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**Thesis:**

Behavioral Economics: How Modern Economics Turned towards  
Empiricism with the Contribution of Psychology

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## **Abstract**

Economics came to be the modern formalistic science of today, by among other things, gradually excluding notions related to psychological literature. In doing so, although it managed to create universal theories that expanded to other disciplines, it lost in realistic foundations.

The purpose of this thesis is to present how, despite this early dichotomy between the two sciences, psychology's contribution can help to shape modern economics by providing an empirical foundation and enriching the understanding of human behavior. Economics literature at least in the field of behavioral and experimental economics, is turning towards empirical research and experimentation.

We conclude that as this shift has made some roads into microeconomics, although it is still excluded from most economics textbooks, after the 2008 financial crisis and the doubt that spread over the usefulness of the dominant theories in finance, the same may happen to the rest of Economics as the behavioral approach is becoming even more mainstream.

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## **1. Introduction**

Since its inception as a separate field, economics has undergone many phases vis-à-vis its empirical foundations. The purpose of this thesis is to illustrate how in the course of time, economics appears to be coming full circle in this respect, through the contribution of psychology.

Starting from the beginning and Adam Smith, at a time when today's distinction between the various social sciences was non-existent, and ending with the recent financial crisis, we will present the critical contributions of psychologists in economic literature, in an environment that at least quite recently was very discriminating against those other sciences.

Hamermesh (2013) searching the publications in top economic journals through the years of 1960-2010, recognizes how the percentage of theoretical work is declining while empirical and experimental research is on the rise. Card and Della Vigna (2013) see similar decline on the absolute number of papers. This is a very interesting finding, considering how not so long ago, experiments and empirical data were dismissed as irrelevant to the science of economics, which prides itself in producing robust universal theories regarding the behavior of individuals and their rational choices.

In the second chapter, starting with Adam Smith, we see how psychological insights although incorporated in economic literature to begin with, started to be excluded gradually in an effort to make economics a more "scientific" field. This trend started to a large extent with the Marginalists, who introduced mathematical formalization that became the means by which economics would supposedly move on and away from psychology. Then the ordinal revolution stripped utility of any of its hedonic and introspective substance, making it just an empty measure of preference satisfaction. We end with the neoclassical approach during the post-war years, when modern economics was formed and expanded across other sciences using rational choice theory.

During these years psychology also went on a different path, at first adopting empiricism and experimentation with the Behaviorist movement of J.B. Watson, creating a polarization with the approach in economics. And then moving on to become a cognitive science. It is during this period that we come across the first critiques of the

notion of (perfect) individual rationality from a psychological perspective, through Herbert Simon's notion of bounded rationality, associated with what has been called "old" behavioral economics. Later on two prominent psychologists D. Kahneman and A. Tversky upset the still waters of economics and gave birth to the "modern" or "new" behavioral economics.

In the third chapter, we will elaborate on the two main papers by Kahneman and Tversky, "Judgment under Uncertainty" (1974) and "Prospect Theory" (1979). The revolutionizing aspect of these papers and the numerous by the same authors, was the effective presentation of bounded rationality as a systematic characteristic of human behavior which could no longer be disregarded anymore by economic theory. In the place of perfect foresight and rationality they put forward heuristics and biases, those mental rules that influence individual decisions, and they also provided a theoretical model (Prospect theory) that incorporated such biases in a formalized fashion familiar to the modern economics. All this is complimented by rich experimental results from psychological research.

This was followed by the works of various economists like R. Thaler, who introduced the notion of mental accounting, but also others who flooded economics with notions of individual bounded self control, hyperbolic discounting, happiness and individualism. Then, the way all these insights were formed into a paternalistic approach, the Choice Architecture or 'Nudge', by which political intervention using psychological insights, can stir people to more optimal behaviors, is examined.

This chapter ends by mentioning how empiricism in economics was also introduced by the experimental economics of economists such as V. Smith, which appeared during the same period as behavioral economics. Although, contrary to behavioral economists, they tried to strengthen the notion of individual irrationality, their interpretation is different regarding its aggregate impact. They argue that real free market mechanisms will weed out irrational individuals, and from there, Market Design will emerge. This approach uses the tools of experimental economics and game theory and aims to create effective markets that will perform in the public's interest.

