The Efficient Markets Hypothesis and Behavioral Finance – Discussions Persist

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Dedication

In this pandemic period, challenges were overcome and objectives were achieved.

First of all, I would like to thank God, without Him none of this could have been done.

Secondly, my beloved and loving wife Jessica Amanda, who has always provided me with the necessary support during this period of uncertainty.

Thirdly, my advisor in this paper, doctor Devin Rafferty.

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Table of Contents

Introduction

In the context of scientific research in finance and capital markets, the topic of market efficiency and the issue of investor behavior are of central importance.

The efficient markets hypothesis (EMH), in the sense of FAMA (1970), implies the fact that agents use all relevant information in asset negotiations, so that their prices fully reflect the economic fundamentals and other information that is relevant to them. In a market considered efficient in this sense, there will be a better allocation of investor resources to capital assets; negotiated prices will be considered fair - without the possibility of so-called abnormal gains or losses; the role of the regulatory state and also of investment fund managers will have different dimensions, in addition to other inherent characteristics.

Conversely, in an inefficient situation, price behavior will be differentiated, with the possibility of assets being poorly priced, in a way incompatible with the current information set. This fact, in turn, will have its own consequences fundamentally different from those prescribed by the EMH, especially in relation to the existence of abnormal gains for some investors in exchange for excessive losses for others.

The practical consequences of whether the EMH is pertinent in a given market are of great relevance. In countries characterized by considerable volatility, there is often a concern with strong price movements, which, in certain situations, have led to capital flight and intense reserve consumption, causing serious economic repercussions. In this context, it would be extremely important, for example, to understand these movements, assessing whether they are supported by rationality and what would be the conduct prescribed to national economic authorities.

In this way, the theme of market efficiency consists of a research object that has been extensively worked on in finance. Since the beginning of the seventies, when

FAMA (1970) published " Efficient Capital Markets: a review of theory and empirical work ", one of the greatest references in the area, several studies sought to investigate whether the EMH found support in specific capital markets in different parts of the world. Test methodologies have been developed and improved while an increasing number of data has been the subject of study. However, the evidence from the full range of research has not yet come to definitive conclusions. While some of the studies corroborate this hypothesis, failing to identify anomalies, others presented evidence to the contrary, concluding by rejecting the aforementioned market efficiency.

In parallel with the realization of these studies, a new line of thought called behavioral finance was developed. The authors of this branch of research are dedicated to investigating whether factors inherent to human behavior interfere in the price movements of traded assets. It is a new approach for understanding market movements and investors' attitudes, having a wide field of analysis and whose conclusions have brought relevant repercussions to scientific research in economics and finance. Specifically in relation to the latter, it is worth noting that, many times when presenting evidence about the relevance of these behavioral variables, they come to defend that the hypothesis of efficiency does not adhere to the reality of the market.

Although academic research has existed for a long time, from the seventies and eighties, these researches started to have greater visibility in the financial literature. It is worth mentioning that currently there is a strong opposition between the thoughts related to EMH against behavioral researchers. On the one hand, Eugene Fama and other EMH theorists, and on the other hand, several authors, such as Thaler, De Bondt, Statman, Shiller with opposite arguments. Specifically dealing with the dispute between FAMA and Thaler, The Wall Street Journal, in the report " As Two Economists Debate Markets, the Tide Shifts ", published in October 2004, exposes: " Neither shies from

tossing about highbrow insults. Mr. Fama says behavioral economists like Mr. Thaler " has not really established anything " in more than twenty years of research. Mr. Thaler says Mr. Fama " is the only guy on earth who does not think there was a bubble in Nasdaq in 2000. "

This debate shows how the environment is and the intensity of the debate on the matter, which - it can be said - presents strong controversies in today's finance.

The title of an important article in the field reflects this situation " Behavioral Finance: Past Battles and Future Engagements ", by Meir Statman, published in 1999, also emphasizes the battle waged in this field of research.

This reality can also be verified, making a brief analysis of the recent publications of some of the main and most widely read academic journals in finance. The Journal of Finance, for example, presented a considerable volume of articles related to the topics of market efficiency and behavioral finance.

In concrete terms, this study was specifically dedicated to showing the strengths and weaknesses of these two economic thoughts. For that, established methods and literature review were used to support the points presented.

As a contribution, this research will present empirical evidence on an important issue for finance, considered controversial, indefinite and which requires further clarification.

1 - The efficient markets hypothesis, FAMA (1970).

In the theme market efficiency, FAMA (1970), with his work ‘’Efficient Capital Markets: a review of theory and empirical work’’, was one of the main reference works.

However, we must not forget to mention that this problem is earlier. When it comes to economics, other authors have already used the analogous term market imperfections. Markowitz (1952), for example, came to use this expression: ‘’If we ignore market imperfections the foregoing rule never implies that there is a diversified portfolio which is preferable to all non-diversified portfolios’’.

FAMA (1970) reviews the development of the theoretical structure of the theme, citing the work of Louis Bachelier (1900), ‘’Théorie de la Spéculation’’, relating to tests of the random walk hypothesis: ‘’the first statement and test of random walk model was that of Bachelier in 1900’’. ‘’After Bachelier, research on the behavior of security prices lagged until the coming of the computer’’.

After Bachelier, some decades passed before the emergence of new studies on this specific problem, we can mention authors such as Kendall (1953), Working (1934), Roberts (1959), Osborne (1959), Alexander (1961), Cootner (1964), in addition to others. FAMA (1970) explains that in none of these works is an effort perceived to interpret economic explanations for the observed phenomena in more depth. According to this author, this is only seen initially from works such as those by Mandelbrot (1966) and Samuelson (1965).

The study by Mandelbrot (1966), for example, consists of a theoretical essay whose introductory words mention the focus of the works previously carried out by the financial literature and its specific proposal: In most part work (...) the emphasis has been on the statistical behavior of price series themselves. The present paper will attempt to relate the behavior of prices to more fundamental economic ‘’triggering’’

quantities. This effort will constitute a simplified but detailed application of certain ideas current in economic theory concerning the roles of anticipation and of expected utility.

An interesting point that needs to be noted is that, among the thanks for this transcribed work, Mandelbrot (1966) even cited the name of Eugene Fama, who was already dedicated to studies on the behavior of the market. This article, in fact, is being written in order to discuss EMH from the economic point of view of price behavior, using, including recognized models such as serial correlation tests. However, in this article, not all available models will be used to prove the efficiency of EMH.

