

Behavioral Finance from 2001 to 2012: Concepts, Themes and Academic Production

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Abstract

We discuss the role of Behavioral Finance in the context of Finance, presenting a dual approach: the use of concepts from psychology to the understanding of financial decisions, markets and asset pricing; and as a process of building a new paradigm. A conceptual definition for Behavioral Finance is set to define scope and conduct this research. A sample of scientific papers from 2001 to 2012 is evaluated, divided in two equal time periods, also compared by country and academic production. Effects of Preferences, and the study of effects in beliefs in financial decisions, and in portfolio selection, are dominant in the studies. Non-US research spreads, especially in China and EU, but US is still dominant in the role of providing academic texts. A research agenda is presented on developing studies on cross cultural aspects of biases, corporate finance and on the role of education in behavioral aspects of financial decisions.

Keywords: Behavioral Finance, Bibliometric Study, Beliefs, Financial Theory, Process, Decisions

1. Foreword

Theory in Finance has experienced for the last thirty at least years the questioning of the dominant paradigm of Modern Finance (MF), especially by Behavioral Finance (Kahnemann and Tversky, 1979). MF is based on a series of assumptions and hypothesis: the notion of rationality of economic agents and their homogeneous expectations; the possibility of obtaining the fundamental value of an asset (pricing); the portfolio optimization and risk assessment through median-variance approaches; and that markets had informational efficiency (EMH), though, limiting opportunities to beat the market, through the supremacy of the rational arbitrageur and reducing expected volatility around fundamental asset values.

Barberis and Thaler (2003) consider the difficulty of dealing with situations MF not explained by models based on rationality unlimited agents as a cause of the emergence of a new approach, Behavioral Finance (BF), combining psychology and limits to arbitrage, as its foundations. Psychology should provide theoretical resources to develop a new understanding for those phenomena in finance. Limits to arbitrage are understood as how rational agents interact with those no fully rational ones to eliminate price fundamentals deviations and in the way eliminating long term possibilities of excess return above the market. Implementation costs, market dynamics, non fully rational investor behavior (the noise traders) and risk evaluation influence rational investors decisions and strategies, bounding their effects on making markets efficient. Heuristics (representativeness, availability, anchoring), and biases, such as mental accounting, narrow framing, naïve diversification, (myopic) loss aversion, (so as mood and sentiment, as stated by Barberis and Shleifer, 2003, 2005) divert or limits fully rational decision processing for all human agents.

From these foundations, theory and experiments testing behavioral fundamentals on asset pricing, stock markets, cross section returns and corporate finance are developed to challenge fully rational assumption and market efficiency. A few significant examples follow. To Shefrin and Statman (1985), investor behavior does not follow the predicted by a utility curve or risk aversion principles in financial decisions. Investors profit on their stocks sub optimally, selling when prices rise, and maintaining their loss positions longer than expected rationally, increasing their final losses. It is the disposition effect, a capital market situation analyzed by Finance and Psychology.

Shiller (2003) cites the excess volatility on the US stocks market as one of the major challenges to MF, so as the “smart money vs ordinary investors” contest. Baker and Wuergler (2011) present evidences that managers and investors may benefit from a behavioral approach on traditional corporate finance issues in a theoretical view so as in a practical decision making stand point. Shefrin (2010) identified five categories of contributions to the vision of BF as a process of building a new paradigm: 1. Beliefs and preferences (biases behavior) 2. Portfolio selection, 3. Asset pricing; 4. Corporate finance, and 5. Financial market regulation. And a sixth category would be the BF survey, or surveys, to perform the update of the knowledge synthesis on the field. This covers mostly the fields in finance and financial decisions to be made by individuals, acting as managers (in companies or public administration), investors, traders, analysts or other market participants.

Though BF advocates tend to present its side as more descriptive than normative (Thaler, 1999), closely to real world finance phenomena, as opposed to a more normative MF and locate there its major contributions, especially on the agent’s defining assumptions, a major contribution of BF to Finance is to bring new questions that affect academic and practitioners, adding as much new normative insights (cognitive psychology) as descriptive evidence (its application) to the field. Bell, Haiffa and Tversky (1995) studying decision process, discuss differences among normative, descriptive and normative approaches. They present a third one, prescriptive, which is mediation of these two, reducing the gap between idealistic theorizing of the first and empirical behavior of the second. It fits the need to specify their bias, evaluations, and check for its result’s consistency. One possible step for BF should be to consolidate normative, comprehensively theoretical models in finance, that could answer questions not satisfactorily done for MF, in BF’s researchers point of view, or preferably, in a broader consensus.

1.1 Research Proposition

De Bondt and others (2008) and Shefrin (2010) propose a commitment vision, pursuing a dialogue between BF and MF (named Neoclassical Finance by those authors), whereas the first brings realism of the human factor in decisions, institutions and market, along with its challenges, and the comprehensive and rigorous framework of the second one. This combination would lead to a new paradigm, a process they call “behavioralizing finance” (Shefrin, 2010, p.6).

In this view, where finance seems to go through a process of building a new model, we investigate how the journals and proceeding papers stand and which topics are approached from 2001 to 2012, covering the decade that viewed Daniel Kahnemann, one of the BF founders awarded an economy nobel prize, in 2002 on his work on bounded rationality in economy with Amos Tversky (Kahnemann, 2002).

