited capacity to process it, are the main factors leading to the overreaction, underreaction, high trading volume and momentum effects. Even if asset prices grow over their fundamental value, overconfident investors tend to believe that there will be others willing to pay even more. This eventually ends in a financial bubble.

On the other hand, models derived from unconventional preferences are less common but provide a complementary insight related to the equity premium. Based on Prospect Theory and loss aversion, these models lead to higher than expected discount rates used to value stock (versus bonds). This, in turn, results in excessively higher returns and volatility.

Finally, certain models introduce a higher degree of complexity by considering heterogeneous investor profiles, including both rational and irrational agents, public and private information or the learning effect. By framing diverse investor profiles, these models better capture the social interaction or herding among them. Moreover, given the complexity and uncertainty surrounding the markets and the heterogeneity of agents, it is difficult to imagine a rational behavior of the entire system. However these latter models are still dominated by investors' biased beliefs (overconfidence) and may still lack a deeper analysis of the combined effect of biased beliefs and unconventional preferences.

2.5. Critics and Elements for Further Research

2.5.1. Alternatives to the Models of Irrational Investor Behavior

Despite the empirical evidence, at present, the traditional model of profitability and risk still prevails over Behavioral Finance. Several authors, having defended the traditional thesis, have gone on to adopt the theory of Behavioral Finance, and ultimately returned to the risk and return model or a similar alternative. As stated by Livio Stracca (2004, p 374): “it is far from being a foregone conclusion that the behavioral methodology will come to dominate economic research and completely supplant the mainstream approach based on expected utility maximization and rationality”.

Fama and French (1996) find that anomalies largely disappear in a three-factor model that allows for explaining the expected return in excess of the risk-free rate. These three factors are: (i) the excess return of market portfolio, (ii) the size effect (difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks) and (iii) the book-to-market effect (difference between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low-book-to-market stocks). The model explains the reversal of long-term returns described by De Bondt and Thaler (1995) but fails to describe other anomalies such as the continuation of short-term returns found by Jeegadesh and Titman (1993).

Carhart (1997) adds price momentum as an additional factor to the Fama and French three-factor model. The model, based on size, book-to-market and momentum factors, explains the evolution of risk-adjusted returns in mutual funds (including also investment expenses) and therefore is consistent with market efficiency. Moreover,

the results do not support the existence of more skilled fund portfolio managers, able to obtain superior returns or alpha.

Daniel and Titman (1997) proposed the characteristics model. Although it cannot be said to fall under the traditional theory, neither is it aligned with the Behavioral Finance framework. The authors note that there is evidence that market behavior can be explained by characteristics such as size, debt or past returns. Referring to Fama and French (1992), they highlight that there is no risk effect related to the factors book-to-market or size (characteristic) and price. In contrast, they highlight that companies with high book-to-market ratios tend to have similar characteristics, related to types of business, industry, and size.

Fama (1998) advocates the prevalence of market efficiency to the extent that market anomalies tend to contradict each other and can also be explained by random effects or the methodology used in the analysis as, for instance, sample period bias. He notes in particular that overreaction is just as common as underreaction and that the continuing trend of abnormal returns is as common as the mean reversion. Therefore momentum and reversal trends may compensate each other, resulting in overall market efficiency.

Davis, Fama and French (2000) base themselves on the evidence of Fama and French (1992), according to which companies with high book-to-market ratios offer higher returns, thereby defying the Capital Asset Pricing Model theory. They propose four possible explanations: 1) by chance; 2) it is not an anomaly: the higher profitability due to book-to-market is a compensation for risk in a multifactor system, such as the three factor model of Fama and French (1996); 3) it is due to the negative overreaction to companies with weak fundamentals; and 4) it may be explained by the

characteristics model introduced by Daniel and Titman (1997). Regarding the latter, they note that the evidence found is due to the short period of time considered (1973-1999). The range considered by Davis, Fama and French (2000) covers 68 years (1929-1997), and they found that the risk and return model provides a better explanation. Thus, they conclude that the three-factor model (book-to-market, size and β) explains the behavior better than the characteristics model proposed by Daniel and Titman (1997). In particular, they underline the strong evidence with respect to profitability and book-to-market.

Brav and Heaton (2002) compared different conceptual frameworks capable of explaining the financial anomalies: theories based on irrational investor behavior (Behavioral Finance) and rational structural uncertainty. Specifically, they present three models: 1) the irrational investor subject to the Representativeness heuristic (Tversky and Kahneman 1974) tends to overweight recent evidence, ignoring probability and prior evidence; 2) the irrational investor subject to conservatism can match the above but at different times; and 3) the rational investor subject to structural uncertainty. They discuss the implications of each theory for the disappearance of anomalies in the long term. They estimate that if irrationality causes the anomalies, rational learning (arbitrage) should be able to correct it. Thus, they indicate that irrational anomalies cannot survive in the presence of rational arbitrage. They further stress that although both frameworks offer opposing hypotheses, they nonetheless show great similarities in mathematical modeling and forecasting, which makes it difficult to distinguish between them.

According to Stracca (2004), despite the wide list of anomalies identified and explained by the Behavioral Finance literature, the “bulletproof evidence” of market irrationality in the beat-the-market sense has not been provided yet. He notes the fact

that, accounting for transactions costs, active portfolio managers do not consistently outperform passive investment strategies (Malkiel, 1995).

Daniel and Titman (2006) cast doubts on the theoretical and empirical foundation of Behavioral Finance. They base themselves on two basic principles of Behavioral Finance theory: 1) In the long term, future returns correlate negatively with past returns and 2) returns correlate positively with price-scaled variables, such as the book-to-market ratio. They define the concept of intangible return or profitability as one that is not directly due to a real productive asset belonging to the company. Daniel and Titman did not find consistent empirical evidence of autocorrelation between past performance and future returns and neither did they consider Behavioral Finance theories to be correct. Instead, they explain that the book-to-market effect and the profitability reversal occur because future returns are related to the past accomplishment of intangible information, and in the long term a reversal of intangible returns occurs.

Jeffrey and Putman (2013) provide an alternative framework for the analysis of economic decisions based on the paradigm of the “homo communitatis” instead of the “homo economicus”. Although the authors consider that the focus of economic theory must be “action by persons”, they reject the assumption accepted by Kahneman and Tversky (1979), stating that decision making is “a choice of outcomes”. The new theory is based on seven principles stated by the authors, that affect choice and decision making: “1) choice is a choice of behavior; 2) by behavior, they mean intentional action; 3) human behavior is driven by deliberate action; 4) behavior choices are motivated by the reasons to engage in one behavior or another; 5) people chose what matters to them; 6) behavior is deeply conditioned by the social practice in community; and 7) for any person a particular event may be real, actually possible or

merely possible”. In short, the investor’s choice and decision-making processes are driven by intentional and deliberate actions, which in turn are the consequence of social conditioning. Jeffrey and Putman claim that experimental findings such as loss aversion or mental accounting are not irrational and are coherent with their theory. Therefore, they conclude that “investor irrationality” is an “illusion” derived from erroneous assumptions and incomplete specifications concerning investor behavior.

In brief, several authors maintain the prevalence of investor rationality, despite their decisions being conditioned by the structural uncertainty of the market itself, and by the impact of intangibles. Furthermore, they defend that arbitrage works over a long-term period, thus ensuring valuation according to fundamentals. In the short term, financial investors would be operating under a bounded rationality context in which it is not always feasible to make optimal choices, due to the multitude of factors and the interaction between them, which does not necessarily imply that their decisions are irrational. Jeffrey and Putman (2013) proposed an alternative framework emphasizing the social dimension of human beings and arguing that rationality should be evaluated from the perspective of the person and not the pure economic reasoning.

2.5.2. Lines for further Research in Behavioral Finance

Considering the relevance of overconfidence for the investor’s decision-making process, further research may be required to better understand the reasons and implications of this particular trait and even to identify different subclasses of this bias. Fellner and Krügel (2012) analyze three different types of judgment tasks related to overconfidence through a survey of university students based on general knowledge questions (task 1), time forecasts (task 2) and signal-based predictions (task 3). They find no evidence of overconfidence bias and that the trend to estimate too narrow intervals is not directly linked to the overweighting of private information.

The authors present their findings as a possible explanation for the lack of sufficient empirical support of overconfidence models in financial decision-making. However, we could argue that investors may not behave in the same way as university students.

Furthermore, the time factor appears on a recurring basis, which indicates that the lack of rationality occurs for a limited period so that, in the long term, assets tend to converge towards their fundamental values derived from rational analysis. The different timing in the processing of information among investors also leads to anomalous market behavior. If we were to draw a parallel to the world of physics, irrational market behavior would correspond to a transitory regime - caused by a disruptive element - to be extinguished over time. This implies that it might be more appropriate to speak of limited and temporary rationality. Thus, a rational investor would outperform profitability with a long-term approach. However, the current scenario is characterized by the complexity and the multitude of factors that can affect how a business will evolve and that is the reason why a transitory period could become a permanent state.

Another issue that is relevant and recurring in the heterogeneous models is the way in which investor decisions are conditioned and based on the behavior of others (herding). Recent empirical work from Menkhoff and Nikiforow (2009) shows that herding is the strongest factor for irrational investor behavior according to fund managers. Fenzl and Pelzmann (2012) provide a comprehensive review of the impact of social conditioning on financial markets. In particular, social interaction is a key element to understand the cycle of boom and crash in financial markets. As stated by the authors, “collective behavior does not simply sum up preexisting individual motives and preferences”. Hence, herding would have the effect of amplifying the impact of other significant investor biases such as overconfidence or loss aversion.

The asymmetry of information (public and private) and the different biases that coexist in the investment universe make it indispensable to evaluate not only what the rational decision is but also what decision will be taken by the market at any given time, taking into account the limited rationality of agents and the time horizon. Thus, assuming that the market as a whole behaves irrationally, the most rational behavior would probably be not to behave in a rational manner, or to focus on a sufficiently long time horizon in which the market would eventually converge towards the fundamentals. In other words, people are often rationally irrational. For instance, considering a housing bubble, even if investors believe that assets are currently overvalued, if they expect the momentum and the upward trend to continue, the most rational behavior would probably be to keep the assets or even buy more and benefit from a further price increase. As another example, if there is a stock that all investors are overweighting, from a job security perspective, the most rational behavior for a particular investor would probably be to also own some shares of this company since in case of failure he could always blame the market or plead that other investors were also wrong. This highlights the social dimension of investor behavior. Investor rationality should be assessed in terms of the other agents, and, as a consequence, it is necessary to evaluate cognitive biases from a sociological perspective and not only as a purely psychological question.

2.6. Conclusions

Even if it might entail a paradigm shift in the area of finance, Behavioral Finance does not constitute a unified theoretical body so far. This article provides a comprehensive review of the Behavioral Finance theory from the perspective of asset pricing that has allowed us to draw a conceptual map in order to structure the research in this field.

Market anomalies, particularly the disjunction between risk and return, along with the Representativeness Heuristic (biased beliefs) and Prospect Theory (unconventional preferences) from the field of psychology, have led to models for irrational investor behavior. As described in our conceptual map, overconfidence (biased beliefs) and loss aversion (unconventional preferences) appear to be the most relevant biases behind the irrational investor's behavior, allowing us to explain the phenomena of overreaction and underreaction and the positive and negative autocorrelation in the return on assets.

However, the dichotomy between rational and irrational investor behavior remains prevalent, and various authors have once again highlighted the importance of risk as a factor in financial decision-making. In some cases, the similarity between the model of irrational behavior and rational structural uncertainty has also been emphasized. One possible line of future research would be a deeper integration of the two previous models, or the development of a dual model in which rationality and irrationality coexist, as in every human being. Under certain circumstances, people can be subject to bounded rationality or even be "rationally irrational". Moreover, models of investor behavior could be improved with a better understanding of social conditioning (herding) and its interrelation with individual psychological biases, amplifying their impact on financial markets.

There is also scope for research into the ability of investors to learn from past decisions, the effect of arbitrage and the impact of the time variable on investor rationality. In particular, it would be relevant to ascertain whether the irrational behavior theories themselves have had any impact on the investor behavior model. The recent period of financial turmoil would constitute an interesting laboratory for studying and contrasting these theories.

Appendices

Appendix A: Selected Main Journals

Table 2.1. Selected Main Journals

n°	Journal Name	JCR Impact Factor (2013)	SJR (2013)	Combined Journal Guide (quartile)
1	Journal of Finance	6.0	18.4	Q1
2	Quarterly Journal of Economics	6.0	25.2	Q2
3	Journal of Financial Economics	3.8	11.5	Q3
4	Review of Financial Studies	3.5	12.6	Q4
5	Econometrica	3.5	18.9	Q1
6	Journal of Accounting and Economics	2.8	7.3	Q2
7	Journal of Financial & Quantitative Analysis	1.9	4.7	Q3
8	Journal of Financial Intermediation	1.6	4.7	Q2
9	Review of Finance	1.6	3.5	Q2
10	Journal of Financial Stability	1.5	1.7	Q4
11	Journal of Financial Markets	1.3	2.8	Q2
12	Finance and Stochastics	1.1	2.0	Q2
13	Journal of Corporate Finance	1.4	1.8	Q2
14	Mathematical Finance	1.3	1.9	Q3
15	European Financial Management	1.3	1.4	Q4
16	Financial Analysts Journal	1.1	1.9	Q1
17	Journal of Economic Psychology	1.2	0.8	Q3
18	Journal of Empirical Finance	0.9	1.3	Q2
19	European Journal of Finance	0.5	0.4	Q2
20	Journal of Behavioral Finance	0.4	0.6	

Note:

- *JCR Impact factor*: impact factor of Journal Citation Reports ®, based on the average number of citations of recent articles published in the journal. It is used as an indicator of the relative importance of journals within their field. Devised by Eugene Garfield, founder of the Institute for Scientific Information, and used for journals since 1975 in the Journal Citation Reports.
- *SJR (SCImago Journal Rank)*: impact index provided by SCImago, based on the number of referrals received by recent articles of the journal, and on the relevance of the journal itself providing the citation. Therefore it is a measure of the "average prestige per article" of the journal under consideration.
- *Combined Journal Guide*: drawn up by the ABS (Association of Business Schools in the UK), uses a hybrid approach for journal evaluation based on peer review, analysis of references (JCR for the last 5 years) and judgment of several editors.

Appendix B: Selected Articles

Table 2.2. Selected Articles (citations according to Google scholar, Nov. 2015)

Author	Year	Journal	Nº of citations	Bias/Theory
Barber and Odean	2001	Quarterly Journal of Economics	2,796	Gender differences
Barberis, Shleifer and Vishny	1998	Journal of Financial Economics	4,059	Overreaction, underreaction
Barberis, Huang and Santos	2001	Quarterly Journal of Economics	1,660	Prospect theory, loss aversion
Bernard and Thomas	1989	Journal of Accounting and Economics	1,689	Earnings momentum
Black	1972	Journal of Business	3,003	Traditional finance
Brav and Heaton	2002	Review of Financial Studies	443	Rational structural uncertainty
Carhart	1997	Journal of Finance	9,230	Price momentum
Daniel, Hirshleifer and Subrahmanyam	1998	Journal of Finance	4,424	Overconfidence, self-attribution
Daniel and Titman	2006	Journal of Finance	648	Book-to-market effect, intangible
Daniel and Titman	1997	Journal of Finance	1,831	Model of characteristics
Davis, Fama and French	2000	Journal of Finance	914	Model of characteristics, overreaction
DeBondt	1993	International Journal of Forecasting	418	Anchoring
De Bondt and Thaler	1985	Journal of Finance	6,345	overreaction
De Bondt, Muradoglu, Shefrin, Staikouras	2008	Journal of Applied Finance	75	Behavioral finance review
De Bondt, Mayoral, Vallelado	2013	Spanish Journal of Finance and Accounting	4	Behavioral finance review
Fama	1998	Journal of Financial Economics	4,444	Market efficiency
Fama and French	1992	Journal of Finance	14,095	Book-to-market effect
Fama and French	1996	Journal of Finance	5,706	Multi-factor model
Fenzl and Pelzmann	2012	The Journal of Behavioral Finance	7	Herding
Fellner and Krügel	2012	Journal of Economic Psychology	17	Overconfidence
Foster, Olsen and Shevlin	1984	The Accounting Review	840	Earnings momentum
Glaser and Webber	2007	The Geneva Risk and Insurance Review	419	Overconfidence
Griffin and Tversky	1992	Cognitive psychology	1,314	Representativeness
Grinblatt and Han	2004	Journal of Financial Economics	499	Prospect theory, mental accounting
Grinblatt and Keloharju	2009	Journal of Finance	317	Overconfidence, sensation seeking
Grinblatt and Keloharju	2001	Journal of Finance	1,004	Cultural biases
Hirshleifer and Shumway	2003	Journal of Finance	895	Weather effects
Hirshleifer, Subrahmanyam and Titman	2002	Journal of Financial Economics	122	Overconfidence
Hirshleifer and Teoh	2003	Journal of Accounting and Economics	808	Limited attention
Hong and Stein	1999	Journal of Finance	2,845	Underreaction, overreaction
Hong and Stein	2007	Journal of Economic Perspectives	481	Disagreement behavioral model
Hong, Stein and Yu	2007	Journal of Finance	119	Value-glamour effect
Jeffrey and Putman	2013	The Journal of Behavioral Finance	3	Homo communitatis
Jegadeesh and Titman	1993	Journal of Finance	7,335	Buying winners, selling losers
Kahneman and Tversky	1974	Science	34,316	Representativeness
Kahneman and Tversky	1979	Econometrica	37,521	Prospect theory
Keim	1983	Journal of Financial Economics	1,979	Calendar and size effects
Lintner	1965	Review of Economics and Statistics	9,519	Traditional finance
Malkiel	1995	Journal of Finance	1,676	Survivorship bias
Menkhoff and Nikiforow	2009	Journal of Economic Behavior & Organization	26	Herding
Mossin	1966	Econometrica	4,713	Traditional finance
Powell and Ansic	1997	Journal of Economic Psychology	795	Gender differences
Prechter	2001	The Journal of Psychology and Financial Markets	81	Herding
Reinganum	1981	Journal of Finance and Quantitative Analysis	281	Lack of correlation between profitability and risk
Reinganum	1983	Journal of Financial Economics	905	January effect
Scheinman and Xiong	2003	Journal of Political Economy	1,400	Overconfidence
Sharpe	1964	Journal of Finance	16,268	Traditional finance
Shiller	1980	American Economic review	3,857	Lack of correlation between stock prices and dividends
Stracca	2004	Journal of Economic Psychology	117	Survey of anomalies
Subrahmanyam	2007	European Financial Management	195	Behavioral finance synthesis
Tahler and Johnson	1990	Management Science	1,744	Loss aversion, house money effect
Van der Sar	2004	Journal of Economic Psychology	41	Behavioral finance review

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3. Prevailing Behavioral Biases and Investor Profiles: a Survey of Professional Investors

Manuel Gonzalez-Igual, M. Teresa Corzo-Santamaría and Patricia Castán Agustín, 2017*

“We don't know the probabilities of future events. Still, you have to take action and so you do it on gut feeling. That's the world we live in.”