In the mid-1960s, another work worth noting is " The Behavior of Stock-Market Prices ", published by Fama in 1965. In this article, the hypothesis of efficiency in its weak form is analyzed, focusing on in the following question: " To what extent can the past history of a common stock's price be used to make meaningful predictions concerning the future price of the stock? ". It is an extensive article, whose focus is fundamentally related to the statistical analysis of price behavior, investigating especially the independence of successive changes in prices and the distribution of these changes.

It is, however, with his best-known article from 1970, that Fama starts to present the theme more robustly and with the systematization with which it becomes known and more worked on.

It starts from the fundamental concept: " A market in which prices always 'fully reflect' available information is called 'efficient' (FAMA, 1970), that is, the question of whether the market is efficient or not depends essentially on how much prices incorporate the information that is relevant to you.

In economic terms, this hypothesis is important. Depending on whether a market is efficient or not, serious repercussions start to exist in the economy: An efficient capital market is an important component of a capitalist system. In such a system, the ideal is a market where prices are accurate signals for capital allocation. That is, when firms issue securities to finance their activities, they can expect to get ‘’fair’’ prices, and when investors choose among the securities that represent ownership of firms’ activities, they can do so under the assumption that they are paying ‘’fair’’ prices. In short, if the capital market is to function smoothly in allocating resources, prices of securities must be good indicators of value. (FAMA, 1976).

Thus, in a market classified as inefficient, there will be no guarantee of a better allocation. The concept of fair price will not be present.

The idea of fair price starts from that it fully reflects the information of the present moment and, therefore, represents the most appropriate value for the moment. This hypothesis even provides an idea of security for economic agents, since, in the opposite direction - of inefficiency being present - the possibility of assets being traded at prices incompatible with the information is inherent, and therefore unfair - with abnormal gain for one of the parties in return for an abnormal loss for the other investor.

Fama (1976) presents a formalization for the EMH, as described below:

- set of all relevant information in t-1.
- set of all the information that the market uses to determine the price of the asset in t-1.
- asset price J at t-1, with J = 1,2, ..., N, where N is the number of market assets.
- the cumulative probability function for asset prices, calculated by the market at t-1, based on information that the market uses to determine the price of the asset in t-1.

- the function of the true cumulative probability for asset prices at t + μ(μ>0), in which all relevant information at t-1 is implicit.

Regarding this formalization, it is easy to observe that past information is not lost and remains available. This is related to the weak form of efficiency, in which information on the past behavior of prices is already incorporated into the quotation of assets.

Fama (1970) also analyzes the issue of market conditions related to efficiency. It mentions three conditions such that, if present, will imply efficiency. They are: absence of transaction costs, all information is available to market participants; and everyone agrees on the implications of current information for the prices and distributions of future asset prices. In his words: For example, consider a market in which (i) there are no transactions costs in trading securities, (ii) all available information is costlessly available to all market participants, and (iii) all agree on the implications of current information for the current price and distributions of future prices of each security. In such a market, the current price of a security obviously ‘’ fully reflects ‘’ all available information.

However, on the subject, the author provides a better explanation by stating that these conditions, despite being sufficient for market efficiency, are not strictly necessary. That is, even if they are not necessarily present, it is still possible to glimpse this market efficiency: ‘’Fortunately, these conditions are sufficient for market efficiency, but not necessary’’ (FAMA, 1970).

When analyzing this theme, a correct definition of this efficiency hypothesis is necessary. Despite implying that prices are fair and that it is not feasible to dedicate efforts to identify undervalued assets or to seek to develop more profitable strategies,

the hypothesis in question does not imply that there will be no investors with higher performance than others. This, in fact, can occur. For there to be efficiency, it is only required that these best or worst performances are due to random and unpredictable factors, that is, there will always be the probability that an asset, based on new information disclosed, will present greater or worse returns in relation to the originally envisaged.

Given the different ways of testing this hypothesis, the classic forms of efficiency have been systematized: weak, semi-strong and strong. These are concepts that are among the most widespread and used. The so-called weak form of efficiency is based on the assumption that asset prices reflect all possible information extracted from past price behavior. In the semi-strong form, current prices incorporate not only information related to their historical series, but also any and all publicly available information, such as financial statements, earnings announcements, disclosed economic information, etc. Finally, the broadest of all is the strong form. In it, in addition to all public information, prices fully and at all times incorporate inside information, even if they are only owned by a few investors.

FAMA (1970) exposes: The initial studies were concerned with what we call *weak form* tests in which the information subset of interest is just past price (or return) histories. Most of the results here come from the random walk literature. When extensive tests seemed to support the efficiency hypothesis at this level, attention was turned to *semi-strong form* tests in which the concern is the speed of price adjustment to other obviously publicly available information (e.g., announcements of stock splits, annual reports, new security issues, etc.). Finally, *strong form* tests in which the concern is whether any investor or groups (e.g., managements of mutual funds) have

monopolistic access to any information relevant for the formation of prices have recently appeared, (p.388).

On the subject, it is worth noting the observation that FAMA (1991) came, in a way, to propose a certain change in this classification. Instead of the weak form tests, suggest using the categorization " return predictability tests ", which includes the predictive power of return patterns and also the predictability of returns from information related to variables such as dividends and rates interest. For tests in the semi-strong form, only a change in the name is proposed, which would become " event studies " and, for the strong form, the expression " private information tests " would be used. (FAMA, 1991).

However, the financial literature did not fail to use the traditional classification as weak, semi-strong and strong.

1.1 - FAMA (1991).

Twenty-one years after the main systematizing work of the efficiency market hypothesis, FAMA (1991) publishes yet another article of great reference: " Efficient Capital Markets: II ", which conducts a review of some of the most relevant research on the subject. In this review, the author classifies the main lines of tests and studies on the subject: (I) predictability of returns, (II) predictability of cross-sectional returns: based on CAPM or multifactorial models, (III) event studies and (IV) insider trading.

In the first group, there are studies that seek to identify whether it is possible to predict the behavior of stock prices, based on past return patterns. In this category of studies, some use price histories in short intervals and others are based on long periods, showing returns in one direction, in the future, passing to a reversal pattern.

In the second working group, there are authors who study the behavior of prices in relation to risk variables, based on models such as CAPM or other multi-factorials.

There are also study events, whose objective is to analyze how prices adjust to new information, and, finally, tests of privileged information, that is, if there are indications that prices do not fully reflect the information held by certain groups of investors.

The conclusions of FAMA (1991) are divided according to the types of tests carried out by the researched financial literature. First, in relation to event studies, the author presents as the main conclusion the fact that, in general, research shows that stock prices adjust quickly to new information, corroborating the hypothesis of efficiency.