1.2 Objectives

This paper’s goal is to research the contributions from authors and publishers in the BF construction process trough 2001 to 2012 and its evolving dynamics in themes, countries, and production aspects, so as to compare BF definition elements over time. The objective is not to reproduce such works, but map the set of academic works using these parameters. To achieve this goal a survey was conducted on scientific journals and proceeding papers over Thomsom Scientific Web of Science ® database, divided into two samples, one from 2001 to 2006 and the other from 2007 to 2012, to compare such aspects over time.

2. Theoretical fundaments

From the 1950’s on, MF became the dominant academic paradigm, but the idea of efficient markets dates back to the nineteenth century, with Mackay and Bachelier (Milanez, 2002, P.04).

2.1 – Modern Finances (MF)

MF are based on the market informational efficiency that avoid permanent, long term abnormal gains, in the agents’ rationality of decision, translated as wealth maximization and risks minimization driver for decisions, the ability of arbitrageurs to return asset prices to their actual value, in pricing these assets objectively in terms of their risk and return (mean-variance) and that the prices tend to return to the average, indicating its unpredictability, as a random walk. Markowitz (1952, 1959) establishes the concept of asset portfolio diversification based on the combined variability of their returns to reduce variability and portfolio risk. Only systemic risk would not be subject to reduction. The efficient frontier would be the limit of the achievable return for each level of risk, given the available assets.

Sharpe (1964) proposes a way to measure risk and expected return associated to a portfolio of assets, from its variation compared to the risk-free asset, developing the Capital Asset Pricing Model CAPM. The market efficiency test is also characterized by the need for a joint hypotheses check: the efficiency level, plus the application of an asset pricing model, through a mathematical model, like the CAPM. The non-verification of either or one of these conditions would remove the opportunity to contest the market efficiency hypothesis. Notwithstanding the limitations noted later, CAPM has become widely used to offer a comprehensive vision for understanding the dynamics of risk and return on assets and markets. Among the limitations noted, is stands the impossibility of estimating some anomalies, such as book to market effect and size effect (smaller firms have a higher ratio of risk / return), incorporated in later models (Fama and French, 1992, 1995, 1996), and momentum effect, which would generate abnormal high returns than expected by traditional CAPM approach. The Efficient Market Hypothesis (FAMA, 1970), another fundament of MF, establishes three forms of market efficiency. In the weak form, current prices reflect the information passed on assets, and the expected return of the associated risk level, so historic information cannot forecast future returns. The semi-strong form, when prices also incorporate all publicly available information in the market, such as investments, profits, etc.

Finally, the strong market efficiency, in which even privileged information, don't result in abnormal market returns for those using it.

The critics of the new approaches impute to BF the lack of a unified and consistent model incorporating the main elements such as anomalies and psychological explanations of the financial phenomena analyzed. Fama (1998) questions the sustainability of anomalies trough time and contradictions between them. Malkiel, studies the performance of index funds in North America, that aim on overcoming the market index gains, the "active trading funds" (Malkiel 2005, p. 3-4). If it was possible to identify agents that obtain recurrent abnormal gains this would be the best proof of market inefficiency. He concluded that less than 5% of the funds outperform the major market indexes, seen as proxies of the stock market. However, as there is a surviving bias on the funds sample, the survey indicates an even smaller numbers, given that some bankrupted funds (due to their heavy losses) were incorporated into others. Furthermore, it reinforces that winner funds in a particular decade are downright losers in the next decade, a reference to the concept of the average return.

2.2 Behavioral Finances (BF)

Haugen (2000, P.19) points out that even back in 1976 a study showed evidence of abnormal returns on assets traded in January. Thaler (1993), defines BF as "open minded finance". Other authors such as Shiller (2003) and Shefrin (2010) consider that it is, respectively, a new focus in Finance and a process of building a new theory. Kahneman (2003), disussing the critics from traditional MF theorists on psychological approach, which is not as compelte as normative rational models, considers the last as "psychologically unrealistic" (p. 1449). Most relevant heuristics in judgement described by Kahneman and Tversky (1979) are availability, representativeness and anchoring. Kahneman and Tversky (1979) present the Prospect Theory as an alternative to Von Neumann – Morgenstern's utility theory (Copeland, Weston & Shastri, 2006) to explain human behavior in the face of decisions under risk. Individuals are more likely to avoid risks in situations involving sure gains and more risk seeker in situations involving sure losses, given the same level of gains, contrary to the risk avoidance notion. It also highlights the certainty effect: certain results are over-estimated compared to only probable ones. Weighting the alternatives replaces probability in the comparison of options. There would be a tendency to approximate values, rather than use precise calculations. (Kahneman and Tversky, 1979). The process would affect decision: the way the problem is presented affects human judgment. Decisions under risk would occur in two stages. First, people eliminate the common elements in the options, and then would compare the remaining part to select the alternative with the higher gain. This would affect the probabilistic assessment of the options, once questioning the rational *homo economicus*, an assumption to most studies in Finance.

To Shiller (2003, P.83-84), the anomalies are present even in the initial article of Fama (1970), but were understood as elements of reality that did not fit the traditional view of MF and as so, not considered. Excess volatility persistence in US stock markets is central to challenge market efficiency. Representativeness and self-attribution bias is used to explain feedback, the mechanism of creating, and evaporating, asset bubbles. Limits to arbitrage are presented, thus no longer returning prices to its fundamental values in the long run. Costs imposed to smart money to short stocks, liquidity and transaction costs may act as barriers.