Robert J. Shiller, 2015

Abstract

This article analyzes the relevance of Behavioral Finance in the functioning of financial markets. Using empirical evidence from four surveys of professional investors involving on average 92 respondents, we aim to enhance the structure and systematization of the field. We first study the awareness and level of education in Behavioral Finance, establishing a clear gap of learning experience for professional investors. We also analyze the main cognitive and emotional biases, identifying representativeness, loss aversion, and herding as the most relevant ones in the decision-making process. Moreover, we evaluate the prevalence of under- and overreaction through several financial scenarios and the lack of ability to predict the market. Finally, we classify professional investors through their investment profile, applying the BB&K five-way model. We identify overconfidence as a predominant bias affecting investors and find a clear disconnect between investors and their clients.

Keywords: Behavioral Finance; behavioral biases; investor profiles; BB&K five-way model

JEL classification: G02, G11, G14, G23

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3.1. Introduction

The Efficient Markets Hypothesis (EMH) developed by Fama (1970) for the financial markets is still the most widespread theory that prevails among investors. Traditional finance theory concludes that stock prices reflect all known information and immediately change in response to new information (Fama, 1998). However, stock market history is full of events that challenge this theory, such as the Tulipmania in the 1630s (Mackay, 1841), the October 1929 Crash (Shiller, 2003) or the Black Monday crash of October 1987 (Shiller, 2000). Among the main market anomalies found in the literature are earnings and price momentum, excess volatility or size and book-to-market effects. The ample evidence of these disruptions along with the theories of irrational behavior (Tversky and Kahneman, 1974; Kahneman and Tversky, 1979) have led to the development of an alternative theoretical framework known as Behavioral Finance.

Behavioral Finance takes into consideration deviations from perfect rationality due to investors' cognitive and emotional biases and explores the different ways this may affect asset prices, developing behavioral models to explain the referred financial anomalies. However, despite the Nobel Prizes awarded since 2002 (Daniel Kahneman in 2002 and Robert J. Shiller in 2013), the field is still today neither structured nor homogeneous (De Bondt et al., 2008; Van der Sar, 2004).

In this article, which is based on direct surveys directly administered to professional investors exposed to the Spanish financial market, we determine the relevance of Behavioral Finance for investors and identify the most significant biases that affect the decision-making process. Based on empirical evidence we characterize the investors' predominant profiles and compare it with their own vision of their clients.

To structure our research, we start by framing the main elements of Behavioral Finance. We first refer to the most relevant anomalies documented in the literature and the two main behavioral theories - Representativeness and Prospect Theory - identifying the prevailing biases that influence the decision-making process. We then describe the different kinds of investor's profiles based on the BB&K model (Bailard, Biehl and Kaiser, 1986). We include a reference to investor sentiment calculated in a similar way to the Confidence Index carried out by Yale University (Dzielinski, 2012).

Next, we develop the methodology of our analysis based on surveys of professional investors with an average of 92 respondents per question. Finally, we discuss the empirical results obtained regarding the following points: 1) education in Behavioral Finance and its awareness by the investors' community, 2) relevance of cognitive and emotional behavioral biases, and 3) investors' profiles and lack of alignment with their clients. Conclusions and References can be found at the end of the paper. Survey questions are included in the appendix.

3.2. Related Literature

3.2.1. Over and Underreaction

There are several financial anomalies that define this irrational behavior. According to Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (1999) the two most relevant anomalies that occur in the securities market are under- and overreaction.

Overreaction to past performance is a clear financial anomaly according to classical finance. De Bondt and Thaler (1985) find that investors tend to place too much emphasis on stocks past performance and too little on the fact that they tend to revert

to their fundamental value. Barberis, Shleifer and Vishny (1998) show empirical evidence revealing two types of anomalies in rational investor behavior: underreaction to specific news, such as earnings announcements, and overreaction to a series of bad or good news. According to Daniel, Hirshleifer and Subrahmanyam (1998), investors overreact to private information because of overconfidence and on the other hand they tend to underreact to public information.

Jegadeesh and Titman (1993) find evidence that stock prices tend to underreact in the short term and in particular, the top performers will probably keep outperforming in the near future. However, in the long run, those stocks tend to be overvalued resulting in a reversal after this period. According to this price momentum effect, over one-year periods, past winners tend to remain winners and beyond that period, momentum is most likely followed by lower profitability.

In brief, market anomalies reflect the lack of correlation between risk and return as opposed to classical finance theory. The two main phenomena identified are under- and overreaction which are interrelated since underreaction to information becomes the seed for future overreaction (Hong and Stein, 1999). Both anomalies result as a consequence of cognitive and emotional behavioral biases such as overconfidence or loss aversion.

3.2.2. Cognitive and Emotional Biases in Irrational Behavior

The theoretical framework of Behavioral Finance supports that, due to cognitive and emotional biases, investors cannot process available information rationally (Brav and Heaton, 2002). According to the Representativeness Heuristic (Tversky and Kahneman, 1974), investors are subject to biased beliefs; they tend to consider a certain event as typical or representative, ignoring the laws of probability, so that the Bayes rule of probability is not properly applied. This theory explains the

overconfidence phenomenon, which results from the overestimation of investors as for their knowledge and their forecasting skills and the underestimation of risk. Griffin and Tversky (1992) highlight that when people forecast, they tend to pay too much attention to the strength of the evidence and not enough attention to the statistical weight.

The other main pillar, the Prospect Theory (Kahneman and Tversky, 1979), establishes a decision model lead by loss aversion. The analysis of behavior in gambling shows that the individual is more sensitive to losses than to gains. In particular, according to the literature, investors are more than twice as much risk-averse as they are gain-seeking (Schneider and Lappen, 2000). This is closely related to the disposition effect, according to which investors tend generally to sell their winners too early, and hold their losers too long (Shefrin, 2000), and to regret aversion bias, meaning that investors try to avoid losses that could have been predicted a priori (Barberis, Huang and Santos, 2001). Another bias related to Prospect Theory is mental accounting. Grinblatt and Han (2005) determined that investors categorize investments on different levels according to different investment objectives. In fact, they are subject to loss aversion and they ignore the interactions between their different investment.

Contrary to the Representativeness Heuristic, Conservatism (Edwards, 1968) helps explain the phenomenon of underreaction, referring to the slow pace of change in behavioral patterns when new evidence appears. It advocates that investors are subject to anchoring bias and usually do not properly adjust their decisions in response to new information. De Bondt (1993), finds that investors expect the past price trend to continue, being bullish in rising markets and bearish in declining markets. Investors are subject to confirmation bias focusing only on positive information related to their

investments and not considering any negative related aspects. Additionally, according to the status-quo bias, investors prefer to keep their current investments to stay the same by sticking with a previous decision (Samuelson and Zeckhauser, 1988).

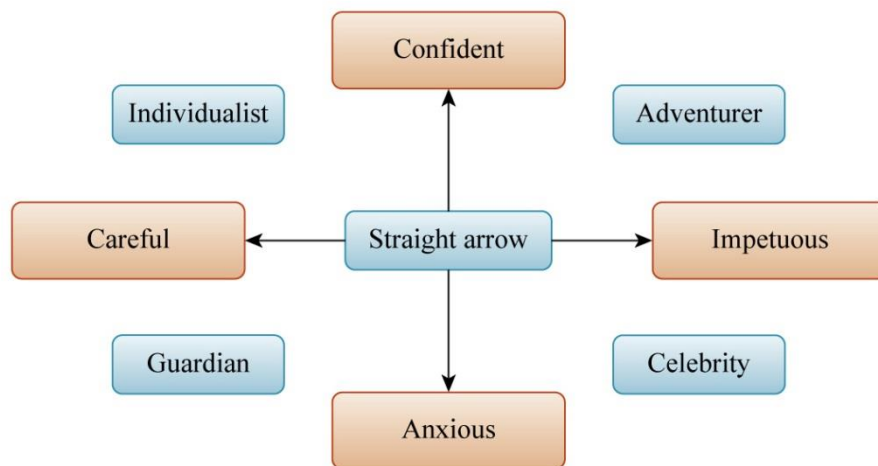
A factor that also has a strong impact on the investor's decision-making process is social interaction, which includes the phenomenon of imitation (herding). Evidence of this behavior was found when Prechter (2001) analyzed the activity of large groups of financial professionals. This tendency to copy what others do is closely related with market anomalies such as bubbles (Shiller, 2000) or momentum.

In line with all this evidence, to simplify their decision-making processes while being unable to fully analyze the available data, investors are conditioned by a number of cognitive and emotional biases, such as overconfidence (biased beliefs) or loss aversion (unconventional preferences) which lead to potentially irrational decisions. Different investor profiles can be identified depending on the prevailing behavioral biases that affect the investors' decision making process.

3.2.3. Investor's Profiles: BB&K Five-Way Model

To conduct our empirical analysis we have used is the BB&K Five-Way Model (Bailard, Biehl and Kaiser, 1986) which classifies investor personalities along two elements: level of confidence and risk aversion. As represented in Figure 3.1. below, the five investor personalities recognized by this approach are the Adventurer, the Celebrity, the Individualist, the Guardian and the Straight Arrow. Each investor personality is located in a different quadrant made up of the two axes of individual psychology mentioned above. One axis named "confident-anxious" reflects the emotional choices made, the other axis is called "careful-impetuous" and reflect how methodical and risk averse an investor is (Thomas and Rajendran, 2012).

Figure 3.1. BBK Model (Bailard, T. E., Biehl, D. L. and Kaiser, R. W., 1986)



Confident and risk-lovers constitute the Adventurer's profile. They have their own ideas about investing, which are so strong that are difficult to advise and they are emotionally biased. Whereas people who do not have their own ideas about investing and are afraid of being left out, establish the Celebrity's profile. This type of investor is mainly driven by cognitive biases. Considering the left-handed half of the diagram, people that have their own ideas about investing and that have a certain degree of confidence in them are included in the Individualist profile. The predominant bias in this type of profile is cognitive (Pompian, 2008). The Guardian's profile is associated with careful people who worry about their money and are not interested in excitement. For this reason, they are dominated by the emotional bias. There is a last profile, the Straight Arrow, which is considered in this model as a very well-balanced person, who is exposed to medium amount of risk (Pompian, 2008).

As described earlier, behavioral investor profiles are defined as a result of confidence and risk-exposure biases. In that sense, measuring the actual investor sentiment through the confidence index and comparing it with a reference is a key element in order to determine the real investors' profile and being able to compare with its own perception. This is especially relevant to our study, since participants in self-reported surveys may have an erroneous view of themselves.

3.2.4. Measuring Investor Sentiment: Institutional Investor Confidence Index

There are no perfect proxies to measure investor sentiment (Baker and Wurgler, 2006, Beer and Zouaoui, 2013). Such proxies can first be classified as direct and indirect sentiment measures.

Indirect measures have a significant advantage over direct ones since they are based on market data, can be observed in real time and reflect both the power of market participant and the strength of their bullishness or bearishness. However they are endogenous to the market activity and may not exclusively measure investor sentiment. Direct sentiment measures are derived from surveys directly asking individuals how they feel about current or future economic and stock market conditions while indirect ones represent economic and financial variables susceptible to capture investors' state of mind. Economists always treat surveys with some degree of suspicion, because of the potential gap between how people respond to a survey and how they actually behave (Baker and Wurgler, 2007). We acknowledge that this critic is especially relevant to our paper, in particular when determining the profile of investors, given the general challenge with self-reported surveys where participants may not have or may not provide an accurate view of themselves. The anonymous character of our survey can help to mitigate this impact, but does not guarantee that we have received unbiased answers to our questions.

In our research, we use an already existing approach to measure sentiment, which is a direct survey data, based on the Yale School of Management's Stock Market Confidence Index developed by Robert Shiller (1999). In the spirit of this Index, we measured the Institutional Investor Confidence Index (IICI) based on the following five different indices resulting from questions included in the surveys:

1. Perspectives' index: to determine whether investors think that the Spanish stock market (IBEX) will go up or down.
2. Valuation index: based on investor's valuation of current stock market assessment.
3. Index of capacity of short-term recovery: established in the confidence that investors have in punctual strong falls.
4. Index of capacity of long-term recovery: established in the confidence that investors have in that strong falls tend to revert.
5. Index of risk of crash: it indicates the risk investors assign to a stock market crash.

Once we have determined these indices, we obtain the ICII averaging the results. The result can range between -100 and 100, meaning that a negative index implies a pessimist perspective of the market and a positive one implies an optimist perspective; with a result of zero entailing neutrality (Confidence Index questions in appendix).

3.3. Data and Methodology

3.3.1. Design of the Survey

As indicated, this study is based online anonymous surveys conducted during 2015 and 2016 to professional investors from the Spanish market associated to Funds People monthly publication. The main objective of this data set was to collect information on the investors' views on Behavioral Finance and irrational biases and to measure their sentiment on the Spanish stock market. The surveys were monthly conveyed by email with a link to the online survey and the structure remained the same during the period they were conducted. They were composed by seven initial questions regarding the investor's confidence index, followed by questions concerning Behavioral Finance and six filter questions (see appendix).

We analyze four sets of questions on Behavioral Finance with an average of 92 respondents per question, considered representative from a statistical point of view.

Surveys focused on the following aspects of Behavioral Finance:

- Acknowledgement and level of education in Behavioral Finance with a total of 101 participants
- Main biases affecting investors with a total of 89 and 100 participants
- Investor and Client profile with a total of 79 participants

3.3.2. Theoretical Basis for Statistical Analysis

All variables have been discretized and our findings have been empirically validated through the following parametric and non-parametric statistic tests depending on the fulfillment of the required conditions (normality, equality of variances on large sample):

Binomial test (non-parametric):

- H_0 : homogenous binomial distribution (equal probability between two values)
- H_1 : non homogenous distribution

Association between variables (non-parametric): χ^2 , γ

- H_0 : there is no association between the variables
- H_1 : there is association between the variables

The higher the result of the χ^2 test, the higher the level of association. Unlike the χ^2 , the γ test ($-1 \leq \gamma \leq 1$) also indicates the type of association between the variables (positive if $\gamma > 0$ or negative $\gamma < 0$).

T-Student test for equality of means (parametric):

- $H_0: \mu_1 = \mu_2$
- $H_1: \mu_1 \neq \mu_2$

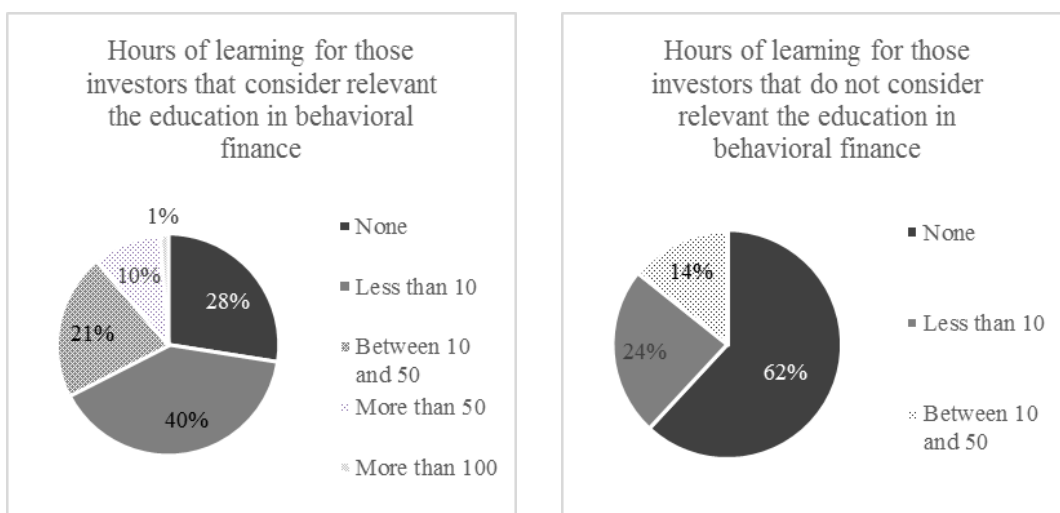
3.4. Results and Discussion

3.4.1. Empirical Evidence: Awareness and Education in Behavioral Finance

We first analyze the results obtained in relation to the study of Behavioral Finance (see questions 6, 7, 8, 17 and 18 related to Behavioral Finance in appendix). Most participants (79% of a total of 101) considered that education in Behavioral Finance is relevant when making investment decisions. Applying the non-parametric binomial test shows that the relevance of Behavioral Finance for investors is statistically significant (pvalue=0.00).