In the last chapter attention is turned to finance where the notion of aggregate rationality is most dominant not least through the famous Efficient Market Hypothesis

(EMH). The impact of this theory was enormous. And since it regarded prices as reflections of fundamental value, it helped create pricing models and free financial markets from regulation. Based as it is on the notion of rationality however, it also attracted a large amount of psychological criticism.

After a brief mention of anthropological findings which show how financial institutions actually perform, nowhere near as rational or as free as implied by the EMH, the points behavioral finance makes against efficient markets theory are presented. The criticism regards market anomalies, which are empirical findings that seem to contradict the efficient markets model, like the “momentum effect” which suggests market predictability. And, although such findings aren’t as conclusive due to the joint-hypothesis problem, still all of these anomalies are then later explained using the psychological perspective, and how overconfidence/pessimism and overreaction push markets away from what the efficiency argument would lead us to believe.

The second point behavioral finance makes, is the limits of arbitrage. Since arbitrage is the way irrationality is moved out of the market, barriers in its implementation also strengthen inefficiency. Such limits are categorized as the fundamental risk. The risk new information will arise that will change the fundamentals, while there are no perfect substitutes to hedge against such an event. The noise trader risk, which is the risk irrationality will not weaken early enough for the short term losses to be reversed. And the implementation costs, which are various costs on trading, which can make an arbitrage opportunity as unprofitable.

Finally in this chapter, herd behavior is explained, a bias by which conformity is the norm and individual behavior is highly influenced by that of the crowd. Under this light, the most recent market booms and busts come under scrutiny.

In the final concluding chapter, the main findings of the thesis are summarized, with emphasis given to the contribution of psychologists in transforming today’s economic theory and practice, and to the field of neuroscience and neuroeconomics with its intention of bringing greater understanding on how our mind works and enrich the science of economics.

## **2. History between Economics and Psychology.**

### **2.1 From Adam Smith to Neoclassical Economics.**

“Economics is the logic of choice. Psychology is the science of behavior” (Maital and Maital 1984: 55). Behavioral economics refers to a recent trend that is described best as the interdisciplinary collaboration between cognitive psychology and the science of economics. To understand better why such a collaboration between two social sciences that both strive to understand and explain the human behavior, is so recent, one must look on the different paths mainstream psychology and mainstream economics followed during the 20<sup>th</sup> century.

#### **2.1.1 Adam Smith**

Unarguably the father of modern economics is Adam Smith with his groundbreaking work that is *The Wealth of Nations*. Smith praises the individualistic pursuit of personal gain as the drive behind social prosperity with his famous quote that the man who “intends only his own gain, [...] he is [...] led by an invisible hand to promote an end which was no part of his intention. [...] By pursuing his own interest, he frequently promotes that of the society more effectually than when he really intends to promote it.” [Smith 1937 (1776):423].

The *Wealth of Nations* is full of behavioral insights but that “invisible hand” played a major role in ostracizing psychological considerations from economic theory. The pure self interest expressed in free markets is what leads to economic efficiency. Such a claim that demands no concern for interpersonal interactions, helps us to ignore the field of psychology, even though Adam Smith, like his contemporary David Hume, was very much aware and pointed to the importance of the human psychological traits. Especially so, in his previous work *The Theory of Moral Sentiments*, in which he describes all the ways in which people care for each others interests.

More interesting is that introspectively, he wrote about the struggle in every individual between what he called the “passions” and the “individual spectator”, terms which directly relate to the instinct versus logic dichotomy or Freud’s (1923) instinctive and impulsive ‘id’ against the more contemplative ‘superego’. According to Meyer (1982: 82) empathy, social comparison, reference group, conformity pressure, balance

theory, self-regulatory system, and intrinsic and extrinsic motivation, behavioral concepts all that are to be found in the *Theory of moral sentiments*. The *Wealth of Nations* according to Meyer, is based on an anonymous and shared goal: the desire to earn more money.

Mark Perlman and Charles McCann (1998:239) best describe Smith's vision of human nature. Smith's homo economicus was a man with a temporal sense, a man who clearly understood that he was a part of a larger social collective. What Smith's man wanted and needed was the responsibility for making his own decisions and accepting the consequences of those decisions. This responsibility had to be understood as existing in concert with the twin principles of self-love and sympathy, for all were combined in the Smithian calculus. In brief, in modern parlance what was to be maximized by Smith's man was the right of self-determination, while still allowing a place for both moral and social sensibilities and even expressions of altruism."