Barberis and Shleifer (2003, 2005) state that investors classify risky assets by their perception, into different styles, moving funds from each other inside these groups, depending on their performance, comoving inside these categories (prices, betas), which would better explain their asset values and risk than only by looking at their fundamentals. Changes through styles of assets, as index inclusions, or inclusion in groups such as small caps, provoke significant long term changes in betas and prices. Sentiment and biases play a key role in defining (or framing) these groups of assets and on investors behavior. Lo (2004) discusses the adaptive markets hypothesis, where regular agent definition is multiple. Rational and non fully rational investors interact to create possible non equilibrium dynamics on asset value, extending price deviation from fundamentals and bubble creation. Pompian (2006) proposes a two level BF concept. Macro BF questions market efficiency via theoretical and empirical arguments, discussing persistent anomalies on calendar (e.g. January effect), fundamental (value vs growth stocks), technical (dividend paying stocks, announcement, arbitrage), though states that an embracing BF theory is still to be presented.

Micro BF focuses on individual investor behavior, evidenced as not fully rational and diverting from expected utility theory, and presents disposition effect, excess trading, home bias and under diversification portfolio as examples sustaining the statement. Subrahmanyam (2007) presents another comprehensive view on BF, addressing the four named areas in finance with the new behavioral paradigms: portfolio allocation, asset pricing models, capital structure of the firm (Modigliani-Miller theorem) plus theory of agency and the pricing of contingent claims. His survey reinforces short term presences of anomalies and long term reversals in the cross section of stock returns. A collection of significant work is presented focusing on those that connect empirical evidence to its behavioral roots in anomalies of the cross section of stock returns, corporate finance and investor trading. Overreaction at least partially explains abnormal returns of book-to-market anomaly and heuristics, an example used to explain asset bubbles through its impacts on individual investors.

On the corporate behavioral finance focus, Baker, Ruback and Wurgler (2007), discuss effects on irrational (rational) investors and rational (irrational) managers, and destination of free cash (invest, return to shareholders or hold), dividend distribution, stock issuing or repurchase, due to mispricing, to behavioral biases. Its effects on value creation (destruction), intentional or non intentional, are presented as a significant matter to be discussed along with agency conflicts and asymmetric information. For project selection, overconfidence or excess optimism plays an important role, as on investment misjudgment and on overestimation of future cash flows, especially when combined with optimistic future performance expectations. Additionally, behavioral signaling is added (Baker and Wurgler, 2011), taking to a model where loss averse managers underpay dividends in present moment in order to increase future payment effects, which offers an alternative to rational value destruction hypothesis for traditional managers signaling models.

According to De Bondt and others (2008), BF is grounded in three sets. Sentiments, which are the elements that lead to errors in judgment, or mistakes, occur at the individual level, "but may present themselves to the market level" (De Bondt and others, 2008, p. 3). However, it is foreseeable because they are systematic. Among these it highlights: Anchoring (taking into account only pieces of information that for some reason is valued the most), representativeness, availability (on exaggerating the value of available information), over confidence (undervaluing risks involved and leading to the phenomenon of excessive investor transactions, among other situations). Behavioral biases, which contradict Utility Theory in decisions under risk. It is included in this topic loss aversion, mental accounting, regret aversion and self-control. Finally, limits to arbitrage. In efficient markets the role of arbitrage is to eliminate deviations in prices from not so rational investors and return asset prices to a position that better reflect their real value. In BF the weight of non-rational investors (noise traders), the transaction costs and limits of risk tolerance by rational investors could lead to a persistence of prices in disequilibrium, causing abnormal returns and also an informational inefficiency of the market.

De Bondt and others (2008) present a classification of BF's contributions into three wide groups of discoveries. What heuristics (or rules of thumb) and behavioral biases influence into financial decisions and how it occurs. In recent production, it adds studies on the impact of emotions and social behaviors, such as herd effect. A second group refers to the dynamics of financial markets, earnings and abnormal behavior of rational agents and noise traders. A third refers to errors of form and its influence on the decisions (De Bondt and others, 2008). To Barberis (2012), BF is built over prospect theory, and main themes are on explaining abnormal asset returns, aggregated stock market and trading.

New models are yet to be proven and consolidated, but theory is being developed. As an example, Koszegi and Rabin (2006) using Prospect Theory based model, state that utility is extracted from a relative point of departures from gains and losses, but not necessarily in disregard to traditional consumption level measures. Barberis and Huang (2008) present a model based in Prospect Theory in which skewness change asset pricing through changing investors' expectations in possible gains.

2.2.1. Towards a compromise solution

In 2010 Shefrin presents the behavioralizing finance concept (Shefrin, 2010, p.3). Though not widely discussed in finance literature, the text presents the merit of pointing a possible future for the theory. It would be the way for the construction of a new paradigm in finance, hybrid between the two theoretical constructs, BF and MF. It encompasses five key areas of finance, with academic work already undertaken and ongoing discussion, providing thus BF with a more complete pack of concepts to complete empirical evidence.