However, despite the relevance of the field, 71% of investors have none or less than ten hours of learning and 35% of investors do not have any education in this area. The lack of Behavioral Finance training from practitioners drives us to be cautious in drawing conclusions from our study. As shown in Figure 3.2., education in Behavioral Finance significantly increases the relevance assigned to the area ($\chi^2= 8.1$; $\gamma=0.518$ with pvalue=0.008): the percentage of investors viewing it as valuable for their job increases from 75% for those with less than ten hours of training to 90% for those with longer learning experience.

Figure 3.2. Education in Behavioral finance



Nevertheless, 62% of the investors that do not have any education in Behavioral Finance recognize the relevance of the field (see Figure 3.2.). The biggest group of investors without training in the field does not possess any official accreditation (47%) and none of investors without education in Behavioral Finance has completed the CFA program. If we discretize the variables accreditation (No accreditation=1; other accreditations=2; CFA Charterholder=3) and hours of learning in Behavioral Finance (0 hours=1; less than 10 hours=2; more than 10 hours=3) we find a significant relation between the accreditation and the education in Behavioral Finance ($\chi^2=10.0$, $pvalue=0.04$). The CFA accreditation is associated with the highest level of learning in the field.

Regarding the adequacy of general financial training and academic education, 59% of the investors considered that it was not really appropriate (binomial test, $pvalue=0.09$), and 61% of the latter determined that the main reason for this is the lack of education in Behavioral Finance. According to the survey, this lack of knowledge in the field is mainly originated because the theory is not homogeneous nor clear (89%). Overall, 81% of investors consider that Behavioral Finance is either too complex or not structured (binomial test, $pvalue=0.00$) what substantiates one of our premises previously mentioned: the need of homogenization of the field.

When investors were asked to determine which cognitive and emotional biases have the highest impact on the decision-making process, the results showed that a definite relationship does not exist between the study of Behavioral Finance and the knowledge of the biases. According to the literature, we assume that the most relevant cognitive and emotional biases are Representativeness and Loss Aversion. We discretize the variable to questions 9 and 10 (2 for the right answer and 1 for the rest) and analyze the relation with the hours of training. We find no significant relation

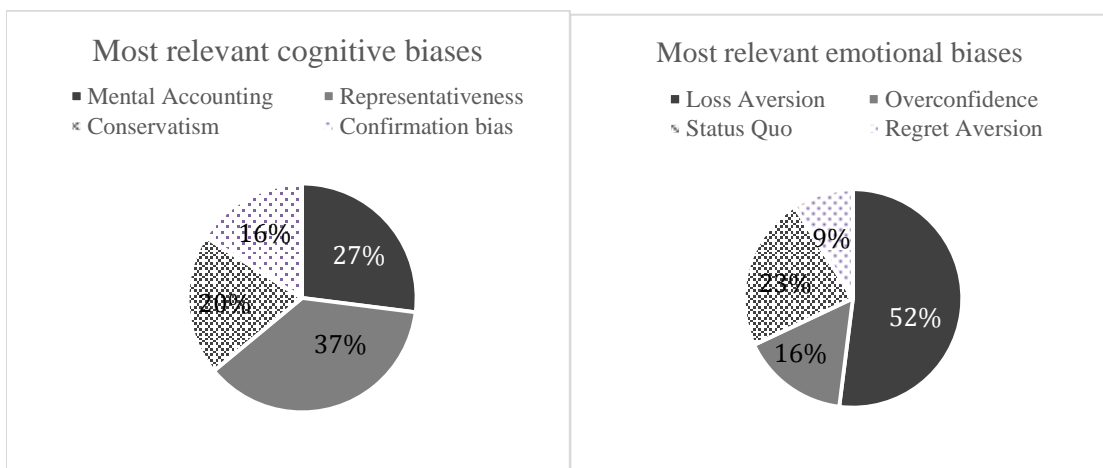
between the hours of learning and the knowledge of the cognitive and emotional biases ($\chi^2= 1.4$ and 1.1 ; p value= 0.49 and 0.57). Hence, according to the results of our survey the field of Behavioral Finance appears to be diffuse and needs to be further structured. As stated by Jeffrey and Putman (2013), Behavioral Finance is still today “an ad-hoc collection of concepts and factors that are basically disconnected, stand-alone concepts”. In a similar way, Hong and Stein (2007), indicate that “if Behavioral Finance is ever to approach the stature of classical asset pricing, it will have to move beyond being a large collection of empirical facts and competing one-off models, and ultimately reach a similar sort of consensus”.

3.4.2. Prevailing Behavioral Biases

As previously described, these irrational biases can be divided into two groups: cognitive (biased beliefs) and emotional (unconventional preferences).

The results obtained in the surveys (see questions 8 to 16 in Appendix) with an average of 95 respondents corroborate the main psychological theories in the field of Behavioral Finance: the Representativeness Heuristic and the Prospect Theory.

Figure 3.3. Main cognitive and emotional biases



In fact, as described in Figure 3.3. the most relevant cognitive biases according to investors are Representativeness (37%) and mental accounting (27%), and the most

significant emotional bias is loss aversion (52%). However, practitioners themselves might be subject to familiarity bias, according to which the most relevant biases could be the ones they are more familiar with. Nevertheless, a relatively significant statistical relation exist among investors that identify Loss Aversion and Representativeness as the most relevant biases ($\chi^2 = 2.7$; $\gamma = 0.33$ with $p\text{value} = 0.097$).

Furthermore, when investors were directly asked about the effectiveness of Representativeness (question 15), the majority of them (67%) agreed with the theory, while only a 6% disagreed. The results show that the agreement with the theory is strong: the average response is 3.9 (1=not valid ... 5=very valid) and allows to reject the null hypothesis $\mu < 3$ (t-student=9.6 and $p\text{value} = 0.000$). When they were asked the same about loss aversion, the results even show a higher level of agreement with the theory: 76% of them agreed and only 7% disagreed, the average response is 4.04 and allows us to reject the hypothesis $\mu < 3$ (t-student=11.1 and $p\text{value} = 0.000$). Moreover there is a very strong positive association between the agreement of both theories ($\chi^2 = 26$; $\gamma = 0.59$ with $p\text{value} = 0.000$). Therefore, despite the lack of sufficient training in Behavioral Finance for practitioners, these results support the argument in favor of a general knowledge of the main psychological theories of Behavioral Finance by professional investors.

Another remarkable conclusion was found in relation to the relevance of herding behavior (question 19). While 61% of participants considered that the main motivation guiding the decision making process is related with irrational biases, such as Loss Aversion, Representativeness and Herding behavior, the remaining 39% considered that it was led by the rational market analysis. Moreover, the most highlighted irrational bias is considered to be herding behavior (49%), followed by emotional biases (36%) and cognitive biases (15%). These results are aligned with

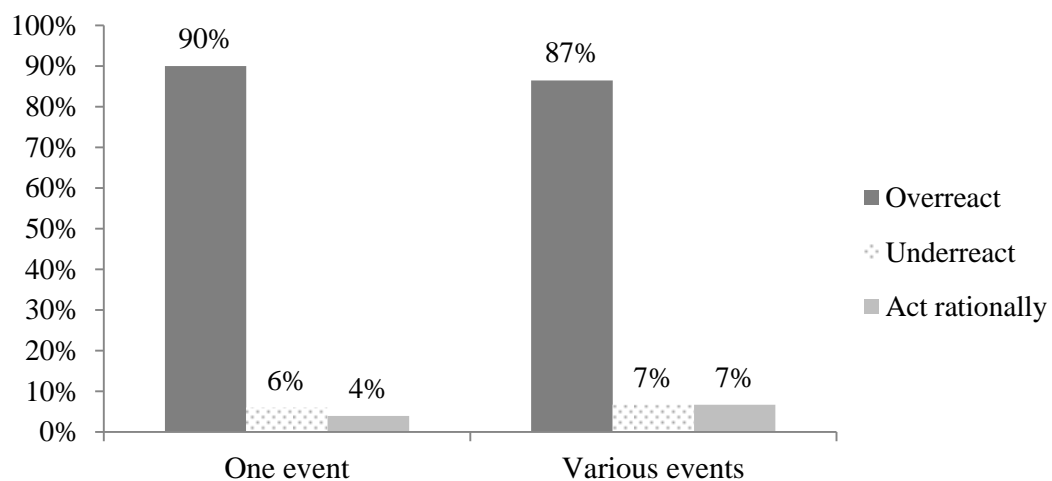
those obtained by a survey carried out by CFA Institute among 724 practitioners who answered that herding was the most influential bias in the investment decision-making process (CFA Institute, 2013). However, such conclusion could appear to be in contradiction with the prevalence of cognitive biases found in the literature. As a possible explanation, it seems logical to think that fund managers would not recognize cognitive biases (i.e. lack of knowledge) as their main driver for investment decisions. This would imply a lack of knowledge on the field, which is, without any doubt, hard to admit.

3.4.3. Prevalence of Overreaction and Underreaction

Different scenarios were analyzed to identify the behavior that prevails in the decision-making process of investors (see questions 11 to 14 and 20 in Appendix) with an average of 89 respondents. In brief, the different scenarios considered were: facing one single and various significant financial events, and facing or overcoming a crisis.

First, in the short term, when a public relevant event takes place, investors tend to over-react (90%) just 6% under-react and the remaining 4% determine that they react rationally (see Figure 3.4.).

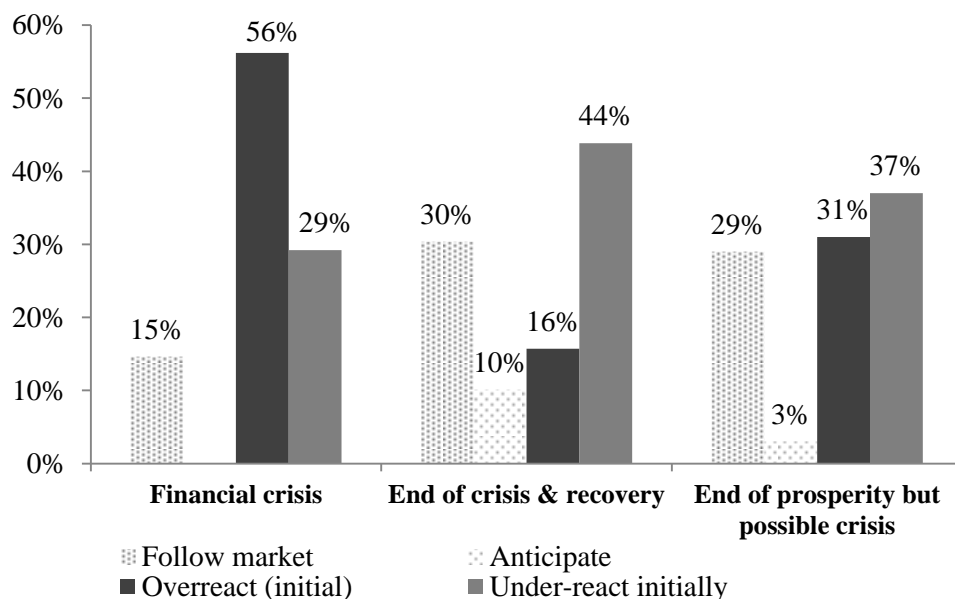
Figure 3.4. Investors' over- and underreaction to single and various events



The same occurs when various public relevant events take place, all of them following the same direction: 87% of the participants consider that investors tend to overreact, and below 7% think that they under-react or react rationally. Considering a dichotomic variable (overreact / no overreact) and applying a non-parametric binomial test shows the prevalence of overreaction versus rational behavior and underreaction (pvalue=0.000). Moreover, we find a strong statistical association between over and underreaction to one and various events ($\chi^2= 48$ with pvalue=0.000; $\gamma=0.69$ with pvalue=0.035).

This prevalence of overreaction is consistent with the literature (De Bond and Thaler, 1985, and Grinblatt and Han, 2005) and can be directly related to Representativeness and overconfidence. When investors are extremely confident about their thoughts and decisions they tend to follow the Representativeness heuristic and they ignore the laws of probability (Tversky and Kahneman, 1974), causing them to overreact. This pattern is also visible, although less clear, during a financial crisis. In this situation, the majority of the participants consider that investors tend to overreact initially (56%) (see Figure 3.5.).

Figure 3.5. Investors' over- and underreaction under different circumstances



This overreaction can be related to the loss aversion bias (Kahneman and Tversky, 1979) according to which investors tend to be more pessimistic during financial crises. However, some of them determine that they tend to underreact initially and overreact later (29%), or follow the market (15%), but nobody believes that they anticipate the market. In this case, no significant relation was found with the behavior as a result of a public relevant event ($\chi^2 = 4.9$ with $pvalue=0.29$). These findings are in line with the empirical evidence of momentum effect provided by Jegadeesh and Titman (1993) and described in our literature review. Moreover, the view of themselves as not being capable of beating the market again shows their pessimistic character. Likewise, a small percentage recognize their herding behavior. This shows lack of confidence on their own judgments, feeling safer following the market.

However, during the transition from the end of a crisis to an economic recovery, the results show the opposite: 44% of individuals consider that investors tend to underreact initially and overreact later, versus 16% who would overreact and 30% who would follow the market (see Figure 3.5.). Again, loss aversion takes place: investors are more sensible to negative situations than to positive ones. Under this scenario, the tendency to anticipate the market is supported by 10% of investors.

Finally, when investors face a situation of end of prosperity and possible entry of crisis, the results are less clear. The only strong conclusion that we obtain is that nearly all of them (97%) think that investors do not anticipate the market (binomial test, $pvalue=0.000$). There is no clear evidence on what tendency is the most popular among investors: underreaction (37%), overreaction (31%) or following the market (29%).

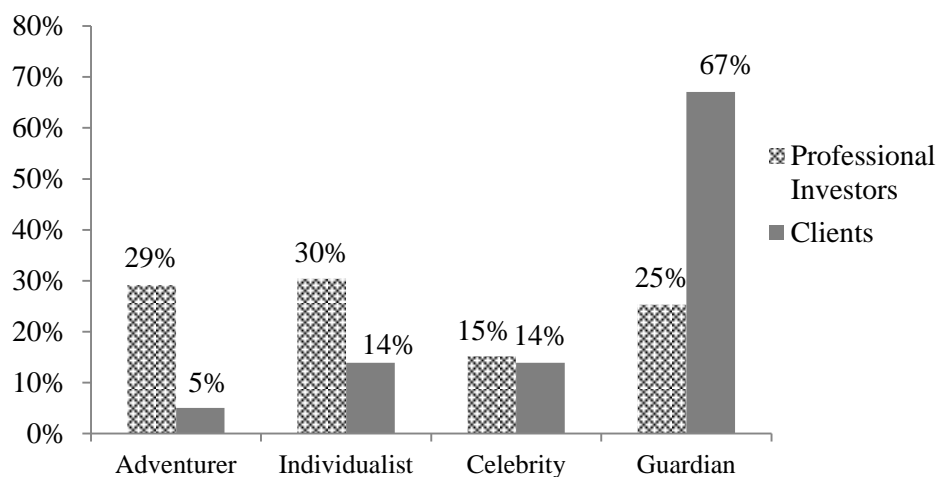
As a conclusion, overreaction is the prevalent behavioral bias as a result of relevant news and is also the dominant behavior in situations of financial crisis which in turn

likely contributes to aggravate the crisis. By contrast, under changing circumstances probably characterized by greater uncertainty, underreaction appears to be the first response with a significant tendency to follow the market. During transition and crisis probably with higher level of uncertainty, the tendency of herding behavior increases, also as a consequence of loss aversion. In order to explain this kind of behavior we analyze next the predominant investors' profiles, comparing it with their own actual confidence index and their particular view of their clients.

3.4.4. Investor and Client's Profiles: Adventurers versus Guardians

Based on the BB&K Five-Way Model, we included two different personality questions in order to determine how the professional investor views himself and how he sees his clients. Intentionally, the straight arrow profile (associated with the absence of biases) was not included in order to better identify the main biases recognized by investors. Interestingly enough, the results summarized in Figure 3.6. show a misalignment between the professional investor and his clients.