The cleanest evidence on market-efficiency comes from event studies, especially event studies on daily returns. There is a large event-study literature on issues in corporate finance. The results indicate that on average stock prices adjust quickly to information about investment decisions, dividend changes, changes in capital structure, and corporate-control transactions. This evidence tilts me towards the conclusion that prices adjust efficiently to firm-specific information. (FAMA, 1991).

After these considerations about event studies, he starts to deal with tests related to inside information. Initially, he explains that, unlike event studies, these tests involve the analysis of abnormal returns at long-term intervals, and are therefore subject to the joint-hypothesis problem: Unlike event studies, however, evaluating the access of investment managers to private information involves measuring abnormal returns over long periods. The tests thus run head-on into the joint-hypothesis problem: measured abnormal returns can result from market inefficiency, a bad model of market equilibrium, or problem in the way the model is implemented. (FAMA, 1991).

Based on this caveat, he mentions that articles such as Ippolito's (1989), which used the Sharpe-Lintner factor model (CAPM), presented evidence of abnormal positive

returns for fund managers, whose positions allowed them access to insider information. On the other hand, it also mentions articles such as Elton, Gruber, Das and Hklarka (1991) and Brinson, Hood and Beebower (1986), which, using multi-factorial models, found different results.

And he concludes: ‘’In truth, though, the most defensible conclusion is that, because of the joint-hypothesis problem and the rather weak state of the evidence for different asset-pricing models, strong inferences about market efficiency for performance evaluation tests are not warranted’’. (FAMA, 1991).

Finally, it presents the conclusions regarding the tests on the predictability of returns. Regarding strategies through the observation of past price behavior, FAMA (1991) explains that, for short-term intervals, many studies, recent and old, suggest that there is a certain autocorrelation in returns. In long-term studies, it is mentioned that some point to the existence of negative autocorrelation in returns from periods of 2 to 10 years, but Fama argues for the low statistical power of these long-term tests.

Regarding the predictability of returns based on other variables. Fama mentions: ‘’ The recent evidence on the predictability of returns from other variables seems to give a more reliable picture of the variation through time of expected returns. ‘’ (FAMA, 1991). It explains that variables such as dividends, profit-to-price ratio and interest rates have a better explanatory potential for returns than the autocorrelations mentioned above.

1.2 - Other evidence to the study of events.

FAMA (1991) states that most of the event studies he researched are compatible with the efficiency hypothesis: ‘’The typical result in event studies on daily data is that,

on average, stock prices seem to adjust within a day to event announcements. The result is so common that this work now devotes little space to market efficiency''.

Bernard (1993) reviews some of the main studies on price reactions to specific earnings announcement events. Among the conclusions, the joint-hypothesis problem qualifies: " any conclusions about market efficiency cannot be divorced from assumed model of market equilibrium " (Bernard, 1993). However, below, it exposes a tendency, in the aforementioned studies, to reject the efficient markets hypothesis: ''When viewed as a whole, the evidence summarized here presents a more serious challenge to the efficient markets hypothesis than could have been anticipated a few years ago. It is difficult to understand how the simple trading rules described here could apparently generate positive abnormal returns. (Bernard, 1993).

Fama (1998), when dealing with market efficiency and behavioral finance, also carries out a wide literature review. Among the researched works, some use studies and events as a methodological strategy. He mentions that many authors present evidence of the so-called *underreaction*: ''The granddaddy of underreaction events is the evidence that stock prices seem to respond to earnings for about a year after they are announced'' (FAMA, 1998).

He mentions as authors that corroborate the hypothesis of long-term *underreaction* by conducting event studies: Ball and Brown (1968), Bernard and Thomas (1990), Jegadeesh and Titman (1993), Cusatis, Miles and Woolridge (1968), Desai and Jain (1997), Ikenberry, Rankine and Stice (1996), Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok and Vermaelen (1995) and Michaely, Thaler and Womack (1995).

However, FAMA (1998) argues that, as many other articles show the opposite, that is, *overreaction*, the hypothesis of efficiency cannot be rejected.

Christophe, Ferri and Angel (2004) published work that, in a study of events, found evidence related to the strong form of efficiency. In moments just before the announcement of earnings announcements, abnormal behaviors were verified, unjustified in relation to the information previously publicly available and relevant. His research was carried out on shares traded on the NASDAQ and provided interesting observations: ‘’a significant portion of pre-announcement short-selling is driven by some other information source that is highly correlated with post-announcement return’’.

Eberhart, Maxwell and Siddque (2004) carried out a research with a sample of stock returns in fifty years, from 1951 to 2001, analyzing the reaction of stock returns in relation to investment announcements by companies in research and development. In their analysis, they used a methodology that considered the three-factor model by Fama and French and the four-factor model by Carhart (1997). They find evidence of *underreaction*, as they state: ‘’We find consistent evidence of mis reaction, as manifested in the significantly positive abnormal stock returns that our sample firms’ shareholders experience following these increases. We also find consistent evidence that our sample firms experience significantly positive long-term abnormal operating performance following their R&D increases. Our findings suggest that R&D increases are beneficial investments, and that the market is slow to recognize the extent of this benefit (consistent with investor underreaction).

They also state that, although the study in question has its own characters, their evidence is compatible with previous studies, when they mention Lakonishok et al (1994), Loughram and Ritter (1995) and Daniel and Titman (2001).

In view of this review carried out in event studies, it is observed, therefore, that the subject is inconclusive and that, depending on the author, different positions are found.

2 - Behavioral Finance

. The traditional theories of finance, almost entirely, were built from a neoclassical microeconomic approach, whose central paradigm is the rationality of economic agents. More specifically, it is assumed that individuals operating in the financial markets are able to correctly update their beliefs after receiving new information, and that their decisions are consistent with the concept of Subjective Expected Utility, as presented by Savage (1964 *apud* Thaler; Barberis, 2003).

The traditional paradigm has the significant advantages of simplicity and ease of modeling from the researcher's point of view. Nevertheless, the validity of this framework for describing the behavior of the markets is an empirical issue. If theories based on the rational agent were able to satisfactorily explain the most important phenomena investigated in the finance literature, there would be no reason - or at least, there would be no strong motivation - to question their foundations and propose alternative approaches. However, a vast set of empirical evidence produced in the last decades reveals that the available theories based on the assumption of individuals' rationality are not capable of satisfactorily explaining several phenomena regularly observed in the financial markets.

The difficulties of traditional theory with regard to its empirical validity suggest two possible strategies. The first is the reformulation of the theory without, however, abandoning the agents' rationality assumption. The second is a paradigm shift, based on the recognition that people do not always behave rationally. This last course of action

guides the entire field of behavioral finance, an area of studies of recent development and accelerated growth.