As Smith identified and discussed some of the phenomena that now occupy behavioral economists it is no surprise that he is in a way regarded as a behavioral economist himself. (see Ashraf, Camerer and Loewenstein 2005).

With David Ricardo (1817), political economy moved attention to how output is distributed with, while the alliance between economics and social politics remained strong until late nineteenth century. While psychology played some role regarding income distribution, Ricardo's theory of inequality was not based on human factors. The Ricardian school of classical economics was forming theories, emphasizing objective factors, such as technological costs and land. Bentham's (1789) social theory with its subjective hedonic utility, was mostly used by economists of the period, to explain economic behavior and only secondarily to justify economic policy.

### **2.1.2 Marginal Revolution**

Utility theory came to the spotlight with the works of Jevons (1871), Menger (1871) and Walras (1874) and their neoclassical/marginal revolution of the 1870s in economics. Their innovation was the use of the mathematical method in economics and the marginal utility theory of value. It's worth noting that during that era, the social scientists were going through an identity crisis, mostly dealing with their projection as a science. That chronic struggle is what eventually split them into different approaches



and then drove each discipline away from each other, eventually forming today's social sciences distinction.

In the middle of the 1850s, Gustav Fechner (1860) dissatisfied with the dominant Cartesian dualism and mind over matter perception, sought for a more scientific basis for psychology (Gigerenzer 1993, Murray 1993). The result was Psychophysics and the stimulus-response paradigm, the study of the relationship between the intensity of a physical stimulus and its subjective psychological perception.

Jevons and the marginalists (they worked independently from each other although they ended up with similar discoveries) in their pursuit for a "better science", drew the mathematical formalization from physics (Mirowski 1988,1989) and they slimmed Benthamite utility through psychophysics, from a multi-dimensional factor to a simple measurement of stimulus-response, of only pleasure and pain (Cohen 1997). This way, they created a theory of "mechanics of utility and self-interest" [Jevons 1970(1871): 90].

They were criticized on a psychological basis also by Mill (see Maas 2005) but still, by employing a cardinal and hedonistic notion of utility it's obvious that they, like Bentham, "considered utility to be a real psychological (or physiological) substance, [...] From the perspective of the marginal utilitarians, the theory of utility transformed economics into a science by making it possible to derive economic laws from a single fundamental law of human nature – the law of maximum utility." (Lewin 1996: 1297).

Neoclassical economics<sup>1</sup> at their birth were still tied to psychology through hedonism and introspection, while they aligned with the psychological domain of psychophysics. This is beautifully shown by Haukelom (2008:1-6) who demonstrates how the law of diminishing marginal utility is directly related to the Weber-Fechner law, which describes the relation between objective stimulus and subjective sensation. And how both go back to Bernoulli (1738) and his solution to the St. Petersburg paradox where he introduced utility as a function of wealth.

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<sup>1</sup> It is interesting to note that the term neoclassical economics, was created by the institutionalist Veblen (1900: 261), who tried to tie the economics of the late 19<sup>th</sup> century to classical economics, so as to make the argument that both are unscientific (Aspromourgos 1986).

Schabas (1990,1997) argues that for Jevons economics had become a branch of psychology. Introspection and hedonism though, would later come under attack in both sciences, and the result would be a split in the two domains since each followed a different path. What counted as empirical evidence changed in the late 19<sup>th</sup> and early 20<sup>th</sup> century, so the then psychology, as an introspective non-science of psyche, needed to be out of economics.

### **2.1.3 Ordinal Revolution**

The first conscious attempt to break the two sciences, was made by Vilfredo Pareto in what was later described as the “Paretian turn” in economics, which was completed during the 1930s and 1940s by Hicks and Allen(1934), Samuelson(1938) and others. (Bruni and Sugden 2007). Utility theorists moved away from cardinalism and accepted an ordinal approach to utility. Subjectivity, introspection and hedonism in economics were removed.

As Mandelbrot and Hudson (2004: 153) put it, “His legacy as an economist was profound. Partly because of him, the field evolved from a branch of moral philosophy as practiced by Adam Smith into a data intensive field of scientific research and mathematical equations. His books look more like modern economics than most other texts of that day: tables of statistics from across the world and ages, rows of integral signs and equations, intricate charts and graphs”

Although economists then viewed psychology as relying deeply in introspection and subjectivity with Freud’s Psychodynamics<sup>1</sup>, it is worth noting that in the same period, psychology was also experiencing a turn also, by the behaviorist movement of J.B. Watson and B.F. Skinner.