Figure 3.6. Investor and Client's profiles



Based on 79 answers (see questions 2 and 3 related to Behavioral Finance in Appendix) we find that 60% of investors define themselves as highly confident (versus 40% low-confident) and 56% of investors view themselves as risk averse

(versus 44% as risk lovers). Moreover, the personality types that professional investors are most recognized with are the Individualist and the Adventurer with approximately 30% each, both being characterized by a high level of confidence (see Figure 3.6.). Hence, we can infer (binomial test, p value=0.115) again that overconfidence appears as one of the most relevant behavioral biases among investors, in line with literature (Barber and Odean, 2001).

It is important to note that when asked about the personality type of their clients, 81% of professionals determined that clients were characterized by risk-aversion. 67% of all the surveyed investors agreed on defining their clients as Guardians, meaning mainly driven by risk aversion and insecurity.

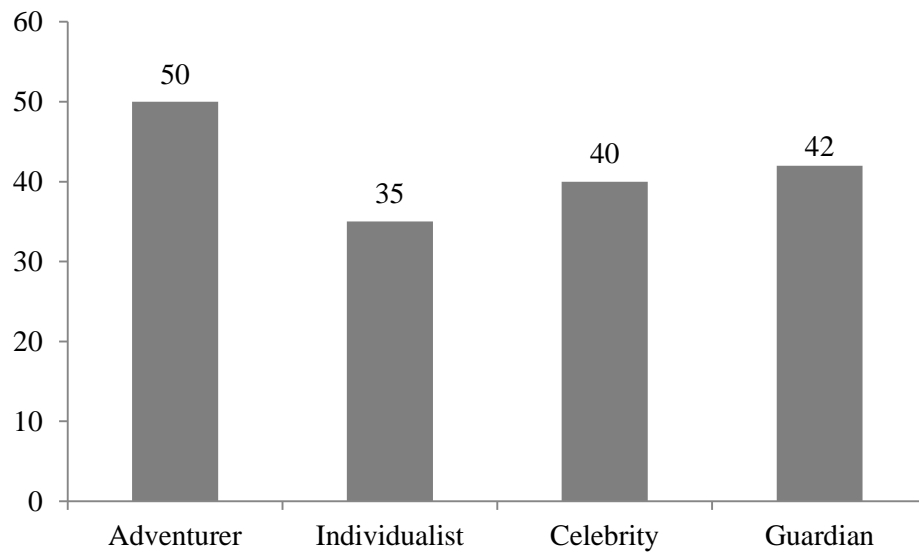
78% of all the adventurous investors do define their clients as Guardians. Only a 5% of all investors see their clients as Adventurers, which happens only for investors who consider themselves as risk-lovers. If we discretize the profiles (Guardian=1; Celebrity=2; Individualist=3; Adventurer=4) we find a significant negative association between the investor's and the client's profiles ($\chi^2= 9.5$; $\gamma= -0.32$ with p value=0.041). This means that investors who view themselves as Adventurers or Individualists tend to define their clients as Guardians.

In general, investors view themselves as more confident and risk-seeking than their clients. This misfit between the professional investor and his clients can be related, again, to an excess of confidence on the side of professional investors.

As previously mentioned we acknowledge the existing challenge with self-reported surveys, since professional investors may have an inaccurate view of themselves and could also misprofile their own clients. However, the conclusions of our study related to investors and clients' profiles, should be interpreted on a relative basis and as reflective of the view of the practitioner.

Furthermore, in order to mitigate the potential lack of correspondence between reality and self-perception, we analyze the relation between the Confidence Index, (see questions in Appendix) and the different recognized types of personality. The average confidence index was calculated for each personality group.

Figure 3.7. Confidence index for different investor profiles



The results shown in Figure 3.7. are partially aligned with the findings related to the direct answers related to Behavioral Finance:

- The personality type that had the highest level of confidence is the Adventurer (51), in line with what would be expected. However the difference versus the average confidence index for the rest of investors (39) does not appear to be very statistically significant (t-Student test for equality of means, pvalue=0.16).
- Moreover, the Guardian has the second highest confidence index (42) when it should intuitively be the group with the lowest level of confidence. In addition, the Individualist has the lowest confidence index (35) when we would expect to have a high level of confidence. This may imply a lack of correspondence between investor perception of themselves and how they actually are.

Analyzing these results, even if not statistically strong, we find that those investors with a low level of confidence (Celebrity and Guardian) do have a relatively high confidence index (both higher than the Individualist) and therefore seem to have a more distorted perception of themselves than those with higher levels of confidence. On the other hand, by definition the two predominant investor types based on the BB&K model (Adventurer and Individualist) are characterized by a high level of confidence, which can be related with the prevalence of overconfidence among behavioral biases.

Finally, a remarkable element in this section is the misalignment between the perceptions of the professional investor himself and reality and between the professional investor and his client. This disconnection introduces an additional factor of uncertainty, which clearly deviates from classical finance theory.

3.4. Conclusions

Even if the field of Behavioral Finance is diffuse and needs to be structured, it is considered very relevant by professional investors when making decisions in the financial markets. However, a clear lack of education and training in the field does exist, which in itself compels us to be cautious in drawing the conclusions from our survey. The participants in our empirical study determined that this gap is due to the absence of clarity and homogeneity of the theory. This lack of structure in the field is supported by our literature review (Van der Sar, 2004; Hong and Stein, 2007; De Bondt et al., 2008; or Jeffrey and Putman, 2013).

Furthermore, supporting previous literature, investors considered the most relevant biases to be representativeness (cognitive) and loss aversion (emotional). This finding is aligned with two of the main pillars of Behavioral Finance: Representativeness Heuristic (Tversky and Kahneman, 1974) and Prospect Theory (Kahneman and

Tversky, 1979). In addition, according to practitioners, herding or social interaction plays a critical role in the investors' decision-making process.

In relation to the expected behavior in different financial scenarios, according to professional investors, there are two predominant phenomena that are closely interrelated: under- and over-reaction, the latter being prevalent. However, there is a pattern that does almost never take place, which is anticipating the market. This entails a lack of confidence in investors' own judgment, as they feel safer following the market.

Considering our goal of modeling investors' behavior and applying the BB&K five-way model, we find that investors tend to define themselves as Individualists and Adventurers, while they predominantly view their clients as Guardians. Two important points must be highlighted here. First, the disconnect between investors and their clients: the investor views himself as having a high level of confidence, while he sees his clients as risk averse and insecure. The second point is the misfit between how the investor sees himself and how he actually is. Considering the responses to our survey and applying the confidence index, we found that some practitioners tend to perceive themselves as more confident than they really are. These two points support the investors' overconfidence.

These misfits can constitute the scope for further research in the field of Behavioral Finance, as they introduce an element of uncertainty. In particular, the misalignment of perception between clients and professional investors clearly deserves further analysis regarding the implications for financial markets and the investment community.

Appendix: Summary of Questions and Answers in the Surveys

Control Questions

Age

a. [less than 40]	35%
b. [40-50]	48%
c. [50-60]	12%
d. [60-65]	2%
e. [more than 65]	2%

Gender

a. Man	82%
b. Woman	18%

Education

a. CFA	12%
b. CEFA	5%
c. EFA	15%
d. EFPA	21%
e. FRM	0%
f. CAIA	3%
g. CIIA	2%
h. PRMIA	0%
i. CFP	0%
j. Incomplete CFA	9%
k. None of the previously mentioned	45%

Job/Firm type

a. Independent	10%
b. Bank	50%
c. Insurance company	5%
d. Family office	5%
e. Other financial groups	17%
f. Retired	1%
g. Unemployed	0%
h. Other	11%

Assets under management

a. Below 25 million euros	42%
b. Between 25 and 50 million euros	9%
c. Between 50 and 100 million euros	13%
d. Between 100 and 250 million euros	13%
e. Greater than 250 million euros	22%

Investment style

a. Fixed income	25%
b. Mixed fixed income	35%
c. Mixed variable income	38%
d. Euro variable income	39%

e. International variable income	33%
f. Guaranteed fixed income	10%
g. Guaranteed variable income	9%
h. Global funds	26%
i. Funds of funds	16%
j. Hedge Funds, real estate funds or similar	9%
k. Other	13%

Confidence Index Questions

In the next six months, I think that the IBEX 35 will:

a. Rise more than 10%	29%
b. Rise, but less than 10%	46%
c. Drop, but less than 10%	16%
d. Drop more than 10%	8%

The Spanish stock market prices are:

a. Too low	36%
b. Adequate	52%
c. Too high	12%

Given the current situation, if the IBEX 35 fell 3% tomorrow, the day after tomorrow the index would:

a. Go up	50%
b. Go down	33%
c. Remain the same	17%

Given the current situation, if the IBEX 35 fell 25% in the next six months, prices six months after would:

a. Go up	77%
b. Go down	9%
c. Remain the same	15%

What is the probability of crash in the Spanish stock market in the next six months?

a. 0-25%	75%
b. 25-50%	21%
c. 50-75%	4%
d. 75-100%	0%

Behavioral Finance Questions

Question #1 With which investment style do you feel more comfortable as professional investor?

a. Value Investing	52%
b. Growth Investing	9%
c. Absolute Return	14%
d. Relative Return	3%
e. Momentum	5%
f. Capitalization	6%
g. Passive management	11%

Question #2 Which of the following profiles, as professional investor, better corresponds to yours?

a. Adventurer: risk lover and with high level of confidence		29%
b. Celebrity: risk lover and insecure		15%
c. Guardian: risk averse and insecure		25%
d. Individualist: risk averse and with high level of confidence		30%
Question #3 How do you see your clients?		
a. Risk lover and with high level of confidence		5%
b. Risk lover and insecure		14%
c. Risk averse and insecure		67%
d. Risk averse and with high level of confidence		14%
Question #4 Value from 1 to 4 (being 4 the most relevant) the relevance when anticipating the evolution of a Value type security		
a. DCF	Most relevant	47%
	Relevant	43%
	Less relevant	6%
	Not relevant	4%
b. Macroeconomic	Most relevant	23%
	Relevant	35%
	Less relevant	23%
	Not relevant	19%
c. Multiples	Most relevant	30%
	Relevant	39%
	Less relevant	15%
	Not relevant	15%
d. Technic	Most relevant	5%
	Relevant	14%
	Less relevant	41%
	Not relevant	41%
Question #5 Value from 1 to 4 (being 4 the most relevant) the relevance when anticipating the evolution of a Growth type security		
a. DCF	Most relevant	24%
	Relevant	46%
	Less relevant	11%
	Not relevant	19%
b. Macroeconomic	Most relevant	41%
	Relevant	43%
	Less relevant	10%
	Not relevant	6%

c. Multiples	Most relevant	22%
	Relevant	44%
	Less relevant	14%
	Not relevant	20%
d. Technic	Most relevant	11%
	Relevant	32%
	Less relevant	28%
	Not relevant	29%
Question #6 Do you consider relevant the education/training in behavioral finance when investing?		
a. Yes		79%
b. No		21%
Question #7 How many hours of training in behavioral finance have you received?		
a. None		35%
b. Less than 10		37%
c. Between 10 and 50		20%
d. More than 50		8%
e. More than 100		1%
Question #8 Which of the following cognitive biases do you consider that has more impact on investment decisions?		
a. Mental accounting		27%
b. Representativeness		37%
c. Conservatism		20%
d. Confirmation bias		16%
Question #9 Which of the following emotional biases do you consider that has more impact on investment decisions?		
a. Loss aversion		51%
b. Overconfidence		16%
c. Status quo bias		23%
d. Regret aversion bias		9%
Question #10 Which of the following factors do you think has more impact on investment decisions?		
a. Rational analysis	Very relevant	38%
	Relevant	41%
	Normal	15%
	Little relevant	4%
	Irrelevant	2%
b. Irrational cognitive biases	Very relevant	4%
	Relevant	22%
	Normal	46%
	Little relevant	18%

	Irrelevant	10%
c. Irrational emotional biases		
	Very relevant	12%
	Relevant	31%
	Normal	34%
	Little relevant	13%
	Irrelevant	10%
Question #11 Looking at the market, in the short-run facing a significant public event, investors tend to:		
a. Overreact		90%
b. Underreact		6%
c. React rationally		4%
Question #12 Looking at the market, in the short-run facing various public events that follow the same direction, investors tend to:		
a. Overreact		87%
b. Underreact		7%
c. React rationally		7%
Question #13 Looking at the market, facing an economic crisis, investors tend to:		
a. Follow the market behavior		15%
b. Anticipate the market behavior		0%
c. Overreact initially		56%
d. Underreact initially and overreact later		29%
Question #14 Looking at the market, facing an end of crisis and economic recovery, investors tend to:		
a. Follow the market behavior		30%
b. Anticipate the market behavior		10%
c. Overreact initially		16%
d. Underreact initially and overreact later		44%
Question #15 Do you consider valid the following sentence? “The individual evaluates the investment in terms of profit and loss and not on the basis of the final wealth, being more sensitive to losses than to gains”:		
a. 1 (not valid)		0%
b. 2		6%
c. 3		27%
d. 4		39%
e. 5 (very valid)		28%
Question #16 Do you consider valid the following sentence? “Subjects tend to consider a given event as typical or representative, ignoring the laws of probability or the statistical evidence”:		
a. 1 (not valid)		0%
b. 2		7%
c. 3		17%
d. 4		42%

e. 5 (very valid)	35%
Question #17 Do you consider adequate the education/training of fund managers and professional investors when investing?	
a. Yes	41%
b. No, more technical formation in business valuation is needed	19%
c. No, more formation in technical analysis is needed	1%
d. No, more formation in macroeconomic concepts is needed	3%
e. No, more formation in behavioral finance is needed	36%
Question #18 Which of the following reasons better explains the lack of relevant training in behavioral finance for fund managers/professional investors?	
a. It is not a relevant field when making investment decisions	11%
b. It is relevant but inaccessible	8%
c. It is relevant but it is a field of knowledge too complex	23%
d. It is relevant but the field is diffuse, not unified and hard to transmit	58%
Question #19 The decision-making process of fund managers is motivated by:	
a. Rational analysis of the markets	30%
b. Irrational cognitive biases	10%
c. Irrational emotional biases	16%
d. Herding behavior (social interaction)	44%
Question #20 Given a situation of end of prosperity and possible entry in crisis, investors tend to:	
a. Follow the market behavior	29%
b. Anticipate the market behavior	3%
c. Overreact initially	31%

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4. Impact of Education, Age and Gender on Investor's Behavior: Modeling Confidence

Manuel Gonzalez-Igual, M. Teresa Corzo-Santamaría and Antonio Rua Vieites*

“They will sell without knowing the motive; and they will buy without reason. They will find what is right and they will err for fault of their own.”

Joseph de la Vega (1688)

Abstract

We identify a gap between the relevance of Behavioral Finance and the lack of education in the field, based on surveys given to 106 professional investors from Spain and Portugal. CFA Charterholders have a higher level of training and admit of being particularly influenced by herding behavior. Consistent with prior studies, we find that female investors view themselves as more driven by rational analysis and are more risk-averse, whereas younger investors are more influenced by cognitive and emotional biases. Finally, we develop a model to determine professional investors' confidence, with female and more experienced investors exhibiting higher levels of confidence.

Keywords: Behavioral Finance; Investor Survey; CFA; Education; Gender; Age; Investor Confidence

JEL Classification: G40, G41, G11, G14, G23, D83

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4.1. Introduction

Three main premises, which entail the lack of arbitrage opportunities, characterize classical finance: 1) investors are rational agents (Miller and Modigliani, 1961); 2) financial markets are efficient in processing information (Fama 1965, 1970); and 3) expected returns are a function of risk (Markowitz, 1952 and Sharpe, 1964). As described by Thaler (1999), investors are considered to be rational in two ways: 1) making decisions according to expected utility theory and 2) making unbiased forecasts about the future.

Conversely, in real life, every investor has limited access to information, is surrounded by external constraints and influenced by its own personal behavior. There is ample evidence that investors cannot be considered as rational agents and that biased beliefs and unconventional preferences lead to suboptimal investment decisions (Barberis and Thaler, 2003). As a consequence of investor's cognitive, emotional and social biases, markets exhibit several financial anomalies, such as the Equity Premium Puzzle (Mehra and Prescott, 1985), the Momentum Effect (Jegadeesh and Titman, 1993) or violations of the law of one price (Lamont and Thaler, 2003).

In the twenty-first century, the Dotcom bubble, the Subprime mortgage crisis and the recent Bitcoin bubble are prime examples of irrational behavior, described by Shiller (2000 and 2006) as “irrational exuberance”⁽¹⁾. Evidence of investor's under and overreaction has led to the development of Behavioral Finance, which seeks to understand the impact of irrational investor's behavior on asset pricing and on the functioning of financial markets. Behavioral Finance represents a new paradigm in the field of finance, with three Nobel prizes awarded over the last 15 years: Daniel Kahneman (2002), Robert J. Shiller (2013) and Richard H. Thaler (2017).

However, the field of Behavioral Finance lacks sufficient structure and homogenization (Jeffrey and Putman, 2013 and De Bondt et al., 2008). In addition, despite the relevance given by practitioners to Behavioral Finance, professional investors recognize that their level of training is clearly insufficient.