In this chapter, I will present a brief overview of the behavioral finance area, discussing its fundamentals and motivations. One of my inspirations was reading the book Thinking, Fast and Slow by Daniel Kahneman, winner of the Nobel Prize in Economics. One example of specific application of this new paradigm is also presented. It is intended, through this chapter, to illustrate the process of constructing theories from this alternative approach, highlighting its usefulness for understanding important phenomena observed in practice.

Shleifer and Summers (1990) were the first to define the limits to arbitration and psychology as the two fundamental pillars on which the behavioral finance approach is built. The limits on arbitrage are related to the difficulty that rational investors may face to undo distortions caused by less rational investors. Psychology, in turn, describes in more detail the possible deviations from pure rationality that can account for these distortions.

For Thaler and Barberis (2003), deviations in rational behavior are intrinsic to human nature and must be incorporated into economic analysis as a natural extension of traditional models, since the evidence suggests so much that agents are capable of making a certain variety of errors systematic, but also that their distortions have important economic implications.

Some of the most important studies in the area of behavioral finance show that in an economy in which rational and irrational agents interact, irrationality can significantly influence asset prices. Nevertheless, in order to produce more detailed predictions, behavioral models need to specify the form of agents' irrationality, that is, the way in which their behavior differs from traditional normative theory. There,

psychology plays a fundamental role in providing the theoretical background that explains the cognitive biases that influence people's preferences, behavior and decisions. The fundamentals of behavioral finance are discussed below.

2.1 - Limits on arbitration.

In traditional models, which start from the premise that the agents are all rational and there are no frictions, the price of an asset in the market is equivalent to its fundamental value, given by the sum of the discounted values of its expected cash flows. The hypothesis that currents prices reflect fundamental values is known as EMH, presented by FAMA (1970).

In the view of many economists, even though part of the financial market agents acts irrationally, EMH will prevail. His argument is based essentially on two assertions: a) if there is a deviation in the prices of the assets in relation to their correct values, an attractive profit opportunity is created; b) rational agents will quickly take advantage of this opportunity, driving prices back to their equilibrium values, in which the price and the fundamental value of the asset are the same. This mechanism for correcting distortions in the market is called arbitrage.

Thaler and Barberis (2003) evaluate that the first aspect of the previously presented argument is a debatable point for behavioral finance researchers. The authors explain that, when an asset is poorly priced, strategies to regain balance can be risky and costly, becoming uninteresting to rational investors. Therefore, the presence of agents that are not entirely rational could account for permanent price distortions or that reverberate for a long period.

Arbitration can be defined as an investment strategy that offers gains without any risk or additional costs. Rational investors, when acting when they notice that prices

are incorrect, are called arbitrators, because they seek a risk-free gain. However, behavioral researchers argue that these strategies adopted by rational agents in the real world cannot be called arbitration, as, in most cases, they are risky. That way, the price may remain incorrect.

Among the risks to which arbitrators are exposed, the following stand out (Thaler; Barberis and Shleifer):

- The fundamental risk of the asset. For arbitration to take place in the classic sense - without risk - it is necessary that perfect substitute assets for the asset subject to arbitration be available. Due to the difficulty of finding perfect replacement assets, it is impossible to eliminate part of the fundamental risk of the asset;
- The risk arising from movements of irrational investors. Introduced by De Long (1990), it is the risk that a price distortion already detected by the arbitrators will become even more pronounced in the short term.
- The costs of implementing the strategy. Included in this topic are the so-called transaction costs, commissions, fees, difference between the purchase and sale prices. Taken together, these costs can decrease or even eliminate the possible gains from arbitration, making it less attractive.

3.1 - Psychology

Theories based on " limits on arbitrage " show that irrational investors cause deviations in observed prices in relation to the fundamental value of assets, and that rational agents have restrictions to take advantage of the opportunities for gain resulting from these distortions. In most of these theories, it should be noted, irrationality is

treated in a generic way and generic approaches tend to limit the richness of the conclusions and predictions that can be extracted from the model.

When a researcher wishes to explain in more detail the structure of distortions caused by non-rational agents, he can draw on the vast repertoire of experimental evidence studied by psychologists or other researchers on human behavior. Behavioral research reveals the systematic biases observed when people form their beliefs and preferences. Thaler and Barberis (2003) and Bazerman (2002) present summaries of some of the main works in this area.

Regarding the biases related to the beliefs of the individuals, we highlight the overconfidence, optimism, conservatism, perseverance, anchoring with insufficient adjustment and those that emanate from the heuristics of availability and representativeness. Then, each of them is presented in greater detail.

- Overconfidence: various research on human behavior reveals that many individuals are overconfident in their own estimation skills, disregarding the true uncertainty that exists in the process. People believe that their estimates in situations involving uncertainty are more accurate than they really are. Tversky and Kahneman (1974) explain this phenomenon of overconfidence as a result of the fact that people use their initial estimates as an anchor, which causes a bias in their confidence interval estimates. The initial anchor adjustments are insufficient, leading to confidence intervals that are too small.
- Optimism: evidence of this bias was offered by Weinstein (1980), whose study revealed that more than 90% of the people surveyed fantasized too

much about their abilities and possibilities, believing that they could do better than they actually did.

- Representativeness: Tversky and Kahneman (1974) researched this heuristic, which generates biases related to the use of representativeness as a way to simplify the analysis of problems. For individuals who use this heuristic, the probability of a specific event occurring is related to the probability of a group of events represented by the specific event. In other words, people tend to think about events or objects and make judgments about them based on previously formed stereotypes.

Bazerman (2002) explains that individuals tend to ignore objectively relevant information (base measures) when estimating the probability of an event when other descriptive information is provided, even when it is not relevant to the problem.

In addition, people have a bias of not taking into account the role of the sample size when considering the validity of the information obtained based on the sample as representative for the entire population. It is common to believe that the probability of a given event is the same, regardless of the sample size. Tversky and Kahneman (1974) argue that the sample size, although fundamental in statistics, is not a relevant part of people's intuition.

Many individuals have a tendency to disregard independent events as such. People believe that random and non-random events are balanced. It is observed that many people end up ignoring the fact that extreme events tend to regress to the average in a large number of attempts.

- Perseverance: there are a number of studies that prove that people often have an opinion, which has two effects: they are reluctant to look for

evidence that contradicts their beliefs and, when they find them, consider them with excess skepticism.

According to Bazerman (2002), many look for confirmatory evidence of a certain event, excluding the search for information that does not confirm it. This ends up generating a strong bias in the decision-making process, as it is not possible to know if something is true without checking for its possible non-confirmation.