2.2.2. Beliefs and Preferences

Human beings do not act according to Utility Theory. Its actions are mediated by the systematic errors that alter the outcome expected by rational MF. The behavioral biases affect the actual parameters of the decisions, overweighting extreme gains and losses, which would explain the biases of optimism and pessimism. Presence of heuristics and mental accounting, often used unconsciously, to make judgments, weight options and probabilities. The perception of variability (volatility) also helped explain some phenomena, such as overconfidence. The preferences are also governed by how it builds the vision of utility. The authors propose the understanding from the Prospect Theory (Kahneman and Tversky, 1979), or its cumulative version (Kahneman and Tversky, 1992), describing behaviors consistent with the biases those cited above, or, alternatively, with the SP / A Theory. Lopez proposes that behavior towards risk would be associated with a function that measures the security (described as the degree of fear that certain negative event occurs) or potential (positive event), plus an aspiration variable (Shefrin, 2010, p.55-57). This mediates the two situations and would be a third possible source of utility. Preferences also encompass Neuroeconomics, or how understanding the brain work helps to understand the self and regret that affect decisions. These points build the initial ground from which the hybridization is done in the subsequent categories.

2.2.3. Portfolio Selection

The limits to rationality also lead to new parameters, through the employment of Prospect Theory, and not of Utility Theory, leading to optimal points attainable that may not be optimized if compared with rational expectations. The disposition effect; the effect of self-control in reducing the biases' limits to rationality; biased diversification, that does not lead to risk reduction; excess transactions by investors; the implications of the options and derivatives markets; and bias for dividend paying stocks would be topics of study in this field. These would assist in understanding the structuring of financial products and to develop asset portfolios. The challenge would be to build a market theory comprising the main biases that lead to non rational attitudes and decisions, which should be added to the rational ones. Shiller (2003), Barberis and Thaler (2003), along with De Bondt and others (2008) and Shefrin (2010), form the basis of the theoretical framework used in this block.

2.2.4. Asset Pricing

It comes to analyze how a behavioral approach would affect asset pricing. Its focus is on understanding specific anomalies such as overreaction and underreaction. Shefrin (2010) proposes to focus on an unifying vision that encompasses pricing preferences (which would affect the rational assessment of future cash flows and the past ones, leading to systematic errors by the investor) and relevant behavioral investors biases (which in turn deviates from traditional, rational evaluation, of risk and return) leading to a new understanding about concepts such as variability, risk and return, among others.

2.2.5. Corporate Finance

It is the "intersection between Finance and Management" (Shefrin, 2010, p. 112). It includes the influence of behavioral biases in managers' decisions and its suboptimal effects. Among the research themes are debt; capital structure; inefficient project pricing; the over-optimism bias in expectations of future cash flows and deviations resulting performance; and the impact of real versus expected, overstated, assessment on firm value. It is the effect of overconfidence in managerial decisions. Resulting from these are the non-payment of dividends to shareholders (generating a potential agency conflict from behavioral background), effects in shareholders premium distributions models by a bias of risk taken by the managers inadvertently, among other effects.

The social networks of corporate actors may also potentially affect governance and firm performance, reinforcing biases and biased decision behavior. It also studies the characteristics of the psychology of entrepreneurship. The leading reference authors are Baker, Ruback and Wuergler (2007), cited by Shefrin (2010).

2.2.6. Financial markets regulation

How regulation can affect perceptions, expectations and behaviors that drive pricing decisions, portfolio selection, debt and project selection? It covers banks, cards, rating agencies, derivatives, among others. The rules of company reporting, how to deal with conflicts of interest and the impact of financial crises (Shefrin, 2010). Informational efficiency and “fairness” (Shefrin, 2010, p.131), or equal conditions among participants in the regulations, should be balanced with transparency of information. The very rules of the market would have a psychological bias, for example, when they arise as the reaction to a recent extreme event that could be mitigated by regulation, such as Enron / WorldComm and the emergence of the Sarbanes-Oxley or SOX.

2.2.7. “Survey of Surveys”

It would be the synthesis of theory, highlighting key works on BF. The approach serves as a reflection and positioning on the evolution of knowledge in the subject. Thus, enhancing the transitional character of this process, that would create the environment to promote debate and build a new consensus, challenging the strengths and weaknesses of both sides, BF and MF.

2.3. BF Definition

There is no unified definition for BF, but a summary of main concepts is presented on Chart 1. To Shefrin (2010), the goal is to introduce the effect of sentiment on asset pricing, which distort risk perception and equilibrium. Shefrin (2010) proposes as a starting point for the concept the SDF function (stochastic discount factor) used, for example, in CAPM.

2.4. Chaos Theory and other approaches

BF is not the only challenge to MF. Other theoretical approaches are also being considered as potential new models in finance, encompassing the complexity and chaos theories, from the questioning of the hard sciences to the world of certainties, replacing it by the possible futures within a finite set of probabilities. Some authors call this new field of Chaos Theory in Finance (Cardoso and Olivo, 2005). The application of concepts taken from physics and applied in the study of capital market phenomena generates the Econophysics (Mantegna and Stanley, 1998), using probabilistic models to capture randomness and predictability of systems interactions in finance.