The aim of this paper is to contribute to further systematization in the field by analyzing the impact of education, age and gender on investor's behavior and level of confidence, based on direct surveys given to 106 professional investors exposed to the Iberian market, of which 51% are CFA Charterholders.

There are five main contributions of this study to the existing literature and to the investment community. First, regarding education, we find a clear gap between the importance of Behavioral Finance for the practitioner and the lack of learning experience in the field. Additionally, in line with previous literature (Menkhoff and Nikiforow, 2009), we find that the level of education in Behavioral Finance does not reduce investors' behavioral biases.

Second, concerning gender and consistent with existing literature (Pompian and Longo, 2004), female investors view themselves as more driven by rational analysis and more risk-averse, which implies significant differences related to unconventional preferences and emotional biases such as loss aversion.

Third, regarding age, despite their lack of experience, younger investors unanimously recognize the relevance of Behavioral Finance and acknowledge being more influenced by both cognitive and emotional biases.

Fourth, we analyze the different types of behavioral investor's profiles as defined by the Bailard Biehl and Kaiser model (1986), and find a clear misfit between investors and their clients, in particular, related to their level of confidence. This may be explained by the role played by trust, as explained in Gennaoli et al. (2015).

Our final contribution is to develop a model for investor's sentiment based on the Confidence Index as defined by Robert Shiller (2000). We analyze the impact of our three independent variables (Education, Age and Gender) and find that women and more experienced investors have a higher level of confidence among practitioners, while education does not have a significant impact on the Confidence Index.

4.2. Related Literature

4.2.1. Prevailing Behavioral Biases: Overconfidence, Loss Aversion and Herding

According to the theoretical framework of Behavioral Finance, investors are not capable of processing available information rationally due to cognitive and emotional biases (Brav and Heaton, 2002). The two main psychological theories are the Representativeness Heuristic (Tversky and Kahneman, 1974) and the Prospect Theory (Kahneman and Tversky, 1979).

As defined by the Prospect Theory, investors tend to evaluate bets in terms of losses and gains, instead of expected final wealth, because of the influence of loss aversion bias (Kahneman and Tversky, 1979). In particular, they are approximately twice as sensitive to losses as they are gain-seeking (Schneider and Lappen, 2000). Mental accounting bias (Thaler, 1985) is closely related to loss aversion, as investors tend to categorize their investments on different levels (Grinblatt and Han, 2005), in terms of potential losses and gains, but ignore the interaction among those investments.

Moreover, according to the Representativeness Heuristic, investors are considered to be overconfident, as they overestimate their knowledge and ability to predict future outcomes. They tend to consider a certain event as typical or representative (Tversky and Kahneman, 1974), and as a consequence they do not properly apply the laws of probability, paying too much attention to the strength of the evidence and not enough

to the statistical weight (Griffin and Tversky, 1992). Utilizing a data set of 78,000 investors, Barber and Odean (2000) found that overconfident behavior results in excessive trading, which negatively affects portfolio manager performance. Evidence of the overconfidence of institutional investors is less available than for individual investors, since finding a suitable sample is more difficult. Chuang and Susmel (2011) find that individual investors are more prone to overconfident trading behavior than institutional investors. Overconfidence is present in both groups, but the bias is stronger in the sample of less sophisticated investors (Chen et al., 2007).

Opposite to the phenomenon of overconfidence, conservatism (Edwards, 1968) advocates that investors are subject to status quo bias (Samuelson and Zeckhauser, 1988) as they generally prefer to avoid changes in their investment decisions and do not properly adapt in response to new information. Similarly, they are subject to confirmation bias, considering only the positive evidence related to their investments.

Herding or social interaction also plays a key role in investor behavior (Chang, Cheng and Khorana, 2000). When analyzing the activity of large groups of financial professionals, Prechter (2001) found evidence for this phenomenon of imitation. There is a close relationship between this imitation behavior and some market anomalies, such as bubbles (Shiller, 2000 and Shiller, 2006) or momentum. Nevertheless, this behavior does not have to be classified as fully irrational, since not every investor in the market has the same information or knowledge, and therefore, it is understandable to copy those who stand out (De Bondt et al., 2013) for the sake of personal comfort.

In brief, the decision-making process is conditioned by several conflicting biases, such as overconfidence, loss aversion, or herding, among others. The main goal of our

research is to determine the impact of education, age and gender on the referred investor's behavioral biases.

4.2.2. Impact of Education, Age and Gender on Investor's Behavior

In this article, institutional investors represent a variety of professional investors, including banks, insurance companies, pension funds, endowment funds, mutual funds, as well as investment professionals, such as investment advisors.

Institutional investors are becoming increasingly educated about behavioral finance and the inefficiencies that behavioral biases can create in the stock markets. Even if slowly, Behavioral Finance, is beginning to be included in university curriculums and textbooks. Behavioral Finance is also part of professional education, such as the CFA curriculum.

Behavioral biases affect institutional investors through the underlying investor base. An institutional manager needs to be aware of the implications of each relevant behavioral bias. This is an important topic in the field of wealth management. Pompian (2012), for instance, develops a model of individual behavior to help fund managers understand the wide range of clients and how to best serve their individual needs.

Aging causes a well-documented decline in people's cognitive ability, which empirically dominates any experience effect. According to Korniotis and Kumar (2011), older investors exhibit worse investment skills even though they are more experienced. In fact, financial mistakes appear to follow a U-shaped pattern, with the fewest mistakes made at approximately age 53 (Agarwal et al., 2009). Although aging decreases cognition and financial literacy, it is not associated with a decrease in confidence in managing one's own finances (Gamble et al., 2014). Individuals appear to overweight their personal experience in the stock market with insufficient

consideration of all available data (Greenwood and Shleifer, 2014). This finding would be aligned with the Representativeness Heuristic, but from an age perspective. Conversely, Lin et al. (2010) find that younger and male traders tend to prefer online trading, which in turn, is associated with more active trading and, hence, with overconfident behavior.

An extended stream of the literature compares trading choices between male and female professional money managers. According to Lundberger, Fox and Puncochar (1994), men are generally more overconfident than women, in particular in masculine domains, such as the financial industry. Based on an experiment involving over 1,300 individuals, Estes and Hosseini (1988) find evidence that women have lower confidence than men as it relates to investment decisions. Barber and Odean (2001) also find significant gender differences in overconfidence, indicating that men trade 45% more actively than women do, and, as a consequence, male investors reduce their net annual returns through trading by almost one percentage point more than females do. Concerning the impact of gender on risk aversion, Powell and Ansic (1997) find that women are less risk-seeking than men. Similarly, according to Olsen and Cox (2001), female investors consider risk attributes to a greater extent than men, in particular, as it relates to the risk of losses and uncertainty. Similarly, Li et al. (2013) find that female sell-side analysts tend to be more risk-averse in their recommendations than men. Pompian and Longo (2004) also find differences related to gender: while women are realistic, pessimistic and show low-risk tolerance, men tend to be overconfident, unrealistic and high risk tolerant.

However, several other studies have investigated differences between men and women professional money managers and overall gender differences do not seem to exist among professional investors (Atkinson, Boyce and Frye, 2003). Bliss and Potter

(2002) find that female fund managers hold portfolios with marginally more risk than men, but find no significant difference in performance and turnover between the two groups. Beckmann and Menkhoff (2008) analyze survey responses of 649 fund managers in the U.S., Germany, Italy and Thailand and confirm that female fund managers tend to be more risk-averse, as predicted by gender studies. However, the expected lower degree of overconfidence by women is insignificant in fund management. This evidence suggests that experience and investor sophistication lessen common differences in behavioral biases.

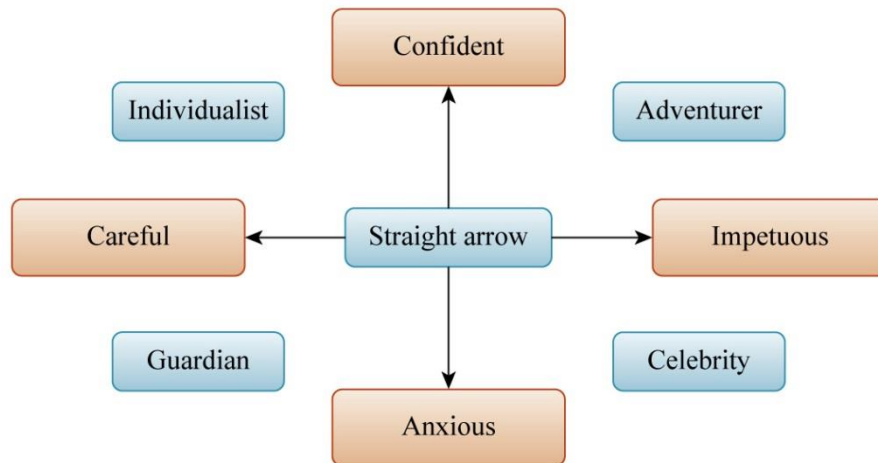
4.2.3. Modeling Investor's Profiles: BB&K Five-Way

To examine investor types and personalities and to evaluate the impact of our three independent variables in our empirical analysis, we use the BB&K Five-Way Model. This model, developed by Thomas Bailard, David Biehl and Ronald Kaiser (“Personal Money Management”, 1986), determines two elements that help classify investor personalities in five different groups. These two elements are the level of confidence and risk aversion. The five groups or investor personality profiles recognized by this model are the Adventurer, the Celebrity, the Individualist, the Guardian and the Straight Arrow.

For the visual representation of this model, two axes of individual psychology define four quadrants as shown in Figure 4.1.

The axis named “confident-anxious” reflects the emotional choices made. Whereas the other axis, named “careful-impetuous,” reflects how methodical and risk-averse an investor is (Thomas and Rajendran, 2012). Each profile is in a different quadrant, except for the straight arrow profile, which is situated in the intersection of both axes.

Figure 4.1. BBK Model (Bailard, T. E., Biehl, D. L. and Kaiser, R. W., 1986)



The first quadrant constitutes the Adventurer's profile. This type of investor is characterized by being highly confident, risk-loving and emotionally biased. In addition, Adventurers are difficult to advise since they have their own strong ideas about investing. Similarly, the Individualist investor has its personal ideas about investing and has a high degree of self-confidence, but a higher level of risk aversion. Additionally, the Individualist investor is predominantly influenced by cognitive biases (Pompian, 2008).

People who do not have their own ideas about investing and are afraid of being left out, form the second quadrant, denoted as Celebrity, mainly driven by cognitive biases. Guardian investors are more careful than Individualists and are not particularly interested in excitement, being dominated by emotional biases rather than cognitive ones.

Finally, the profile located in the center of the diagram is the Straight Arrow. This investor, considered as very well balanced, is exposed to a medium amount of risk (Pompian, 2008; Thomas and Rajendran, 2012).

In short, the two main characteristics that help define behavioral investor profiles are confidence and risk-exposure. For this reason, to determine the real investors' profile, the usage of a confidence index to evaluate the sentiment of investors seems

appropriate. Furthermore, being able to compare the investor's own perception with a more objective reference, such as the results obtained from the confidence index, allows us to obtain a better understanding of the investors' true nature.

4.2.4. Measuring Investor Sentiment: Institutional Investor Confidence Index

Behavioral Finance states that investor sentiment might significantly alter market outcomes and therefore affect asset prices in equilibrium (Baker and Wurgler, 2006; Baker and Wurgler, 2007; and Uygur and Tas, 2012).

In our research, we use an already existing approach, known as the Stock Market Confidence Index, that measures investor sentiment through direct survey data, developed by the Yale School of Management, under the direction of Robert Shiller ("Measuring bubble expectations and investor confidence", 2000).

Based on this, we introduced five different questions in the surveys to professional investors to measure Investor Confidence (see also Appendix, Confidence Index Questions). With the responses to these questions, we established the Institutional Investor Confidence Index (IICI) ⁽²⁾, composed by these five different indices related to investor's expectations for the Spanish stock market: i) perspectives' index; ii) valuation index; iii) short-term recovery index; iv) long-term recovery index; and v) crash risk index.

To take also into consideration the macro expectations, we include two additional indices related to the expected evolution of interest rates (IICI 2): vi) short-term interest rate index; and vii) long-term interest rate index.

Once these indices are determined, we average the results to obtain the IICI and IICI2. The result of the index can range between -100 and 100. A negative index indicates a pessimist perspective of the market, whereas a positive index denotes the contrary, an optimistic outlook. A result of 0 indicates neutrality in the market perspectives.

4.3. Data and Methodology

4.3.1. Data and Design of the Survey

As previously stated, this study is based on surveys given to professional investors from the Iberian market during February 2017. These data set is based on online surveys to fund managers associated with Funds People monthly publication and members of CFA Society Spain.

The survey was composed of six filter questions, followed by seven questions regarding investor's sentiment to elaborate the Confidence Index and twenty questions concerning the practitioner's view of Behavioral Finance. The appendix includes all the questions included in the survey.

Our survey was completed by a total of 106 professional investors, of which 85% directly work in the financial industry. Approximately 60% of practitioners are investor advisors fund managers or work in investment analysis, and the remaining 40% work in investment banking, private equity or in other financial and investment positions.

Concerning the main independent variables of our study (Education, Gender and Age): 51% of participants are CFA charterholders (54 investors), 26% are women (28 investors) and 56% are less than 40 years old (59 investors). The size of the sample and sub-samples (CFA accreditation, gender and age) are large enough to provide statistically significant conclusions.

A more detailed description of the sample can be found in the Appendix (Control questions).

4.3.2. Methodology

The main objective of our research is to study investors' views on Behavioral Finance and irrational biases and to examine their level of confidence, based on the empirical results of our surveys. We have focused our analysis on the impact of the level of education, gender and age on i) the level of awareness and knowledge in the field; ii) prevailing cognitive and emotional behavioral biases and; iii) investors profiles and alignment with their clients. Finally, we develop a model for investor's confidence, analyzing the influence of the referred variables.

We have discretized all our variables to cope with simplified information and we have empirically contrasted our findings through different statistical tests, fulfilling the required conditions (normality, equality of variances or large sample of data). The tests that we performed are both parametric and non-parametric:

- **Parametric tests:** T-Student test ($H_0: \mu_1 = \mu_2$) or ANOVA ($H_0: \mu_1 = \dots = \mu_i = \dots = \mu_k$) for equality of means for two or more groups, respectively.
- **Non-parametric tests:** binomial test (H_0 : homogenous binomial distribution ($P=0.5$)) and χ^2 , Gamma (γ) and/or Cramer V are used to test the association between variables (H_0 : there is no association between the variables). Particularly, the Gamma γ test ($-1 \leq \gamma \leq 1$) constitutes another measure of the association between variables (positive if $\gamma > 0$ or negative $\gamma < 0$) when variables are ordinals or dichotomies or a mixture of both. The Cramer V test is used when the variables are nominal ($0 \leq V \leq 1$).

For ordinal variables or when the required conditions (normality, equality of variances or large sample of data) are not fulfilled, we use the Mann-Whitney test for two groups, or the Kruskal-Wallis if there are more than two groups.

We also used perceptual maps for the analysis of multiple correspondence analysis between variables.

Finally, to build a model to determine investor's confidence, we generate a Factorial Confidence Index based on factorial analysis, reducing investor sentiment to a single variable that is a linear combination of the five sub-indices that define IICI. Using this new index as the dependent variable, we develop a Multiple Linear Regression model for the Confidence Index based, among others, on our three main independent variables: level of education, age and gender.

4.4. Results and Discussion

4.4.1. Awareness and Education in Behavioral Finance

We start by analyzing the level of awareness and education in the field (questions 6, 7, 8, 17 and 18 related to Behavioral Finance in Appendix). A vast majority of practitioners (92%) recognize the relevance of Behavioral Finance to make investment decisions. According to the non-parametric binomial test, the relevance of Behavioral Finance for professional investors is statistically significant (pvalue=0.00). Despite this, 48% of investors have less than ten hours of education in Behavioral Finance and 20% have no training at all, which compels us to be prudent with the findings from our study.

Surprisingly enough, we find no relation between the level of training in Behavioral Finance and the relevance assigned to the area ($\chi^2 = 0.180$, pvalue =0.91; $\gamma=0.077$, pvalue=0.80). 92% of investors with 10 hours or less of training consider it relevant, versus 93% with more than 10 hours of training.

When asked about the adequacy of the education received in finance, 73% of practitioners consider it to be inappropriate, and 57% of the latter determined that the

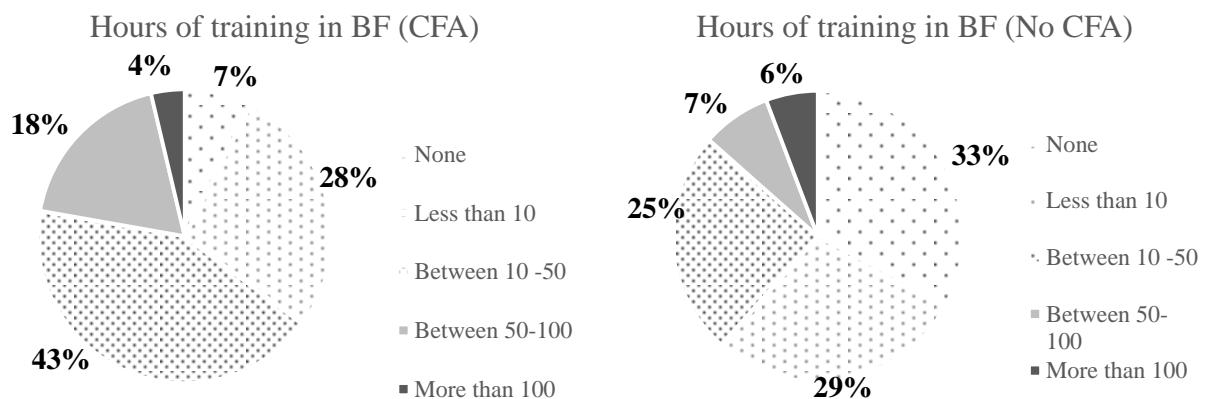
main reason for this is the lack of education in Behavioral Finance. The majority of investors consider that the lack of education in Behavioral Finance to be due to the lack of structure and clarity of the theory (61%) or to its complexity (19%).