In the academic context of finance, Thaler and Barberis (2003) note with irony that, although much has already been demonstrated against EMH, there are many theorists who remain firm to their belief that markets are efficient.

- Anchoring: research shows that people build their estimates from an initial value, or anchor, based on whatever information is provided to them, adjusting it to obtain a final answer. However, Slovic and Lichtenstein (1971) showed that, in most cases, the adjustments made from the anchor are not sufficiently large, which results in decisions that deviate from rationality. In other words, decisions taken in identical contexts can be quite different due to the presence of different reference values available to decision-makers, although these values should not have a major impact on the final decision.
- Availability: the biases that emanate from the availability heuristic are related to the fact that the most frequent events are more easily remembered than the others, and that the most likely events are more remembered than the unlikely ones. As, for example, cited by Bazerman

(2002), the misuse of availability heuristics can lead to systematic errors in the management decision-making process.

4.1 - Preferences and decision making.

The behavioral approach is also concerned with the ways in which individuals define their preferences and use them to make decisions. Two of the main contributions in this area are Prospect Theory, introduced by Tversky and Kahneman (1974), and research on aversion to ambiguity, commented on below.

4.2 - Prospect Theory

A fundamental step when trying to model financial phenomena such as the behavior of asset prices is the assumption of assumptions about the preferences of investors, about how they assess the risks involved in a decision. The vast majority of models assume that investors evaluate alternatives considering their expected utility.

The concept of expected utility goes back to the studies of Von Neumann and Morgenstern (1944). The authors argue that the preferences of individuals fulfill the requirements of completeness, transitivity, continuity and independence, and, as a result, they can be represented by the hope of a utility function. However, empirical research has shown that people do not follow such normative approaches when making many of their decisions.

Among all the alternative approaches to the expected utility theory, the most used by behavioral finance researchers is the prospect theory, proposed by Tversky and Kahneman (1974). The authors, opposing the theory of expected utility, argue that each decision tends to be evaluated independently.

Prospect theory argues that:

- gains and losses are assessed relatively and a neutral reference point;
- potential results are expressed in terms of gains or losses relative to the fixed neutral point;
- choices are governed by a value function in the form of " S ";
- the way in which the problem is presented can alter the neutral reference point;
- the pain associated with the loss of $ X is greater than the pleasure associated with the gain of the same $ X;
- there is a tendency to overestimate events of low probability and to underestimate events of medium and high probability.

4.3 - Aversion to Ambiguity.

According to Tversky and Kahneman (1974), the probabilities of the occurrence of uncertain events are erroneously evaluated. The perception of the certainty of an event can be easily manipulated, generating what the authors called pseudo-certainty (when the individual believes that an event has a 100% or 0% chance of occurring). The effects of certainty and pseudo-certainty lead to inconsistencies in the judgment. However, according to the prospect theory, individuals place greater value on perceived certainty or pseudo-certainty.

Savage (1964) developed the concept of subjective utility, proposing that, in certain situations, people represent their choices through a utility function that is weighted by the subjective probability formulated by the decision maker.

A classic example to demonstrate people's inconsistency in relation to subjective utility is Ellsberg's Paradox (1961). The results of his experiment suggest that people do not appreciate situations in which they are unaware of the probability distributions of a

given game. Such ambiguous situations generate discomfort, indicating an aversion to ambiguity.

5 - Example of application of behavioral finance

Empirical evidence based on financial data indicates that new theories are needed to better understand a range of important phenomena in the area of finance. In turn, the results of behavioral research suggest that approaches that relax the traditional assumptions of perfect rationality for agents can bear good fruit, justifying the recent effort to develop the field of behavioral finance.

Below, I will briefly comment on a study that adopted the behavioral approach in investigating the dynamics of prices in the capital markets and investment and financing decisions within companies.

This debate aims to illustrate how the results of behavioral research can be used in the construction of formal and quantitative models.

5.1 - Excessive confidence and speculative bubbles

Scheinkman and Xiong (2003) presented one of the most interesting applications in behavioral finance. The basic idea is to try to explain the irrational behavior that leads to the formation of speculative bubbles by assuming that investors can be overconfident.

These bubbles are characterized by the large volume of asset transactions at values considered to be above fair, and also by exhibiting a lot of price volatility. They have already occurred at different times in history, with emphasis on the shares of Internet companies listed on Nasdaq, and in the North American real estate market in 2007.

Some classic finance models consider that investors have homogeneous expectations, that is, they all have the same information and are able to determine the same fair value of the assets. In this environment, bubbles would not be formed or there would be no exaggerated changes in prices with subsequent reversion to the average.

In the model proposed by Scheinkman and Xiong (2003), expectations are heterogeneous due to the overconfidence of investors. The authors manage to explain the formation of bubbles from the model, in addition to its three key characteristics: price above fair, high volatility and large volume of transactions.

The essential idea is that two groups of investors, A and B, receive two sets of information signals, sA and sB, from which they form their expectations about the price of the asset. The point is that, although both groups observe sA and sB, each of them attributes a different power to his signal than he actually has. Group A investors, for example, believe that sA is more informative than it really is, which reveals overconfidence. The same rationale applies to group B agents.

The authors developed a model with a parameter Ý ($0 < Ý < 1$), an indicator of the degree of overconfidence. The value of Ý corresponds to the correlation between the innovations of each signal and the innovations in the fundamental price determination process. When $Ý = 0$ there is no overconfidence and expectations become homogeneous.

Based on this argument, Scheinkman and Xiong (2003) developed the pricing model. In balance, the owner of an asset will sell to investors in the other group whenever his view of the fundamentals is significantly exceeded by the view of the other agents.

Scheinkman and Xiong (2003) analyze the theoretical results and perform numerical exercises that reveal the model's ability to explain notorious and recent cases

of speculative bubbles such as those of companies on the Internet. In addition, their simulations show that regulatory instruments such as the Tobin Tax, which is, a tax on spot currency conversions that was originally proposed with the intention of penalizing short-term currency speculation, would be ineffective for reducing the value of the bubble and price volatility, finding satisfactory results only for decreasing the volume of transactions. This tax was suggested by Tobin (1978) and would apply to transactions in the foreign exchange market, with the aim of reducing the volatility of the exchange rate. The idea is that such a tax, by increasing the cost of transactions, could become a tool for reducing the irrational escalation of asset prices.

Considerations about the Tobin Tax show that the Scheinkman and Xiong model has both a prescriptive character, aiding in the development of regulatory policies, as well as a descriptive one, helping to explain the formation of speculative bubbles.

6 - Winning portfolios versus losing portfolios: main works.

The researches by De Bondt and Thaler (1985, 1987) and Jegadeesh and Titman (1993,2001) are some of the most cited and worked on in the financial literature, being, even, generators of strong debates and discussions.