3. Methodology

The aim is to study the academic production on BF through a sample of significant journals, proceeding papers and publications from 2001 to 2012. Thomson Scientific Web of Sciences® database was used as a representative universe of global academic production. Knowledge areas comprised Economics, Business Finance, Business and Management, all under Business Economics umbrella. Search was conducted using keywords based on Chart 1, though restraining the resulting sample to articles conforming to that BF definition. The sample was divided into two equal halves sub samples (S1 and S2), to evaluate approaches and production changes over time.

For (S1) and (S2) 50 mostly cited articles were selected on each one’s publication period, considering a twelve years citation period for the first and six year for the last one, to analyze themes presented in the BF as a process view and its findings. The procedure is a quantitative and qualitative analysis of their content. The article’s contents were analyzed against two cleavages whose concepts were described in the theoretical part of this study, the contribution that is brought, as classified by De Bondt and others (2008), named as findings or discoveries, and its insertion in one of the five aspects of the behavioralization in finance, proposed by Shefrin (2010). It is emphasized that this classification aims to assess whether the focus of that relates to one of the categories of process, and supports fully, partially or not corroborates the assumptions of this theory. As a qualitative analysis, we sought a synthesis, always reductive. Thus, the analysis aimed to identify the theme that stands out in each article, and then rank it as their main contribution. Objective is to get comprehensive schemes indicating how the whole set of articles researched present facing BF and how they are distributed by the criteria examined.

Lotka coefficient was used in a pioneering study by Chung and Cox (1990) for the American production in finance. The Lotka coefficient considers that there is a constant c ratio between authors quantity (n) n which publish articles, given by equation described on Chart 2.

This c Lotka coefficient would equal 2. The distribution of authors published an article to be 60.79%, two articles, 15.20% of the total, the three items, 6.80%, and so forth. Chung and Cox (1990) find values for the first sample of American literature in finance. Coefficients above 2, refers to lower productivity than expected. With the logarithmic version of this equation is possible by regression to obtain the value of c observed in this sample and compare it with the expected value. For values above 2, as Leal, and Bortolon Almeida (2013), it means that productivity would be lower than expected by Lotka parameter.

4. Results

Applying the defined criteria we found a sample of 687 articles on BF, 157 published from 2001 to 2002 (forming then S1) and 530 from 2007 to 2012 (S2). Distribution over time presented on Table 1 shows that for the same search criteria, (S2) is 3.35 times larger than (S1). Production tended to be crescent but is declining since 2011.

Articles are predominant during total period, as presented on Table 2. Determine country relevance demands choosing among concepts. In this study it is considered that author's nationality on researched database. Since co-authorship is relevant, it will result in an over than 100% participation, but presents de advantage of clearly show the country footprint on articles.

BF started as a US based move in the decade of 1970. It is still American led trough entire period, both (S1) and (S2), but other countries participation is growing in the second part (S2), especially China and some EU countries, as shown in Table 3, breaking original frontiers for BF.

BF authorship is spreading over countries, growing 50%, from 26 to 39 countries over period, and ending 2012 with authorships from 50 different countries over total period. Despite this, US authors are still predominant both in (S1) and (S2). On a non parametric Wilcoxon test to compare the samples, the obtained p value is 0,1236, confirming that both are similar on their distribution.

Journals publishing BF articles are disperse, as presented in Table 4. Ten major publishing titles for sample resemble (S2), due to its comparative weight. First period (S1) lacks Journal of Behavioral Finance, one major source, though jeopardizing comparison.

The 50 mostly cited articles on each sub sample represent together, 14,5% of total articles and 72% total citations over time.

When selected the 50 mostly cited articles for each publication period and analyzing period sample from the BF as process view (Table 5) , it shows some changes trough time. In the first part of the decade (S1), portfolio management, asset prices and beliefs and preferences were the main themes addressed, coherent with previous decade tradition, and less on corporate finance and market regulation. Only one surveys was found, probably due to a significant book production available on time, some of them previously mentioned. In the second part of the decade (S2) beliefs and preferences became more relevant in the most cited sub sample, extending empirical work on BF fundamentals and opening new fields, as effects behavioral biases in evaluating impacts of climate change in businesses (Brekke and Johansson-Stenman, 2008). Portfolio management is the second largest theme, and Corporate finance becomes the third, indicating crescent interest on managers decisions in this matter, such as overconfidence and misvaluation on cash flows, project selection, dividend payment and stocks issuance (repurchases). Questions derived from irrational (rational) managers and rational (irrational) investors are also addressed.

Defining a single major contribution in each article is certainly restrictive, and certainly biased. We reinforce that criteria used is based on interpreting what each paper bring to build BF as a new paradigm in finance. Table 6 present data from major findings on the mostly cited articles for (S1) and (S2). On this view, Behavior biases, based on cognition or in sentiment, grow over time, from (S1) to (S2) as major contribution. (S1) started just after the Internet bubble, and market bubbles are more studied during this first half of the period, both on theoretically and empirically. In contrast, Framing is a potential field to future research, with only four articles, 3 of them on (S1).

Citation is evaluated over entire period, 2001 to 2012. Ten most cited articles are presented on Table 7. Surprisingly one of them is a survey from 2009 (S2). From 2001 to 2006 and from 2007 to 2010 publishing experienced relevant growth, then a reduction from 2010 and from 2012 citations reduce, similar to 2006 to 2007. From 2001 to 2011 and 2012 annual citations grew from 11 to 232 and 205, indicating its relevance as reference to new researches, as presented on Graphic 3.