4.4.2. Impact of CFA Accreditation on Level of Awareness and Education

Regarding the CFA accreditation, 100% of CFA charterholders acknowledge the importance of the field, compared to 85% among non-CFA charterholders.

Moreover, as shown in Figure 4.2, CFA charterholders have a higher level of training, as only 7% recognize having no education in Behavioral Finance, compared with 36% for non-CFA charterholders. In addition, 65% of CFA charterholders have more than 10 hours of training, compared with 38% of non-CFA charterholders.

Figure 4.2. Education in Behavioral Finance vs. CFA Accreditation



If we discretize the variables accreditation (no accreditation=1; other accreditations=2; CFA Charterholder=3), relevance (non-relevant=1; relevant=2) and hours of learning in Behavioral Finance (0 hours=1; less than 10 hours=2; more than 10 hours=3), we find a significant association between the CFA accreditation and i) the relevance of the field ($\gamma=0.93$, $pvalue=0.003$:) and ii) the hours of education in Behavioral Finance ($\chi^2= 205$, $pvalue=0.006$ and $\gamma=0.44$, $pvalue=0.000$).

Moreover, we find a significant association between having the CFA accreditation and the adequacy (question 17) attributed to education in Finance ($\chi^2=6.86$, $pvalue=0.032$; $VCramer=0.255$, $pvalue=0.032$). In general, CFA Charterholders tend to consider the education in finance to be adequate.

4.4.3 Impact of Age on Level of Awareness and Education

We find a strong relation between age and level of awareness in the field: the younger the investor, the higher the relevance of Behavioral Finance. 100% of practitioners below 40 years of age recognize the importance of Behavioral Finance, versus 86% for investors between 40 and 50 years old and only 43% for investors older than 50 years. There is a statistically significant association between these discretized variables ($\chi^2= 37.2$, $pvalue=0.000$ and $\gamma=-0.962$, $pvalue=0.002$). The negative sign of γ implies that the younger the investor, the higher the relevance of Behavioral Finance.

However, despite their higher interest in Behavioral Finance, young investors do not have a higher level of training. Among investors younger than 40 years, 49% have less than 10 hours (versus 48% of total investors surveyed), and 25% have no education (versus 20%). We do not find any significant statistical relation between the age of the investors and the level of training ($\chi^2= 0.708$, $pvalue=0.950$ and $\gamma=0.049$, $pvalue=0.761$). Among non-CFA young investors, 63% have less than 10 hours (versus 65%) and 46% have none (versus 36%).

Here again, we find a clear gap between the importance of Behavioral Finance for the practitioner and his lack of learning experience and training in the field. Almost twenty years after Richard Thaler (1999) predicted the “End of Behavioral Finance,” as he expected it to be viewed as a redundant phrase, professional investors still have a clear learning deficit in the field.

4.4.4. Impact of Gender on Level of Awareness and Education

According to our survey, we find no significant statistical relation between gender and relevance of Behavioral Finance: 89% of women consider Behavioral Finance relevant versus 94% of men ($\chi^2=0.55$, pvalue=0.46). Analyzing gender for the non-CFA population, we still find no significant difference (87% of women versus 83% of men).

Concerning the level of education, we find significant differences related to gender, in particular, if we analyze the non-CFA charterholders. Women have a superior level of education in the field. 52% of women have more than 10 hours of training versus only 28% of men; and 45% of men have no training in Behavioral Finance versus 11% of women ($\chi^2= 4.56$, pvalue =0.10). The higher level of education might be a possible explanation for the gender differences among investors, as it relates to risk aversion and overconfidence.

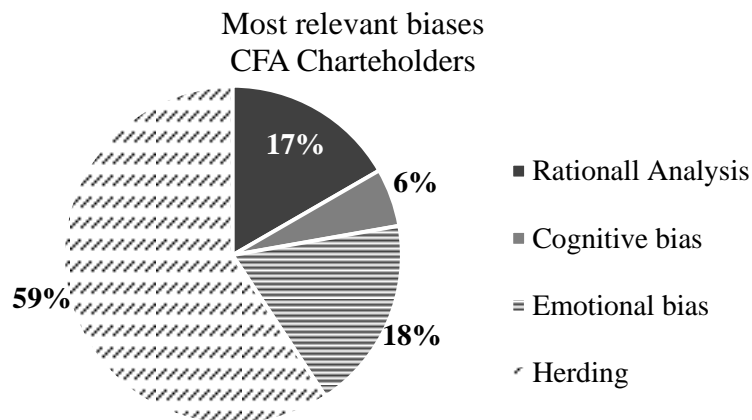
4.4.5. Impact of Education, Age and Gender on Prevailing Behavioral Biases

Asked about the main driver in their decision-making process (question 19), professional investors indicate that irrational biases (emotional, cognitive and herding) clearly prevail (65%) versus rational analysis (35%). Applying a non-parametric χ^2 test, the prevalence of irrational behavior by investors is statistically significant ($\chi^2= 27.59$, pvalue=0.000).

According to practitioners, social conditioning or herding appears to be the most predominant bias (39%) versus the other two main categories (emotional and cognitive biases) considered together (27%). This agrees with the results obtained by a survey carried out by the CFA Institute among 724 practitioners who considered herding as the most influential bias in the investment decision-making process (CFA Institute, 2013). This is also aligned with empirical evidence from Menkhoff and

Nikiforow (2009), showing that herding is the strongest bias according to fund managers. As described in Figure 4.3, the prevalence of herding is particularly stronger for CFA Charterholders (59%), whereas for Non-CFA Charterholders, rational analysis prevails (54%).

Figure 4.3. Most relevant biases for CFA Charterholders

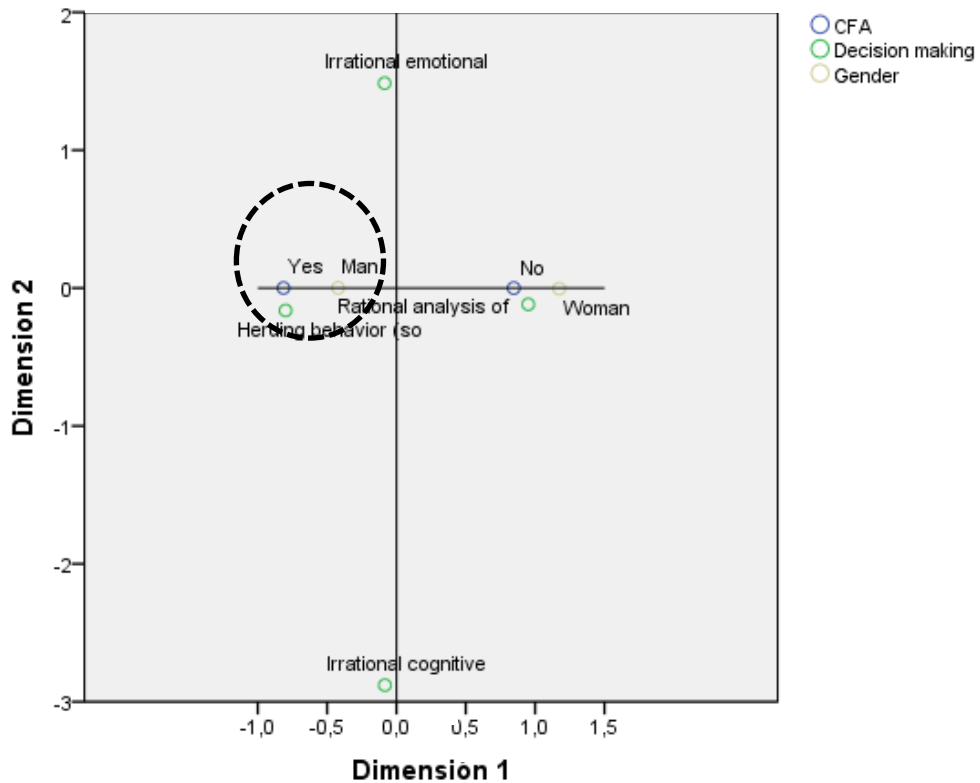


Concerning gender, men are recognized to be more biased than women. According to the answers to question 19, rational analysis is considered as the main decision-making factor for 57% of women (vs. 27% of men), whereas herding behavior is considered as the most relevant aspect for 44% of men (vs. 25% of women). We find here a significant difference related to the main decision-making factor and gender ($\chi^2 = 8.35$, $pvalue = 0.039$; $\gamma = -0.431$ $pvalue = 0.012$). The negative value of γ is associated with a stronger focus on rational analysis for female investors.

To analyze the two previous factors simultaneously (CFA education and gender), we draw the following perceptual map (question 19), as a result of a Multiple Correspondence Analysis. Figure 4.4 below, shows a clear association between being a man, a CFA charterholder and being impacted by herding behavior. On the other hand, there is also a clear association between being a woman, not being a CFA charterholder and being driven by rational analysis. Cognitive and emotional

irrational biases appear as external categories, not directly related to the rest of the variables.

Figure 4.4. Perceptual Map: Decision-Making vs. CFA and Gender



Concerning age (younger or older than 40 years), we find that younger investors are more driven by herding behavior (44% for younger vs. 32% for older), whereas rational analysis prevails for older investors (43% for older vs. 29% for younger). If emotional and cognitive biases are considered together, we do not find a significant difference with age ($\chi^2 = 2.72$, pvalue = 0.262; $\gamma = -0.25$, pvalue = 0.079).

For confirmation purposes, a similar analysis can be performed based on the answers to question 10, in which investors are asked to quantify the relevance (from 1, irrelevant, to 5, very relevant) for the following decision-making factors: rational analysis, cognitive biases and emotional biases (herding behavior was not considered below). Table 4.1 summarizes the main results:

Table 4.1. Main decision-making factors according to investors

Decision-making factor	Total Population	CFA Accreditation		Gender		Age	
		CFA	No CFA	Men	Women	Less 40	More 40
Rational Anal.	4.1	4.1	4.1	4.0	4.3	4.1	4.1
Cognitive Bias	2.9	2.9	2.8	3.0	2.5	3.1	2.6
Emotional Bias	3.1	3.1	3.0	3.1	2.9	3.3	2.8

Overall, rational analysis (average relevance 4.1) prevails versus both cognitive (2.9) and emotional (3.1) biases. However, this does not mean that rational analysis is more relevant than behavioral biases, as these have not been considered together (cognitive and emotional biases and herding behavior).

Moreover, we find no significant association between the relevance of decision-making factors and the CFA accreditation (herding is not considered in question 10).

Concerning gender, women view themselves as more driven by rational analysis (4.3 versus 4) and less impacted by irrational biases (both cognitive and emotional).

Applying the t-student test for the equality of means, the only significant difference based on gender is related to cognitive biases (p value=0.022), considered less relevant by women.

Regarding age, younger investors acknowledge being more impacted by both cognitive and emotional biases. Applying ANOVA, we find significant differences for cognitive biases (pvalue=0.019), which are considered more relevant for young investors. However, both younger and older investors assign the same relevance to rational analysis.

In questions 8 and 9 of our survey, investors are asked about their main cognitive and emotional biases.

As shown in Figure 4.5, concerning cognitive biases, Confirmation bias is the most widely accepted among investors (34%), followed by Representativeness (26%), Mental Accounting (24%) and Conservatism (16%). Additionally, as described in

Figure 4.5, CFA Charterholders especially emphasize the relevance of Confirmation bias, which is considered as the most relevant bias by 42% of them (versus 25% non-CFA Charterholders).

Figure 4.5. Most relevant cognitive biases



Concerning emotional biases, Loss Aversion stands out as the most relevant one, according to 57% of practitioners, followed by Overconfidence (17%). We do not find significant differences concerning the relevance of Loss Aversion, either for CFA Charterholders (59%) and non-CFA Charterholders (54%) ($\chi^2= 1.452$, $pvalue=0.69$, $VCramer=0.117$, $pvalue=0.69$) or related to gender (predominant for 52% of women versus 55% of men, and $\chi^2= 1.76$, $pvalue=0.62$, $VCramer=0.129$, $pvalue=0.62$) or age ($\chi^2= 6.45$, $pvalue=0.69$, $VCramer=0.144$, $pvalue=0.69$).

4.4.6. Professional Investor's and Client's Profiles

Considering the BB&K Five-Way Model framework, two personality questions were included to determine how professional investors view themselves and how they see their clients (questions 2 and 3). We purposely did not include the Straight Arrow profile as a possible response to better identify the main biases recognized by investors, as this type of investor is associated with the absence of biases.

Table 4.2 summarizes the results related to the investor's profile. Overall, investors view themselves as being predominantly highly confident (64%) and risk-averse

(61%), and the predominant profile is the Individualist (42%), followed by the Adventurer (23%).

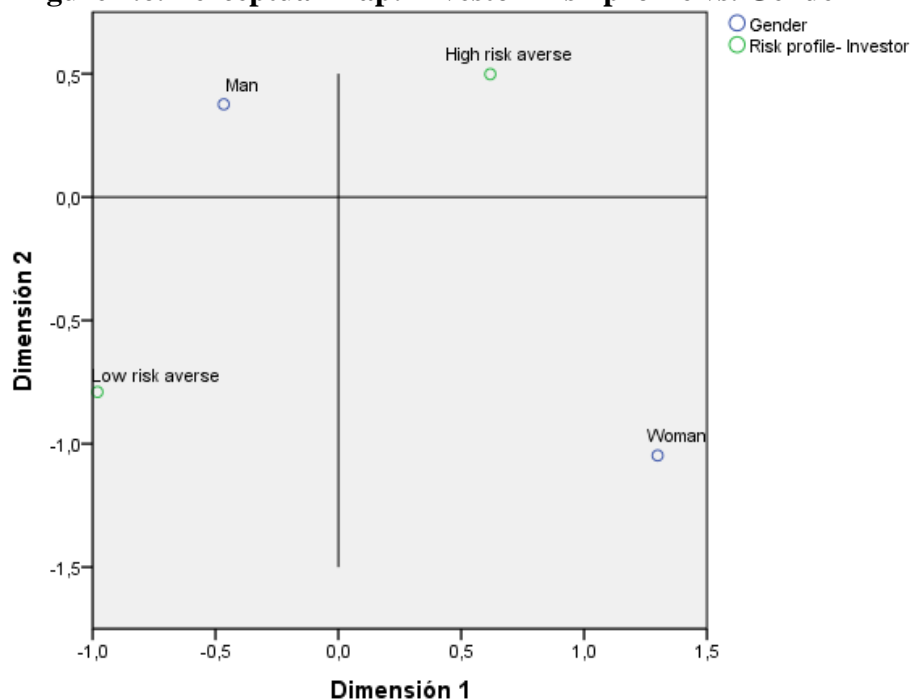
Table 4.2. Investor's profiles (BBK Model)

Risk Profile / Confidence & Risk Aversion	Total	CFA	NO CFA	Men	Women
Adventurer (High Confidence, Low risk averse)	23%	22%	23%	26%	14%
Celebrity (Low Confidence, Low risk averse)	16%	17%	15%	19%	7%
Guardian (Low Confidence, High risk averse)	20%	20%	19%	17%	29%
Individualist (High Confidence, High risk averse)	42%	41%	42%	38%	50%
High Confidence	64%	63%	65%	64%	64%
Low Confidence	36%	37%	35%	36%	36%
Low risk averse	39%	39%	38%	45%	21%
High risk averse	61%	61%	62%	55%	79%

We find significant difference regarding gender, in particular, related to the level of risk aversion ($\chi^2= 4.77$, pvalue=0.029 and $\gamma=-0.498$, pvalue=0.018).

According to their own perception, women are more risk averse (79%) than men (55%), as we can see in the following perceptual map (Figure 4.6). This implies significant differences related to unconventional preferences, and therefore, to emotional biases, such as Loss Aversion. This leads to different investment strategies depending on the gender.

Figure 4.6. Perceptual Map: Investor Risk profile vs. Gender



However, we find no significant differences in investors' confidence related to gender. Therefore, the significant difference related to the overall profile is relatively weak ($\chi^2= 5.2$, $pvalue=0.159$ and $VCramer =0.22$, $pvalue=0.159$).

Moreover, we do not find significant differences related to having the CFA accreditation concerning the practitioners' confidence level, risk aversion or their overall investor profiles ($\chi^2= 0.069$, $pvalue=0.995$ and $VCramer =-0.2$, $pvalue=0.995$).

Additionally, there are no differences related to age and the investors' profiles ($\chi^2= 3.28$, $pvalue=0.773$ and $VCramer =1.26$, $pvalue=0.773$).