6.1 - De Bondt and Thaler (1985, 1987)

De Bondt and Thaler (1985, 1987) - ‘’Does the Stock Market Overreact?’’ - summarizes the essence of the research objective worked on, which was to investigate the existence of excesses of reaction in the medium and long term in the North American stock market.

The authors begin the article by citing considerations about the interference of behavioral variables in the performance of economic agents. They specifically mention the work of Kahneman and Tversky (1982). They state that there is a certain understanding in the literature that individuals do not react correctly to new information and that, for example, there is a tendency for investors to assign different weights to information, being influenced by behavioral variables. The authors begin the article by citing considerations about the interference of behavioral variables in the performance of economic agents. They specifically mention the work of Kahneman and Tversky (1982). They state that there is a certain understanding in the literature that individuals do not react correctly to new information and that, for example, there is a tendency for investors to assign different weights to information, being influenced by behavioral variables.

They also mention that the theme in economics has been a matter of concern for some decades, specifically mentioning authors such as Keynes and Willians in the thirties: one of the earliest observations about overreaction in markets was made by J. M. Keynes: ‘’ … day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and nonsignificant character, tend to have an altogether excessive, and even absurd influence on the market’’ (1936). About the same time, Williams noted in this Theory of Investment Value that ‘’prices have been based too much on current earning power and too little on long-term dividend paying power’’ (1938). (De Bondt; Thaler, 1985).

The authors also cite the work of Arrow (1982), for which two factors are observed in the market as incompatible with the efficiency hypothesis: the excess of volatility and the anomaly of the "price on profit" ratio. In relation to the first, it also cites research by Shiller (1981), which currently constitutes a well-cited reference in

behavioral finance. This excess of volatility is seen when price fluctuations are, a priori, incompatible with movements in expected future dividends.

The price-to-profit ratio anomaly, " price earnings ratio (P / E) " is based on, among others, Basu (1977) and consists of the fact that stocks with low P / E tend to show higher returns adjusted to the risk than stocks with high P / E.

At this moment, it is possible to register a later work by FAMA and French (1992), who studied the relevance of some variables such as P / E, the size of the company's market, the ratio of book value to market value, in addition to financial leverage. Among the conclusions, the aforementioned authors explained that the Capital Asset Pricing Model (CAPM) is not an adequate model for the North American capital market, with excess verified returns associated with the mentioned variables. These authors, however, conclude that the CAPM model is poorly specified and not because of the market's inefficiency.

De Bondt and Thaler (1985) conclude the initial part of the work with the following exposition, which consists of the main basis for the investigation of the research carried out: If stocks price systematically overshoots, then their reversal should be predictable from past return data alone, with no use of any accounting data such as earnings. Specifically, two hypotheses are suggested: (1) Extreme movements in stock price will be followed by subsequent price movements in the opposite direction. (2) The more extreme the initial price movement, the greater will be the subsequent adjustment. Both hypotheses imply a violation of weak-form market efficiency. (Idem, p.251).

In this way, the article is organized in order to investigate the presence of these movements: excessive reactions followed by subsequent adjustments in the opposite direction.

As the work carried out tests for medium- and long-term periods, the authors commented on the joint-hypothesis problem, citing the need to specify an equilibrium model. At this point, they mentioned three possible models: the empirical analysis is based on three types of return residuals: market adjusted excess returns; market model residuals; and excess returns that are measured relative to the Sharpe-Lintner version of the CAPM. (De Bondt; Thaler, 1985).

Ahead, however, it exposes: it turns out that, whichever of the three types of residuals are used, the results of the empirical analysis are similar and that the choice does not affect our main conclusion. Therefore, we will only report the results based on market-adjusted excess returns. (De Bondt; Thaler, 1985).

Thus, after mentioning that the results found do not differ between the waste calculation methodologies used, they mention that they will present only the results of the model based on the residuals of adjusted returns to the market.

The monthly returns on New York Stock Exchange shares between January 1926 and December 1982 were used as a sample.

Empirical evidence has shown that portfolios that in the past were losers performed better than, in the past, winners, corroborating the hypothesis of overreaction. It was observed that the returns of the losing portfolios surpassed those of the winning portfolios by 0.246, with a statistical significance of t = 2.20.

In addition to the 36-month portfolio training and performance analysis intervals, the authors also conducted tests based on other periods, also observing evidence of overreaction at different analysis intervals.

Among other conclusions, the authors also presented evidence that the overreaction effect is asymmetric, being more intense in " losers " than in " winners ".

Finally, it is necessary to present a general synthesis of its conclusions: research in experimental psychology has suggested that, in violation of Bayes' rule, most people ''overreact'' to unexpected and dramatic news events. The question then arises whether such behavior matters at the market level. (p.262).

Consistent with the predictions of the overreaction hypothesis, portfolios of prior ''losers'' are found to outperform prior ''winners''. Thirty-six months after portfolio formation, the losing stocks have earned about 25% more than the winners, even though the latter are significantly riskier. (p.262).

It can be said that these conclusions generated repercussions for the financial literature, having encouraged studies and discussions, which, until today, continue to be carried out.

In 1987, the authors published a new study, testing the overreaction hypothesis once again. In this work, they also specifically investigated whether the supposed effect of over-reaction could, in fact, be a consequence of other explanatory variables: the size effect of the firm and / or risk factors (the CAPM beta).

As conclusions, the results, even considering the influences of the mentioned variables, corroborated the hypothesis of overreaction: " The earnings of winning and losing firms show reversal patterns that are consistent with overreaction " (De Bondt; Thaler, 1987). Thus, it exposes: this paper has made contributions to this task in two different directions. First, two plausible explanations of the winner-loser effect, namely those based on the size or risk characteristics of the winning and losing firms, have been examined. The data do not support either of these explanations. Second, the paper provides new evidence consistent with the simple behavioral view that investors overreact to short-term (i.e., a few years) earnings movements. Certainly, within the framework of the efficient market hypothesis, it is distinctly puzzling that a dramatic

fall (rise) in stock prices is predictive of a subsequent rise (fall) in company-specific earnings. (De Bondt; Thaler, 1987).

6.2 - Jegadeesh and Titman (1993, 2001)

These authors published, among others, two important studies testing the hypothesis of market efficiency, and their results had considerable repercussions for the financial literature. Fama (1998) himself cited the results found in the 1993 work as intriguing. In the words of this author, it was said that these constituted a mystery that should be better studied.

Regarding the 1993 work, it is worth highlighting the relevant conclusions, as well as the exposition of the controversial context related to the theme.