On considering Lotka coefficient to evaluate expected productivity both halves and consequently total sample do not reach expected author productivity. Lotka's c experimentally obtained for (S1), (S2) and total are statistically significantly above 2, as shown in Table 9. It can be at least partially explained for the fact that it is not considered in this study all articles published per author, but only BF related ones.

5. Conclusion

Though restricted by conceptual (BF definition, process development and findings), this research tracks some trends in BF developments in the period of study. Production is on evolving trend until 2011, with reductions in citations and publishing in 2012 and 2011, respectively. This can indicate simply that interest on BF is reducing or that original concept as formulated for sampling is changing and does not account any more for defining what is BF.

Developing a conceptual frame that could be shared among researchers as a common ground is typical of consolidated scientific approaches, which is not valid for BF. Last decade experienced significant growth in consolidating findings on BF Fundamentals, Behavioral Biases and limits to arbitrage, included in the broader Market Dynamics.

Authorship, Organizations and Journals and dispersed on the sample, especially on the second part of it. US researchers are the BF's most contributors as a group and as individuals, but they are not alone anymore. For the second part of the decade is possible to identify China's relevant role, as much as EU (especially UK, Germany and Netherlands). The dispersion on production verified in other countries around the world is another indicative of how pervasive BF is becoming. The most addressed issues are investor's Beliefs and Preferences, basic assumptions for BF and as stated on this text, a work in progress. Articles on Portfolio Selection, Asset Pricing and Corporate Finance are also covered in a lesser amount, the last one crescent in publications. Studies on behavioral aspects of financial regulation are less present and are another field to develop. For the contribution by relevant findings in BF, studies on biases are prevailing, covering cognition and new approaches as the effects of emotions, on financial decisions. There are also studies on market dynamics and speculative bubbles, and on a lower occurrence, the effect of the process shape on the decisions taken, or framing effects.

A research agenda should be settled based on some conclusions taken from the sample studied here. In the scientific production side, evaluate if cultural aspects, translated by different countries and markets react equally or not to the same beliefs and preferences on each field, either Asset pricing, Portfolio Management or others. By now sentiment, or mood, were mediators for behavior and biases, and a few research studied cultural aspects. In a multi country business and decision environment it should be of value to understand. Second, in the mood of a developing behavior corporate finance, study interactions of both rational and irrational managers simultaneously, as in stock markets. Third, if behavior is biased and rationality is bounded, how possible is to improve decisions, or judgment in finance, since BF unveils its effects on practitioners and academics? In special, as BF is still for many of them not as part of formal education in finance, measure how pervasive is BF teaching in each country and if it relates with other variables such as financial market relevance on its GDP and academic production. Fourth, deepen on Framing, as a less studied but not less relevant cognitive aspect, especially in providing its impact on influencing or transforming decisions in finance. Especially studies on financial products and services could be a prolific field, since they present a clearly defined element and its components to provoke investor (or manager) behavior.

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Charts and Tables

Chart 1 - BF Concept

BF = Finance + Psychology (multidisciplinary)
Questions to respond (challenging MF): Anomalies, bounded rationality, irrational markets / agents, bubbles, decision making
Fundamentals = Limits to Arbitrage + Psychology: Prospect Theory, Cumulative Prospect Theory, SP/ A theory, Heuristics (representativeness, anchoring, availability) Biases and Preferences (loss aversion, myopic loss aversion, overconfidence), Sentiment, Framing
Actors: Investors (individual and institutional), managers, regulating agencies, government
(Some) Concepts: Disposition, Endowment, Momentum, Naive diversification, Overreaction, Under reaction, Sentiment investment, Comovement, Adaptive market hypothesis, Non fully rational markets, managers and investors, feedback
Fields of application in Finance (Shefrin, 2010): Beliefs and preferences (assumptions), Asset pricing, Portfolio Management, Corporate Finance, Market Regulation
Contributions (De Bondt and others, 2008): Beliefs (cognitive and sentiment), Framing effects on decision, Market dynamics and bubbles

Source: prepared by the authors

Chart 2 – Lotka Coefficient

Lotka coefficient: $an = a^1/n^c$

Where: an = author number publishing n articles, a1 = number of authors publishing 1 article, n = number of published articles, c = Lotka coefficient

Table 1 - Sample publication over time 2001-2012

	Year	Articles Published	% Total
S1	2001	20	2,91%
	2002	20	2,91%
	2003	21	3,06%
	2004	35	5,09%
	2005	30	4,37%
	2006	31	4,51%
S2	2007	63	9,17%
	2008	75	10,92%
	2009	84	12,23%
	2010	112	16,30%
	2011	99	14,41%
	2012	97	14,12%
Total	S1	157	22,85%
	S2	530	77,15%
	S1+S2	687	100,00%

(S1): Sample 1 of published articles, from years 2001 to 2006, (S2): Sample 2 of published articles, from years 2007 to 2012. Source: prepared by the authors