Table 4.3 summarizes the results on how investors view their own clients:

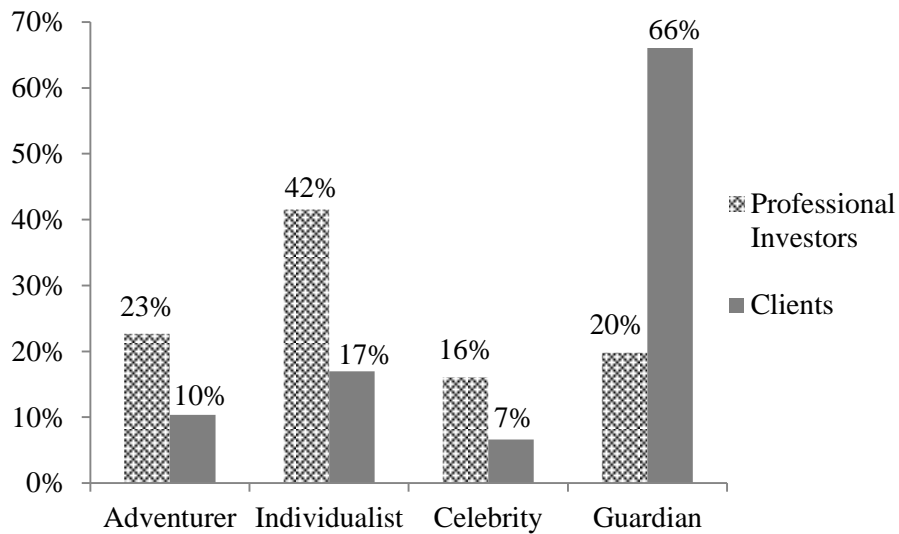
Table 4.3. Client's profiles (BBK Model)

Risk Profile / Confidence & Risk Aversion	Total	CFA	NO CFA	Men	Women
Adventurer (High Confidence, Low risk averse)	10%	13%	8%	10%	11%
Celebrity (Low Confidence, Low risk averse)	7%	4%	10%	5%	11%
Guardian (Low Confidence, High risk averse)	66%	69%	63%	67%	64%
Individualist (High Confidence, High risk averse)	17%	15%	19%	18%	14%
High Confidence	27%	28%	27%	28%	25%
Low Confidence	73%	72%	73%	72%	75%
Low risk averse	17%	17%	17%	15%	21%
High risk averse	83%	83%	83%	85%	79%

Investors predominantly view their clients as having low confidence (73%) and high-risk aversion (83%), and consequently, the predominant profile is the Guardian (66%). Interestingly, the results show a clear misalignment between the professional investor and his clients, as shown in Figure 5.

The following bar chart (Figure 4.7) shows that the most common profiles among professional investors are the Adventurer and the Individualist, whereas their clients are mainly viewed as Guardians. Hence, practitioners view themselves as confident and risk seeking, while they see their clients as risk-averse and insecure. This finding is consistent with the conclusions of a previous similar survey (Gonzalez-Igual, Corzo and Castan, 2017).

Figure 4.7. Professional Investor's and Client's Profiles (BBK)



This misfit can be explained not only by the investors' overconfidence but also by the role of trust that the practitioner plays in the eyes of the client. In fact, once all fees are taken into account, some studies find 2% investor underperformance relative to indexation. This evidence is difficult to reconcile with the fact that investors seek active managers to improve performance.

Some studies of mutual funds note that investor hiring advisors must be obtaining some benefits apart from portfolio returns (Hortacsu and Syverson, 2004). Gennaoli et al. (2015) follow this proposal and develop an alternative view of money management based on the idea that investors do not know much about finance, are too nervous or anxious to make risky investments on their own, and hence hire money managers and advisors to help them invest. Managers may have knowledge of how to diversify or even the ability to earn alpha, but in addition, they provide investors peace of mind. They refer to money doctors as families of mutual funds, registered investment advisors, financial planners, brokers, funds of funds, bank trust departments and others who give investors the confidence to take risks. The allocation of assets to managers is mediated by trust and not only by returns. Trust influences

individual investment risk perceptions and equity premium, and it may also explain the specific securities that individuals select (Olsen, 2012).

In any case, in the context of self-reported surveys, we have to be cautious concerning such conclusions, since it is common that individuals do not have an accurate view of themselves. To mitigate the potential misperception resulting from self-report surveys and to obtain a better understanding of the true nature of investors, we measure the actual investor sentiment through the investor's Confidence Index.

4.4.6. Impact of Education, Age and Gender on Institutional Investor's Confidence

As previously described, we define the Institutional Investor's Confidence Index (IICI) based on the answer to sentiment questions. First, we analyze the relation between the Confidence Index and several investor's characteristics, including education (CFA accreditation), age, gender and the investor's profile. Our final goal is to outline a model for investor's confidence based on the survey results.

We will use the two defined Confidence Indexes: IICI 1 and IICI 2, where IICI 2 includes the view of the macro environment. The average for IICI 1 is 49 (positive values show an optimist outlook) and for IICI 2 is 39.

Regarding the normality, IICI 1 does not follow a normal distribution (Z Kolmogorov-Smirnov= 1.64, p value= 0.01), but it does at a 10% confidence level.

IICI 2 follows a normal distribution (Z Kolmogorov-Smirnov= 1.09, p value= 0.184).

There is homogeneity of variances between the Confidence Indexes (IICI 1 and IICI 2) and our different independent variables ⁽³⁾. Therefore, we can apply the T-student test or ANOVA to assess the impact of Education, Age and Gender on investor's confidence.

Concerning education, we find no impact regarding the CFA accreditation or the hours of training in Behavioral Finance on the Confidence Index. Regarding the CFA

accreditation, we apply the T-student test for the equality of means and find no significant differences related to CFA accreditation for IICI 1 ($t=-0.16$; $pvalue=0.87$) and IICI 2 ($t=-0.29$; $pvalue=0.78$). The average IICI 1 for CFA charterholders is 49.6, versus 48.5 for non-CFA charterholders. Concerning the level of training in the field (none or less than 10 hours, between 10 and 50 hours, more than 50 hours), we apply one factor ANOVA, and find no significant differences in the confidence index related to the hours of training for either IICI 1 ($pvalue=0.86$) or IICI 2 ($pvalue=0.94$). Regarding gender, we find significant differences between men and women for a 10% confidence level ($t=-1.92$; $pvalue=0.058$), where women (60) show a higher level of confidence than men (45). However, there are no significant differences when applying IICI 2 ($t=-1.14$; $pvalue=0.255$). Applying the Mann-Whitney non-parametric test, we confirm these results: IICI 1 (U-Mann-Whitney=810, $pvalue=0.04$) and IIC 2 (U-Mann-Whitney=877, $pvalue=0.12$).

Regarding age, we do find significant differences for both IICI 1 ($pvalue=0.07$) and IICI 2 ($pvalue=0.02$). In general, younger investors (less than 40 years old) show a lower level of confidence than the more experienced ones (40 or higher), with IICI 1 indices of 43 and 54, respectively. When applying the Kruskal-Wallis non-parametric test, we obtain the same results.

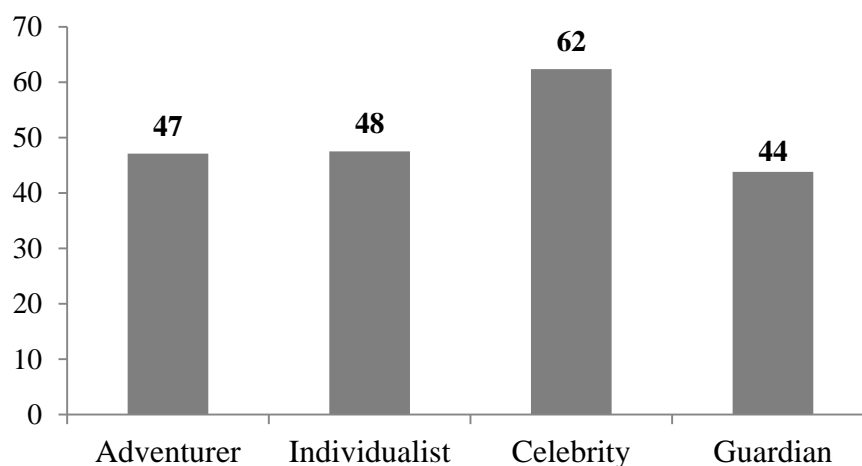
4.4.7. Confidence Index and Investor's Profiles

Furthermore, to mitigate the potential lack of correspondence between reality and self-perception, we analyze the relation between the Confidence Index, (see questions in Appendix) and the different recognized types of personalities.

As shown in Figure 4.8, the average confidence (IICI 1) index was calculated for each personality group. Guardians have the lowest confidence index (44). This is aligned with expectations, but the difference with the average index (49) does not appear to be

material. However, Celebrities have the highest level of confidence (62), when it should intuitively be lower than Adventurers and Individualists.

Figure 4.8. Confidence Index (IICI 1) and Investor's profiles



Based on IICI, there is homogeneity of variances for IICI 1 (Levene=1.44, pvalue=0.24) and IIC 2 (Levene=0.94, pvalue=0.42). Applying one factor ANOVA, we find no significant differences in the confidence index between the different profiles, IICI 1 (pvalue=0.43) and IICI 2 (pvalue=0.23).

4.4.8. Confidence Index based on Factorial Analysis

For simplicity purposes, we generate a new Confidence Index obtained from the extraction of the most relevant information from the five sub-indices associated with IICI 1: the perspectives' index, valuation index, short-term recovery index, long-term recovery index and crash risk index. Our factorial analysis reduces redundant information into a single variable, which is a linear combination of all variables, and which is the new Confidence Index (IICI Factorial) (KMO=0.575, pvalue of Bartlett test=0.000). This new typified variable or factor presents a high correlation with the previously defined confidence indices (0.971, 0.931, respectively).

Based on the new index, we analyze the impact of our main independent variables (Education, Age, Gender and Investor's profiles). The results are summarized in Table 4.4 below:

Table 4.4. Impact of main variables on IICI factorial

Variable	Test	p value	Homogeneity of Variances	
			Levene	p value
CFA accreditation	Equality of means	0.76	2.26	0.14
Hours of learning	ANOVA 1 factor	0.83	1.83	0.17
Age	ANOVA 1 factor	0.03	1.50	0.23
Gender	Equality of means	0.09	0.05	0.82
Investor profile	ANOVA 1 factor	0.30	1.42	0.24

The main conclusions are similar to those obtained with IICI 1 and 2:

- Significant impact of age (5% confidence): young investors have a lower level of confidence than older ones.
- Significant impact of gender (10% confidence): women have a higher level of confidence compared to men.
- No significant impact on Confidence related to CFA accreditation, hours of training in Behavioral Finance and Investor's profile.

4.4.9. A Model for Investor's Confidence

Using the Factorial Confidence Index as the dependent variable, we develop a Multiple Linear Regression model for the Confidence Index based on fourteen independent variables⁽⁴⁾, including Gender (male or female), Age (older or younger than 40 years), CFA accreditation (being CFA charterholder or not) and Education in behavioral finance (Education BF: having/ not having learning experience in Behavioral Finance).

The model is statistically significant ($R^2=0.24$, $F(14,91)=2.7$ and value p (F)=0.013) and there is no heteroscedasticity ($LM=17.60$, $pvalue= 0.67$) or severe imperfect

multicollinearity (VIFs are all lower than 2). The model is therefore valid to identify the main significant variables impacting Investor Confidence.

The results are shown in Table 4.5:

Table 4.5. A Model for IICI factorial

	<i>Coefficient</i>	<i>Standard Dev.</i>	<i>T Student</i>
Gender	-0.549 **	0.246	-2.228
Age	-0.408 *	0.210	-1.938
CFA accreditation	-0.042	0.239	-0.175
Education BF	0.055	0.201	0.272
DCFValue	0.198 *	0.107	1.851
Confidence	-0.115	0.259	-0.443
Risk profile	0.301	0.211	1.427
Relevance BF	0.399	0.391	1.021
Rational Analysis	-0.05	0.114	-0.437
Cognitive Bias	0.061	0.108	0.558
Emotional Bias	-0.073	0.105	-0.691
Representativeness	0.224 *	0.126	1.777
Loss Aversion	0.137	0.126	1.084
Difference Profiles	0.015	0.086	0.179

*p<0.1; **p<0.05; ***p<0.01

As described above, gender and age have a significant impact on investor's confidence index. Female investors have a higher level of confidence compared to men (p value=0.028) and therefore may be more impacted by biased beliefs. This finding is apparently in contradiction with the previous literature, which finds evidence of more overconfident behavior in men than women (Estes and Hosseini, 1988 and Barber and Odean, 2001). However, according to Atkinson et al. (2003) there are no significant differences in the level of confidence related to gender, and Bliss and Potter (2002) even find women hold portfolios with more risk than men. Our research suggests that women are more risk averse (unconventional preferences) but also more confident (biased beliefs) than men.

Concerning age, younger investors have lower confidence than older ones (p value=0.056). This tendency to overweight personal experience is consistent with the existing literature (Greenwood and Shleifer, 2014).

Moreover, practitioners who value the DCF method (pvalue=0.068) and support the Representativeness heuristic (pvalue=0.079) have a higher Confidence Index.

It is interesting to note that the self-perceived Investor's confidence profile is unrelated to the Confidence Index. In contrast, even if weak, there is some relation with the Risk Aversion profile (pvalue=0.157).

It is also worth highlighting that we find no significant differences related to Education variables, such as the hours of learning in Behavioral Finance or holding the CFA accreditation. This is consistent with research from Menkhoff and Nikiforow (2009), according to which behavioral biases are so deep-rooted in human behavior that they are hard to overcome by training.

4.5. Conclusions

According to the empirical evidence, professional investors very significantly acknowledge the relevance of Behavioral Finance but also admit to having an insufficient level of training in the field. This is mainly due to the lack of structure and clarity of the theory, as confirmed by our survey. Our research contributes to further systematization in the field of Behavioral Finance by analyzing the impact of education, gender and age on investor's behavior and on the Confidence Index.

Based on the results of our survey, CFA charterholders possess a superior level of education and awareness in Behavioral Finance and acknowledge being more impacted by herding behavior, whereas for non-CFA Charterholders rational analysis prevails. Compared to men, women also have a higher level of education and consider themselves to be less impacted by irrational biases. Regarding age, young investors

overwhelmingly support the relevance of Behavioral Finance and acknowledge being more impacted by cognitive and emotional biases, but they have a similar lack of education in the field.

The lack of education in Behavioral Finance, despite its increasing relevance for investors, is of the utmost importance from an academic and professional point of view. The implications for the functioning of financial markets and the need to be taken into consideration for the curriculum in financial studies should be carefully analyzed.

Concerning investors' profiles, practitioners view themselves as predominantly Individualists and Adventurers, while they describe their clients as Guardians. This entails a clear misfit between the investors and their clients, especially related to their level of confidence, which should be acknowledged by practitioners and represents a challenge for future research. This result is coherent with the role played by trust as explained in Money Doctors (Gennaoli et al., 2015). This fiduciary role of the investor reinforces his need for education in Behavioral Finance. Based on the analysis of the Adviser-Client relationship, Olson and Riepe (2010) maintain that investors who utilize the findings of Behavioral Finance are more likely to receive the support, agreement and understanding of their clients.

Gender is the only independent variable that has a significant impact on the investor's profile, as female investors view themselves as more risk-averse than men. This lower risk tolerance from female investors is consistent with the previous literature (Olsen and Cox, 2001) and implies different investment strategies depending on the gender.

Finally, we develop a model to determine investor's confidence, and we find significant differences related to gender and age factors. Female investors have a higher confidence index, which may appear to be in contradiction with existing

literature, describing male investors as being more overconfident (Barber and Odean, 2001) or indicating that the differences in terms of overconfidence between men and women are not significant (Atkinson et al., 2003). More experienced investors also show a higher level of confidence, which is consistent with previous literature indicating that practitioners tend to overweight their personal experience, with insufficient consideration of all available data (Greenwood and Shleifer, 2014).

The results of our survey show no impact of the CFA accreditation, the hours of training and the acknowledged investor's profile on investor's confidence. This is aligned with research from Menkhoff and Nikiforow (2009), according to which the level of education in Behavioral Finance does not eliminate nor reduce investors' irrational behavior. Nevertheless, we do find an impact on the confidence index related to specific technical knowledge, such as the relevance assigned to the DCF Method or the Representativeness Heuristic. Based on these findings and further empirical research, a comprehensive model for investor's confidence is yet to be developed and represents an important line for future research.