In the 1993 article, they begin by stating that many journalists, psychologists and economists have been defending the thesis that investors exhibit behaviors compatible with overreaction. In relation to the academic literature on finance, they mention that the profitability of opposing strategies (through the purchase of losing stocks in the past and the sale of winning stocks in the past) is evidenced by many studies, among which they specifically mention De Bondt and Thaler (1985, 1987). Ahead, however, they state that this evidence has been much debated, with controversy on the subject, when Chan (1988), Ball and Kothari (1989) and Zarowin (1990) were mentioned.

A possible contradiction exposed by Jegadeesh and Titman (1993) is that, despite the academic literature showing evidence of the effectiveness of these opposing strategies, much of the market has been using other types of strategies - called 'strength strategies' - based on an opposite criterion, that is, to buy shares in the recent " winning " past and sell shares called " losers ". This finding is mentioned: " For example, the

majority of the mutual funds examined by Grinblatt and Titman (1989, 1991) show a tendency to buy stocks that have increased in price over the previous quarter " (Jegadeesh; Titman, 1993). It should also be noted that this strategy is included in the title of this article: " Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency ".

On the subject, this apparent contradiction is approached as follows: how can we reconcile the success of Value Line rankings and the mutual funds that use relative strength rules with the current academic literature that suggests that the opposite strategy generates abnormal returns? One possibility is that the abnormal returns realized by these practitioners are either spurious or are unrelated to their tendencies to by past winners. A second possibility is that the discrepancy is due to the difference between the time horizons used in the trading rules examined in the recent academic papers and those used in practice. (Jegadeesh; Titman, 1993).

The 1993 paper covered a sample of New York Stock Exchange and American Stock Exchange stock returns, in the period 1965 and 1989, with the authors classifying shares as " winning " (composed of the decile with the best returns in the previous moments) and " losers " (those classified among the 10% of lowest returns).

To prepare this ranking, training periods of 1, 2, 3 and 4 quarters were used. For the analysis of the behavior of the portfolios after this period, windows of 1, 2, 3 and 4 quarters were also used, providing a total of 16 different combinations.

The authors started to observe if the strength strategies would be able to provide abnormal positive returns. In the analysis, they also sought to take into consideration factors such as risk and size effect, in order to investigate whether these possible abnormal returns were not the consequences of these explanatory variables.

As a conclusion of these tests, they mention: Trading strategies that buy past winners and sell past losers realize significant abnormal returns over the 1965 to 1989 period. Additional evidence indicates that the profitability of the relative strength strategies is not due to their systematic risk. (Jegadeesh; Titman, 1993).

In order to investigate the validity of these observations, the same authors, in 2001, published a new research. These begin the work mentioned that part of the literature interpreted the results of the 1993 article as strong evidence of market inefficiency, but others were critical, stating that the results obtained at the time could have been due to poor specification of models or by characteristics specific to the sample, not necessarily present at other times. Thus, the authors extended the tests to the period from 1990 to 1998. ‘’We now have nine additional years of data that enable us to perform out-of-sample tests as well as to assess the extent to which investors may have learned from the earlier return patterns.’’ (Jegadeesh, Titman, 2001).

The data used consists of all shares traded on the NYSE, American Stock Exchange and Nasdaq, excluding those with a price below US$5 and those included in the lowest decile in terms of market value of the NYSE.

At the end of each month, the shares were classified according to their returns in the last six months (formation period). Then, ten portfolios were created based on this ranking order, being considered as winning and losing portfolios formed, respectively, by the shares that represent 10% of higher or worse returns.

It should be noted that all the shares that, in the previous six months of classification, were among the 10% of highest returns, were included in the winning portfolios.

For instance, a December winner portfolio comprises ten percent of the stocks with the highest returns over the previous June to November period, the previous May

to October and so on up to the previous January to June period. Each monthly cohort is assigned an equal weight in this portfolio. (Jegadeesh; Titman, 2001).

A similar procedure was done for the losing portfolios.

According to the results found, the authors explained that, between 1965 to 1989 - period originally studied by Jegadeesh and Titman (1993) -, it is observed that the portfolios that, in the past were classified as winners, continued to show higher returns in the subsequent six months. in relation to losers. The difference between these returns was 1.17% with a t = 4.96 statistic. ‘’The table reveals a monotonic relation between returns and momentum ranks over the 1965 to 1989 sample period, confirming the results in Jegadeesh and Titman (1993) ‘’ (Jegadeesh; Titman, 2001).

About recent data samples: The table reveals that this returns pattern continues in the more recent 1990 to 1998 period. In this period, past winners outperformed past losers by 1.39 percent per month, which is close to the corresponding returns in the original Jegadeesh and Titman (1993) sample period. (Jegadeesh; Titman, 1993).

The authors also sought to isolate the influence of the size variable and observed that this phenomenon is present in both large and small firms. ‘’The results indicate that the momentum effect continues in the 1990s for large stocks as well as small stocks’’ (Jegadeesh; Titman, 1993).

The analysis is also extended to include models that consider variables related to risk. For this purpose, the CAPM and the Fama and French three-factor model (1993, 1996) are used. The latter is seen consolidating itself in the financial literature as one of the greatest references in stock pricing models, since the Capital Asset Pricing Model.

In the tests carried out by Jegadeesh and Titman (2001), results compatible with the previous evidence are observed, with the alpha coefficients of the winning portfolios

in the past surpassing those related to the losing portfolios. In this way, the moment effect remained, even after using these two models and pricing.

In view of all these results, that there is a tendency in winning portfolios in a period of six months to maintain results superior to other losers in the subsequent six months, Jegadeesh and Titman (2001) analyzed the possibility of this phenomenon being compatible with the underreaction hypothesis, this being investigated as a working hypothesis. In this discussion, the authors of behavioral finance are also mentioned: Barberis et al. (1998) discuss how a ‘’conservatism bias’’ might lead investors to underreact to information in a way that is consistent with our null hypothesis. The conservatism bias, identified in experiments by Edwards (1968), suggests that individuals underweight new information in updating their priors. If investors act in this way, prices will tend to slowly adjust to information, but once the information is fully incorporated in prices, there is no further predictability in stock returns. This interpretation suggests that the post holding period returns will be zero. (Jegadeesh; Titman, 2001).

Jegadeesh and Titman (2001), in this analysis, used three different periods (measured in months):

a) " Formation period ": t = -5 to t = 0. With a duration of six months, it was used to classify the shares as " losers " or " winners ".

b) " Holding Period ": t = 1 to t = 6 or 12. In possession of the formed portfolios, the returns of the winning and losing portfolios were compared.

c) " Post-Holding Period ": t = 13 to t = 60. It consists of the period for analyzing the behavior of portfolio returns after the first 12 months following the formation period.