Table 2 - Document Type

Publication	S1		S2		Total	
	Publications	%	Publications	%	Publications	%
Articles *	136	76,40%	466	84,27%	602	82,35%
Proceedings paper *	27	15,17%	52	9,40%	79	10,81%
Editorial	9	5,06%	8	1,45%	17	2,33%
Book review	3	1,69%	3	0,54%	6	0,82%
Review	3	1,69%	15	2,71%	18	2,46%
Book chapter	0	0,00%	9	1,63%	9	1,23%
Total per type *	178	100,00%	553	100,00%	731	100,00%

(*) Proceedings papers turned into articles are double counted and changed global document type base, but do not alter global figures. (S1): Sample 1 of published articles, from years 2001 to 2006, (S2): Sample 2 of published articles, from years 2007 to 2012. Source: prepared by the authors

Table 3 – Countries and participation on publication

Countries	2001-2006 (S1)		2007-2012 (S2)		(S1) + (S2)	
	Records	% of 157	Records	% of 530	Records	% of 687
USA	99	63,57	207	39,06	306	44,54
ENGLAND	17	10,83	42	7,93	62	9,03
P.R. CHINA	9	5,73	52	9,81	61	8,88
NETHERLANDS	5	3,19	42	7,93	47	6,84
GERMANY	10	6,37	36	6,79	46	6,70
CANADA	4	2,55	24	4,53	28	4,08
TAIWAN	2	1,27	23	4,34	25	3,64
FRANCE	3	1,91	21	3,96	24	3,49
ISRAEL	5	3,19	20	3,77	24	3,49
AUSTRALIA	3	1,91	19	3,59	23	3,35
Subtotal	157	100,51	486	91,70	646	94,03
Others	24	8,41	189	25,66	210	18,78
Total	181		675		856	
Countries in sample	26		49		50	

(*) Countries is based on organization nationality, then multiple nationalities lead to multiple count

(**) For (S1) 5 other countries and for (S2), 25. Source: prepared by the authors

Table 4 – Journals

Source Titles	Total		(S1)		(S2)	
	Publ.*	%	Publ.*	%	Publ.*	%
Journal of Behavioral Finance	48	7,0%	-	-	48	9,1%
Journal of Banking Finance	45	6,6%	6	3,8%	39	7,4%
Journal of Economic Behavior Organization	39	5,7%	6	3,8%	33	6,2%
Journal of Financial Economics	28	4,1%	12	7,6%	16	3,0%
Journal of Finance	25	3,6%	11	7,0%	14	2,6%
Journal of Economic Dynamics Control	23	3,3%	7	4,5%	16	3,0%
Review of Financial Studies	21	3,1%	10	6,4%	11	2,1%
Journal of Financial And Quantitative Analysis	12	1,7%	-	-	11	2,1%
European Financial Management	11	1,6%	2	1,3%	9	1,7%
Journal of Business Finance Accounting	11	1,6%	2	1,3%	9	1,7%
Other Journals	424	1,6%	101	64,3%	324	61,1%
Total Journals	45		79		79	
Total Sample	687	100,0%	157	100,0%	530	100,0%

(*) Publ. = Publications. Source: prepared by the authors

Table 5 – BF as a Process

BF as Process (50 most cited articles S1 and S2)	2001-06 (S2)			2007-12 (S1)			2001-12 (S1 + S2)		
	Articles	Cited	%	Articles	Cited	%	Articles	Cited	%
Beliefs and preferences	11	514	15,0	15	477	31,7	26	936	18,9
Portfolio selection	16	1.206	35,1	12	335	22,2	28	1.467	29,6
Asset pricing	14	1.029	30,0	9	249	16,5	23	1.278	25,8
Corporate finance	6	547	15,9	11	288	19,1	17	835	16,9
Market regulation	2	109	3,2%	0	-	0,0	2	109	2,2
Survey synthesis	1	30	0,9	3	158	10,5	4	317	6,4
Total	50	3.435	100,0	50	1.507	100,0	100	4.942	100,0
Total Sample	157	4.330	-	530	2.494	-	687	6.824	-

Source: prepared by the authors

Table 6 – BF's Main findings

BF Main Findings (50 most cited articles S1 and S2)	2001-06 (S2)			2007-12 (S1)			2001-12 (S1 + S2)		
	Articles	Cited	%	Articles	Cited	%	Articles	Cited	%
Behavioral biases - cognition and sentiment	30	270	68,3	37	1.002	67,0	67	3.143	65,1
Market dynamics and speculative bubbles	17	918	27,6	9	283	18,9	26	1.211	25,1
Decision process shaping judgement	3	138	4,1	1	54	3,6	4	192	4,0
Survey of Surveys	0	-	0,0	3	156	10,4	3	285	5,9
Total	50	3.326	100,0	50	1.495	100,0	100	4.831	100,0
Total Sample	157	4.330	-	530	2.494	-	687	6.824	-