John B. Watson’s lecture given at Columbia University on Behaviorism in 1913, was the starting point for the movement. An approach evolved from the earlier studies in infant and animal experimentation (see Wozniak 1993) that sought scientific legitimacy in excluding subjectivity from psychology, disregarding mental states and operating exclusively with objective and measureable behavioral data.

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<sup>1</sup> A term derived from thermodynamics in physics.

Using classical conditioning and experimentation, behaviorism coincided with the fall and elimination of introspection as a scientific way to understand the human consciousness and behavior (see Lyons 1988). Perception became discrimination, memory became learning and language became verbal behavior. That's when the first IQ tests were implemented. Behaviorism eventually would become the dominant school in the 1950s, launched by Watson, who as Pareto for economics, hoped to bring psychology to the natural sciences.

Economists, as mentioned before, in their own search for removing subjectivity in the first half of the 20<sup>th</sup> century chose to ignore psychological theories, although it has been argued that psychology was definitely included (see Loewenstein 1992, Thaler 1997, Hands 2010).

The new ordinal utility theory dictated that consumers were still assumed to maximize a utility function. A function which now expressed an ordinal and not a cardinal valuation of various commodity bundles. Rejection of cardinalism meant rejection of hedonism and therefore psychology.

According to Robbins [2007 (1935): 85] economics “is concerned with that aspect of behavior which arises from the scarcity of means to achieve given ends” [Robbins 2007 (1935):24], and “no one [...] could honestly continue to argue that (value theory) has any essential connection with psychological hedonism, or for that matter any other brand of Fach-Psychologie.” That's why also now the term preference is preferred to the term utility, which has psychological extensions.

“[...] different goods have different uses and these different uses have different significances for action, such that in a given situation one use will be preferred before another and one good before another. Why the human animal attaches particular values in this sense to particular things, is a question which we do not discuss. That is quite properly a question for psychologists or perhaps even physiologists.” [Robbins 2007 (1935): 86]

Utility (ordinal) had become a sterile measure of preference satisfaction and had nothing to do with pleasure, pain or anything similar<sup>1</sup>. Additionally preference, with the

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<sup>1</sup> This fact obviously had implications for welfare economics. (see Hicks 1975)

contribution of Samuelson (1948) (who in 1938 asked for more freedom from psychology), will be identified by observable behavior-choice and disregard any need for knowledge of the person's emotions or opinions. The revealed preference theory was essentially empirical and behaviorist in nature.

At this point it is important to note that while psychology in the early 20<sup>th</sup> century was moving toward experimental approaches and behaviorism, leaving behind mental states and psychic phenomena, it was also abandoning notions of volition and free will.

Economics according to Hands (2010) were not willing to fully commit to scientific legitimacy and lose volition, but neither were they willing to lose scientific consistency. The revealed preference theory, allowing the development of its axioms, came to be the solution, along with the ordinal utility theory. Economics created a middle ground where they solved both the volitional and the scientific problem. That eventually came to be the strength of consumer choice theory and contributed to the ascension of neoclassical economics.

## **2.2 Post-war Neoclassical Economics – Old Behavioral Economics**

### **2.2.1 Individual Rationality**

Post-war neoclassical economics developed more mathematically formal, rational models, which dealt with economic decisions that assumed perfect information and maximizing behavior. Neumann and Morgenstern (1944) were those who quantified preference and introduced an axiomatic theory of expected utility. The human agent was regarded as a highly rational individual<sup>1</sup>, with perfect probability judgment and enough time to weigh alternatives, that aimed to maximize his wealth<sup>2</sup>. Game theory is Rational Choice theory in practice.

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<sup>1</sup> Mentions on rationality/irrationality throughout this thesis, refer not to the literal but to the economic meaning of the terms, related with economic optimization.

<sup>2</sup> John Von Neumann and Morgenstern (1944) introduced game theory. An extension of decision theory in which the behavior of other (rational, utility maximizing and with perfect information) agents is taken into account. In it for simplification reasons they assumed utility to be equivalent with money. "We shall therefore assume that the aim of all participants in the economic system,... is money" [Neumann and Morgenstern 1954 (1944): 8]

Of course the realism of such assumptions is non-existent, but the liberty of making them was justified by Friedman and Savage<sup>1</sup>'s "as if" hypothesis, which states that "in making a particular class of decisions, individuals behave as if they calculated and compared expected utility and as if they knew the odds. [...] The hypothesis cannot be declared invalid for a particular class of behavior until a prediction about that class proves false. No other test of validity is decisive." (Friedman and Savage 1948: 298).