Specifically, the analysis of this third period was carried out with the objective of investigating whether the continuity in the behavior of the returns (moment effect) is or is not consistent with the phenomenon of underreaction. If so, the differences between the winning and losing portfolios in this third period should be null, indicating that the continuity in the behavior of returns within the " Holding Period " consisted only of a delayed adjustment to information.

The authors identified that, in the " Holding Period ", thus considered as the twelve months immediately following the formation period (t = 1 at = 12), on average, the winning portfolios exceeded the average returns of the losers by 1.01% over month, with a Student t statistic of 6.52.

However, in the " Post-Holding Period ", in all studied windows of analysis, an inversion was evidenced, that is, the returns of portfolios in the past classified as losers started to surpass those previously elected as winners. In all analyzed subperiods, this fact was verified. In the words of the authors: ‘’over the 1965 to 1998 sample period, the results reveal a dramatic reversal of returns in the second through fifth years’’.

The final conclusion of the work was the confirmation of the study previously carried out and published in 1993. The authors even affirm that this evidence is consistent with behavioral models, but they recommend caution in this sense, because the behaviors predicted by these models are not always verified.

6.3 - Empirical test with a simulated portfolio

Robert’s and Osborne’s articles became very popular about the study of the stock market prices. Many more researches tried to test if security prices follow a random walk. In 1964, Moore took up a test called ‘Serial Correlation Test’.

He found out the ‘Serial Correlation of Weekly security prices. Serial Correlation is said to measure the association of a series of numbers which are separated by some constant time period like the association of the level of Gross National Product in one year with the level of Gross National Product of the previous year. Moore measured correlation of price change of one week with the price change of the next week.

His research showed an average serial correlation of -0.06 which indicated a very low tendency of security price to reverse dates. This means that a price rise did not show the tendency to follow the price fall or vice versa.

The evidence was not considered or interpreted to be different from an average correlation of zero because the evidence was extremely weak which indicates that there is no association. Moreover, a price reversal of a correlation coefficient of -0.06 would not be able to indicate returns to be able to compensate for the cost involved in the transaction.

Fama also tested the serial correlation of daily price changes in 1965. He studied the correlation for 30 firms which composed of the Dow Jones Industrial Average for five years before 1962. His research showed an average correlation of -0.03. This correlation was also weak because it was not very far away from zero and, therefore, it could not indicate any correlation between price changes in successive periods.

In an attempt to seek support through empirical analysis this author made a selection of five shares listed on the American stock exchange, they are: 3M Company, AT&T Inc., Bank of America Corporation, Chevron Corporation and Johnson and Johnson.

The selected period is from 2018 to 2021, where we performed a serial correlation through the values of the shares in the period already mentioned and the result for each analysis were: 0.9627; 0.9446; 0.9362; 0.9633; 0.9275, respectively.

This result demonstrates that there is a strong linear relationship between the variables. The relationship is positive, because as one variable increases, the other variable also increases.

7 - Conclusion

From this review, the main concepts developed from the middle of the last century were presented. Such concepts started the triggering of theories, models, contradictions and successes. It can be said that thanks to the approach of social sciences, psychology and anthropology to the study of finance, the latter gained the possibility of expanding its focus of study infinitely and a more " human " character, at least until it is proven that the decision-making process follows a logical, coherent and consistent pattern like that of an arithmetic calculation.

From the empirical results observed it was possible to perceive that, when reviewing the literature, although there is already a reasonable number of researches, the theme is still related to a strong controversy. In addition, as mentioned, the papers do not always deal with EMH and behavioral finance with the same conceptual delimitation, which may be contributing to such a lack of confusion on the subject. In concrete terms, it was realized that the same set of evidence has often been used to justify both behavioral finances and EMH, which, at first, were positioned as opposites.

In addition, in this paper, we sought to deepen the real dimensions of EMH and behavioral finance, having questioned the concept of " information ".

Behavioral finance is one of the most promising areas of research in finance theory and its development, albeit recent, has been accelerated. There are two central motivations for the flourishing of this research field.

First, several empirical studies that question traditional paradigms have been accumulating in recent years. They reveal that the best accepted theories of finance, based on the perfectly rational agent model, are unable to satisfactorily explain various financial phenomena observed in practice. Naturally, the difficulty in explaining and, therefore, in predicting the direction of the financial markets causes these theories to become deficient and deficient also in what concerns practical prescriptions for investors.

Second, finance researchers already have a more than respectable repertoire of results based on behavioral research carried out by psychologists and other scholars of human behavior. These researches reveal that human beings are frequently subject to important cognitive biases and do not behave according to the classic model inspired by the works of Von Neumann and Morgenstern (1944) and Savage (1964).

As far as research on the limits on arbitrage is concerned, even if there are rational agents in the financial markets, it will often not be in their power to undo the distortions caused by less rational agents. It is suggested, therefore, that the effects of irrationality on the economy can be significant and long-lasting.

Considering the number of biases cataloged in the literature, it can be inferred that there is still a long way to go in the effort to incorporate more realistic cognition patterns into theories in this area of knowledge.

As always, the merit of the models resulting from behavioral approaches, notably those of a descriptive nature, must be assessed in the light of empirical tests, which are expected to multiply in the coming years. These tests should point the way

for future research and reveal to what extent the experimental results on human cognition are valid in the real world.

Also, empirical research was carried out to verify the hypothesis of an efficient market and behavioral finance, in this case, according to the results, we found support in line with what behavioral finance claims.

Finally, it is important to caveat that this new perspective of analysis now proposed represents only an attempt to draw attention to the fact that the topic is not always addressed uniformly and that the language used by the academy still needs greater rigor and precision, hindering the evolution of the supposed debate. It is an initial effort, which nothing more than corroborates this need for better systematization. Thus, it is up to the work of the area the mission of continuing to provide more empirical evidence and, at the same time, questioning the current analysis approaches and the respective models used, starting to adopt a more reflective and critical posture in relation to theme.

It is, therefore, still a long way to go. However, it is to be expected that new and more robust structures of analysis will be developed, allowing an ever-greater scientific maturity on the part of such an important field of finance and economics.

It is worth mentioning, after this discussion that demonstrated the main points of each economic thought, behavioral finances have a more evolved theory in my opinion, that is, adding the psychological factor made this thought more appropriate to the current reality, achieving demonstrate innumerable biases and heuristics already recognized in professional and amateur investors. In addition, the empirical test carried out in this work did not find support to corroborate the aforementioned efficient market theory, showing that the said theory has weaknesses.

8 – Bibliography

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