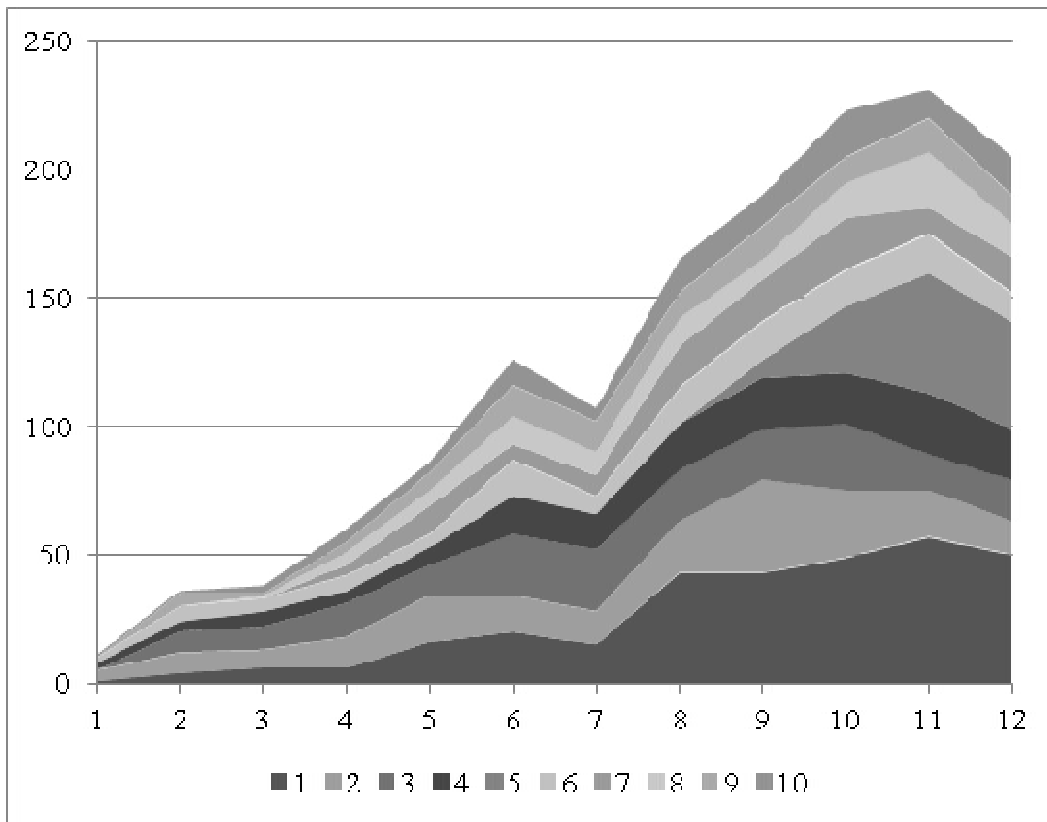
Source: prepared by the authors

Table 7 – Citations 2001-2012

Article Number	Title	Author(s)	Publ Year	Times cited	Avg*	BF as Process**	Main Finding***
1	Boys will be boys: Gender, overconfidence, and common stock investment	Barber, BM, Odean, T	2001	327	25,2	PM	BB
2	Prospect theory and asset prices	Barberis, N, Huang, M, Santos, T	2001	201	15,5	AP	BB
3	Why don't issuers get upset about leaving money on the table in IPOs?	Loughran, T, Ritter, JR	2002	188	15,7	CF	BB
4	Learning to be overconfident	Gervais, S, Odean, T	2001	162	12,5	AP	BB
5	Psychology and Economics: Evidence from the Field	DellaVigna, Stefano	2009	129	25,8	BP	BB
6	Rationality and analysts' forecast bias	Lim, T	2001	120	9,2	CF	BB
7	Style investing	Barberis, N, Shleifer, A	2003	109	9,9	PM	BB
8	From efficient markets theory to behavioral finance	Shiller, RJ	2003	103	9,4	PM	MB
9	Overconfidence, arbitrage, and equilibrium asset pricing	Daniel, KD, Hirshleifer, D, Subrahmanyam, A	2001	103	7,9	AP	MB
10	Mental accounting, loss aversion, and individual stock returns	Barberis, N, Huang, M	2001	101	7,8	CF	BB
-	(S1)	2001 – 2006		1.507	68,7	-	-
-	(S2)	2007 – 2012		3.435	30,1	-	-
-	Total sample	2001 – 2012		6.824	9,9	-	-

(*) Average, (**) Acronyms: AP: Asset Pricing, CF: Corporate Finance, PM: Portfolio Management, (***) Acronyms: BB: Behaviors and biases, MB: Market dynamics and bubbles. Source: prepared by the authors

Graphic 3 – 10 Most Cited Articles 2001-2012 (figures as on Table 7)



Numbers presented on Graphic 3 refer to Article Number displayed on Table 7. Source: prepared by the authors

Table 9 – Sample Productivity and Lotka coefficient

Articles per author	9	8	7	6	5	4	3	2	1	Total Authors	C*	R2*	Chi-square*
(S1)	0	0	0	0	0	4	3	25	227	259	3,34	0,99	0,978
%	-	-	-	-	-	0,02	0,01	0,10	0,88	-	-	-	-
(S2)	0	0	0	1	1	7	15	91	867	982	3,68	0,99	0,998
%	-	-	-	0,001	0,001	0,007	0,015	0,093	0,883	-	-	-	-
(S1) + (S2)	1	1	0	5	3	10	24	127	1103	1274	3,32	0,99	0,999
%	0,001	0,001	-	0,004	0,002	0,008	0,019	0,100	0,866	-	-	-	-
Lotka (%)	0,8	1,7	1,2	1,0	0,8	3,8	6,75	15,2	60,79	-	-	-	-

(*) all calculated Lotka C coefficient, R2 and Chi-square tests obtained form samples were significant at 5%.

Source: prepared by the authors