Appendix: Summary of Questions and Answers in the Surveys

Control Questions

Age

a. [less than 40]	56%
b. [40-50]	38%
c. [50-60]	5%
d. [60-65]	2%
e. [more than 65]	0%

Gender

a. Man	74%
b. Woman	26%

Financial Accreditation

a. CFA	51%
b. CEFA /EFA	10%
j. Incomplete CFA	4%
k. None of the previously mentioned	35%

Job/Firm type

a. Independent	4%
b. Bank	53%
c. Insurance company	7%
d. Family office	4%
e. Other financial groups	18%
f. Retired	0%
g. Unemployed	1%
h. Other	14%

Job title

a. Investment advisor	25%
b. Fund manager	19%
c. Investment analysis and markets operations	15%
d. Investment banking	19%
e. Private Equity	2%
f. Others (Financial and Investment position)	21%

Investment style

a. Fixed income	6%
b. Mixed fixed income	6%
c. Mixed variable income	5%
d. Euro variable income	25%
e. International variable income	9%
f. Guaranteed fixed income	2%
g. Guaranteed variable income	0%
h. Global funds	14%
i. Funds of funds	3%
j. Hedge Funds, real estate funds or similar	5%
k. Other	25%

Confidence Index Questions

In the next six months, I think that the IBEX 35 will:

- | | |
|----------------------------|-----|
| a. Rise more than 10% | 14% |
| b. Rise, but less than 10% | 65% |
| c. Drop, but less than 10% | 18% |
| d. Drop more than 10% | 3% |

The Spanish stock market prices are:

- | | |
|-------------|-----|
| a. Too low | 36% |
| b. Adequate | 55% |
| c. Too high | 9% |

Given the current situation, if the IBEX 35 fell 3% tomorrow, the day after tomorrow the index would:

- | | |
|--------------------|-----|
| a. Go up | 54% |
| b. Go down | 27% |
| c. Remain the same | 19% |

Given the current situation, if the IBEX 35 fell 25% in the next six months, prices six months after would:

- | | |
|--------------------|-----|
| a. Go up | 80% |
| b. Go down | 7% |
| c. Remain the same | 13% |

What is the probability of a crash occurring in the Spanish stock market in the next six months?

- | | |
|------------|-----|
| a. 0-25% | 75% |
| b. 25-50% | 23% |
| c. 50-75% | 2% |
| d. 75-100% | 1% |

Over the next year, the interest rates set by the ECB will:

- | | |
|--|-----|
| a. Go down | 1% |
| b. Stay the same | 66% |
| c. Increase by approximately 0.25% | 30% |
| d. Increase by approximately 0.50% or more | 3% |

Over the next three years, the interest rates set by the ECB will:

- | | |
|---|-----|
| a. Go down | 0% |
| b. Stay the same | 5% |
| c. Increase by approximately 0.50% | 40% |
| d. Increase by approximately 1% | 33% |
| c. Increase by approximately 1.5% | 18% |
| d. Increase by approximately 2% | 5% |
| e. Increase by approximately 2.5% or more | 0% |

Behavioral Finance Questions

Question #1 With which investment style do you feel more comfortable as a professional investor?

a. Value Investing	52%
b. Growth Investing	11%
c. Absolute Return	14%
d. Relative Return	5%
e. Momentum	6%
f. Capitalization	3%
g. Passive management	9%

Question #2 Which of the following profiles, as a professional investor, better corresponds to yours?

a. Adventurer: risk lover and with high level of confidence	23%
b. Celebrity: risk lover and insecure	16%
c. Guardian: risk-averse and insecure	20%
d. Individualist: risk averse and with a high level of confidence	41%

Question #3 How do you see your clients?

a. Adventurer: risk lover and with a high level of confidence	10%
b. Celebrity: risk lover and insecure	7%
c. Risk-averse and insecure	66%
d. Risk-averse and with a high level of confidence	17%

Question #4 Value from 1 to 4 (being 4 the most relevant) the relevance when anticipating the evolution of a Value-type security

a. DCF	Most relevant	58%
	Relevant	24%
	Less relevant	12%
	Not relevant	7%
b. Macroeconomic	Most relevant	17%
	Relevant	36%
	Less relevant	38%
	Not relevant	9%
c. Multiples	Most relevant	26%
	Relevant	49%
	Less relevant	22%
	Not relevant	4%
d. Technic	Most relevant	9%
	Relevant	9%
	Less relevant	26%
	Not relevant	56%

Question #5 Value from 1 to 4 (being 4 the most relevant) the relevance when anticipating the evolution of a Growth-type security

a. DCF

Most relevant	32%
Relevant	31%
Less relevant	24%
Not relevant	13%

b. Macroeconomic

Most relevant	37%
Relevant	31%
Less relevant	23%
Not relevant	9%

c. Multiples

Most relevant	28%
Relevant	37%
Less relevant	29%
Not relevant	6%

d. Technic

Most relevant	13%
Relevant	24%
Less relevant	24%
Not relevant	40%

Question #6 Do you consider the education/training in behavioral finance relevant when investing?

a. Yes

92%

b. No

8%

Question #7 How many hours of training in behavioral finance have you received?

a. None

20%

b. Less than 10

28%

c. Between 10 and 50

34%

d. More than 50

13%

e. More than 100

5%

Question #8 Which of the following cognitive biases do you consider to have more impact on investment decisions?

a. Mental accounting

24%

b. Representativeness

26%

c. Conservatism

16%

d. Confirmation bias

34%

Question #9 Which of the following emotional biases do you consider to have more impact on investment decisions?

a. Loss Aversion

57%

b. Overconfidence

17%

c. Status quo bias

15%

d. Regret Aversion bias

11%

Question #10 Which of the following factors do you think has more impact on investment decisions?

a. Rational analysis	Very relevant	40%
	Relevant	39%
	Normal	12%
	Little relevant	8%
	Irrelevant	2%
b. Irrational cognitive biases	Very relevant	7%
	Relevant	24%
	Normal	30%
	Little relevant	29%
	Irrelevant	10%
c. Irrational emotional biases	Very relevant	11%
	Relevant	26%
	Normal	32%
	Little relevant	21%
	Irrelevant	10%

Question #11 Looking at the market, in the short-run, facing a significant public event, investors tend to:

a. Overreact	88%
b. Underreact	7%
c. React rationally	6%

Question #12 Looking at the market, in the short-run, facing various public events that follow the same direction, investors tend to:

a. Overreact	85%
b. Underreact	7%
c. React rationally	9%

Question #13 Looking at the market, facing an economic crisis, investors tend to:

a. Follow the market behavior	19%
b. Anticipate the market behavior	7%
c. Overreact initially	42%
d. Underreact initially and overreact later	33%

Question #14 Looking at the market, facing the end of a crisis and economic recovery, investors tend to:

a. Follow the market behavior	26%
b. Anticipate the market behavior	8%
c. Overreact initially	6%
d. Underreact initially and overreact later	59%

Question #15 Do you consider the following sentence to be valid? "The individual evaluates the investment in terms of profit and loss and not on the basis of the final wealth, being more sensitive to losses than to gains":

a. 1 (not valid)	4%
b. 2	3%
c. 3	21%
d. 4	44%
e. 5 (very valid)	28%
Question #16 Do you consider the following sentence to be valid? “Subjects tend to consider a given event as typical or representative, ignoring the laws of probability or the statistical evidence”:	
a. 1 (not valid)	3%
b. 2	2%
c. 3	9%
d. 4	46%
e. 5 (very valid)	41%
Question #17 Do you consider the education/training of fund managers and professional investors to be adequate when investing?	
a. Yes	28%
b. No, more technical formation in business valuation is needed	21%
c. No, more formation in technical analysis is needed	5%
d. No, more formation in macroeconomic concepts is needed	6%
e. No, more formation in behavioral finance is needed	42%
Question #18 Which of the following reasons better explain the lack of relevant training in behavioral finance for fund managers/professional investors?	
a. It is not a relevant field when making investment decisions	8%
b. It is relevant but inaccessible	12%
c. It is relevant, but it is a field of knowledge that is too complex	19%
d. It is relevant, but the field is diffuse, not unified and hard to transmit	61%
Question #19 The decision-making process of fund managers is motivated by:	
a. Rational analysis of the markets	35%
b. Irrational cognitive biases	7%
c. Irrational emotional biases	20%
d. Herding behavior (social interaction)	39%
Question #20 Given a situation of the end of prosperity and possible entry into a crisis, investors tend to:	
a. Follow the market behavior	22%
b. Anticipate the market behavior	9%
c. Overreact initially	20%
d. Underreact initially and overreact subsequently	49%

Notes

1. The phrase “irrational exuberance” was previously used by Alan Greenspan, Chairman of the Federal Reserve of the United States, during a dinner speech on December,5 1996. Alan Greenspan did not affirm there was irrational exuberance; he simply asked “How do we know when irrational exuberance has unduly escalated asset prices?” As a result, the Nikkei Index immediately dropped 3.2% and then triggered a very negative impact on markets themselves at a global level (Shiller 2006). The consequence of Alan Greenspan words constitutes by itself a good example of irrational investor behavior.

2. The Institutional Investor Confidence Index (IICI) is composed of the following five sentiment indices:
 - i. Perspectives’ index: based on investors’ expectations concerning the evolution of the Spanish stock market.
 - ii. Valuation index: based on the investor’s valuation of the current stock market assessment.
 - iii. Short-term recovery index: based on investor confidence after a punctual strong fall of the stock market.
 - iv. Long-term recovery index: based on the investors’ confidence concerning the reversion of strong falls.
 - v. Risk of crash index: based on the risk that investors assign to a stock market crash.

IICI 2 is composed of the five previous sentiment indices and the two following ones:

 - vi. Short-term interest rate index: based on investors’ expectations concerning the evolution interest rates over a one-year period.
 - vii. Long-term interest rate index: based on investors’ expectations concerning the evolution interest rates over a three-year period.

3. There is homogeneity of variances between the Confidence Indexes (IICI 1 and IICI2) and our different independent variables:

Variable	IICI 1		IICI 2	
	Levene	p value	Levene	p value
CFA accreditation	3.1	0.08	2.5	0.11
Hours of learning	1.1	0.35	1.2	0.30
Age	1.2	0.30	2.6	0.08
Gender	0.03	0.87	0.20	0.65

4. List of variables consider for the Confidence Index Model:

- Gender: male or female
- Age: younger or older than 40 years
- CFA accreditation: being CFA charterholder or not
- Education BF: having/ not having learning experience in Behavioral Finance
- DCFValue: relevance of Discounted Cash Flow methods when anticipating the evolution of a Value type security
- Confidence: high confidence (Adventurer or Individualist) versus low confidence (Guardian and Celebrity)
- Risk profile: high risk averse (Individualist or Guardian) or low risk averse (Adventurer or Celebrity)
- Relevance BF: Behavioral Finance relevant/not relevant
- Rational Analysis: relevance of rational analysis (values 1 to 5)
- Cognitive Bias: relevance of cognitive biases (values 1 to 5)
- Emotional Bias: relevance of cognitive biases (values 1 to 5)
- Representativeness: accuracy of statement (values 1 to 5)
- Loss Aversion: accuracy of statement (values de 1 a 5)
- Diff. Profile: Difference between profiles (investor-client) (values 1 to 4).

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5. Conclusions

“The fact that people will be full of greed, fear or folly is predictable. The sequence is not predictable.”

Warren Buffet (1985)

The aim of our research, organized in three articles, is to contribute to further systematization of the field of Behavioral Finance by a thorough review and synthesis of the existing literature and using empirical evidence produced from a series of surveys we conducted to professional investors. Our research contributes ten main findings of particular interest to the investment community and the field of Behavioral Finance:

- i. We find a significant gap between the relevance of Behavioral Finance for practitioners and the lack of education in the field. In our surveys, professional investors very significantly acknowledge the relevance of Behavioral Finance, but admit to having an insufficient level of training in this area of study independent of their age. This gap has substantial implications from an academic and professional point of view and should be taken into consideration by scholars in composing a curriculum in financial studies. Moreover, the lack of formal training in the field compels us to be cautious in drawing the conclusions from our surveys.
- ii. The shortage of education in Behavioral Finance is mainly due to a lack of structure and clarity of the theory, as identified in our literature review (Hong and Stein, 2007; De Bondt et al., 2008; and Jeffrey and Putman, 2013) and confirmed by our surveys. Approximately 80% of the participants in our empirical research highlight the lack of clarity and complexity of the theory of Behavioral Finance. This supports the relevance of our study that is aimed at providing further structure to the field.

- iii. As represented in our conceptual map, overconfidence (biased beliefs), loss aversion (unconventional preferences) and herding (social conditioning) are the main behavioral biases according to both our literature review and the results of our surveys of professional investors. This outcome is consistent with the two main psychological pillars of Behavioral Finance: the Representativeness Heuristic (Tversky and Kahneman, 1974) and the Prospect Theory (Kahneman and Tversky, 1979). Herding, in turn, amplifies the impact of individual biases on financial markets and is noted by CFA Charterholders as the predominant irrational bias.
- iv. Regarding investors' behavior under different financial scenarios, there are two predominant and interrelated phenomena according to practitioners: under- and overreaction. According to our surveys, overreaction is the prevalent behavior in response to relevant news and situations of financial crisis, which in turn likely serves to further aggravate the crisis. This prevalence of overreaction is consistent with the literature (De Bondt and Thaler, 1985, and Grinblatt and Han, 2005) and can be directly related to Representativeness and overconfidence. In contrast, under changing circumstances characterized by greater uncertainty, underreaction appears to be the first response, followed by a significant tendency to follow the market (herding) as a consequence of loss aversion.
- v. Concerning behavioral profiles (Bailard, Biehl and Kaiser, 1986), we find a clear disconnect between investors and their clients; particularly in relation to their level of confidence. Whereas practitioners view themselves as highly confident (Individualists and Adventurers), they perceive their clients as more risk averse and insecure (Guardians). This misfit is consistent with investor's overconfidence and with the fiduciary role of the investor as described by Gennaoli et al. (2015). In that sense, concerning the adviser-client relationship, Olson and Riepe (2010) found

that investors who take into consideration Behavioral Finance are more likely to receive their clients' support.

- vi. There is also a misalignment between how investors perceive themselves and what they actually are. Based on the responses to our surveys and the application of the confidence index, we found that some investors tend to perceive themselves as more confident than they really are. This outcome also supports investors' overconfidence and can again be related to the role of trust that a practitioner plays in the eyes of a client (Gennaoli et al., 2015), to the extent that the practitioner's self-image is confused with what he believes the client expects of him.
- vii. Consistent with previous literature (Menkhoff and Nikiforow 2009), the results of our second survey show that level of education in Behavioral Finance (as measured by hours of training or having a CFA accreditation) does not eliminate nor reduce investors' irrational behavior and in particular has no impact on the Confidence Index.
- viii. Concerning gender, female practitioners who participated in the surveys have a higher level of education in Behavioral Finance and view themselves as more driven by rational analysis and more risk averse. This higher loss aversion of female investors is consistent with the findings in the literature (Olsen and Cox, 2001; Pompian and Longo, 2004) and manifests itself in different investment strategies than those adopted by their male counterparts.
- ix. Regarding age, despite their lack of experience, younger investors unanimously recognize the relevance of Behavioral Finance and acknowledge being more influenced by both cognitive and emotional biases. This outcome reflects the increasing importance of Behavioral Finance for practitioners and further highlights

the gap between the importance they attach to the field and their formal education and training.

- x. Finally, we develop a model to determine investor's confidence based on the Institutional Investor Confidence Index (Shiller, 2000) and we identify significant differences related to gender and age factors. Female practitioners appear to have a higher level of confidence, which contradicts previous literature (Barber and Odean 2001). This outcome shows the need for further research to distinguish between loss aversion and overconfidence, which are two different behavioral traits that can potentially be confused. More experienced investors show a higher level of confidence, consistent with the previous literature, indicating that practitioners tend to overweight their personal experience, thereby paying insufficient consideration to all available data (Greenwood and Shleifer 2014).

In conclusion, our research confirms that despite the relevance of Behavioral Finance for the investment community, a more structured, clear and defined theoretical framework is required to establish this field as a new paradigm in the Theory of Finance and to help overcome the shortage of education in the field. To that end, our empirical findings, based on the view of practitioners, contribute to further homogenization of the field by identifying the prevailing behavioral biases and investor's profiles, which are dominated by overconfidence, loss aversion and herding behavior. This view stands in sharp contrast with the practitioners' perception of clients as more risk averse and insecure. We also determine the impact of education, age and gender on investors' irrational behavior and develop a model to determine investors' confidence, with female and more experienced investors exhibiting higher levels of confidence, whereas education does not seem to have a significant impact.

Based on our findings and further empirical research, a comprehensive model for investors' confidence is yet to be developed and represents an important subject for future research. Considering the impact of cultural factors on human behavior, such future research could include extending our survey to a greater number of investors or other geographical areas, in particular in the Anglo-Saxon world that has traditionally dominated the field of Finance. It is probably also worth analyzing if there is any significant correlation between investors' level of confidence and the returns they earn on their investments.

Moreover, future models of investor's irrational behavior can be improved by providing a deeper understanding and greater weight of herding and its interrelations with individual psychological biases, amplifying their impact on financial markets. Future research could use actual data from multiple crisis, circumstances and investors' reactions to develop an Artificial Intelligence algorithm to predict the weight of prevailing behavioral biases under different financial scenarios.

Finally, a more accurate model of investors' behavior should incorporate the duality exhibited by practitioners involving the co-existence of rationality and irrationality, including the concepts of bounded rationality and rational irrationality. This improved model should also incorporate the ability to learn from past decisions and therefore capture the impact of the time variable, although education does not seem to have a significant influence on investor's irrational behavior. Perhaps this will change the day Behavioral Finance becomes a common subject of study in Economics and Finance. According to the practitioners' and the author's point of view, this should already be happening.

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