Milton Friedman controversially defended the use of unrealistic models against criticism, on the basis that any good predictive theory has to have unrealistic assumptions.

"Truly important and significant hypotheses will be found to have "assumptions" that are wildly inaccurate descriptive representations of reality, and, in general, the more significant the theory, the more unrealistic the assumptions [...] To be important, therefore, a hypothesis must be descriptively false in its assumptions." (Friedman 1953: 14).

In the same spirit Hayek [2009 (1948): 73] argues that "All that the theory of the social sciences attempts is to provide a technique of reasoning which assists us in connecting individual facts, but which, like logic or mathematics, is not about the facts. It can, therefore, and this is the second point, never be verified or falsified by reference to facts."

It is obvious how such views lead economists to ignore psychology, but also how the theories of rational models form a normative science<sup>2</sup>. Luce & Raiffa describe the reason accurately stating that "game theory is not descriptive but rather (conditionally) normative. It states neither how people do behave nor how they should behave in an absolute sense, but how they should behave if they wish to achieve certain ends." [Luce and Raiffa 1989 (1957): 63]

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<sup>1</sup> Savage (1954) went on to formalize the conjunction of Utility theory and Bayesian reasoning with the Subjective Expected Utility theory.

<sup>2</sup> Unfortunately this direction along with the fetishism of mathematical formalization, raises questions over the legitimacy of the science. Taleb (2004: 98) speaks of charlatanism disguised with equations.

### 2.2.2 Old Behavioral Economics

During the 1960s though, economists were still relatively concerned about experimental anomalies. Most famous of them were by Allais (1953) and Ellsberg (1961). That's the period when cognitive science<sup>1</sup> started getting attention, and in psychology would later overthrow behaviorism, replace it with cognitive psychology<sup>2</sup>, and bring back the research of the mind and its mental processes.

One of the contributors in this movement was Herbert Simon<sup>3</sup>, who in the 1950s with Alan Newell was using computer programming to simulate cognitive processes (see Newell & Simon 1972). In addition to computer science and mathematics, Simon was also interested in psychology and economics. He is the main figure representing the early approach to partner economics and cognitive psychology, and the one to establish what Sent (2004: 740) calls the old behavioral economics.

Peter Earl (1988: 3) traces the birth of that movement in four different places. Carnegie-Mellon University, with Herbert Simon, University of Michigan with George Katona, University of Oxford and University of Stirling in the U.K. Simon and Katona were the most instrumental figures according to Hosseini (2003:1) in the rise of behavioral economics.

What characterized Simon's approach in economics, was the advocacy of algorithmic theories in economics that contained cognitive mechanisms and the use of satisficing<sup>4</sup> in individuals due to their bounded rationality [Simon 1955, 1957a (1947), 1957b].

Bounded rationality, describes the lack of information, and the less than perfect time and computational abilities in humans, who also have inconsistent utility functions

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<sup>1</sup> The cognitive sciences were born in the 1950s, when computer science, artificial intelligence and neuroscience were coming into existence. The cognitive revolution was an interdisciplinary collaboration between psychology, anthropology and linguistics, with influence from the then emerging fields of computer science and neuroscience.

<sup>2</sup> For a detailed analysis on the popularity of the different trends in psychology, during the second half of the 20<sup>th</sup> century see Tracy, Robins and Gosling 2005.

<sup>3</sup> Gardner (1987: 22) refers to him as "one of the founders of cognitive science".

<sup>4</sup> A portmanteau of satisfy and suffice.

across domains. Satisficing is the result of people's behavior, and describes how they make decisions that are "good enough" considering the above limitations. That comes in contrast to the optimizing of a homo-economicus, who can precisely calculate the results of his choices. The notion of satisficing then points out that real people, due to their humane limitations, end up in suboptimal outcomes.

Also, in Simon's opinion, there is a need to empirically test and validate the neoclassical assumptions regarding human behavior and modify the economic theories on the basis of what is found.

"Behavioral economics is concerned with the empirical validity of these neoclassical assumptions about human behavior and, where they prove invalid, with discovering the empirical laws that describe behavior as correctly and accurately as possible. As a second item on its agenda, behavioral economics is concerned with drawing out the implications, for the operation of the economic system and its institutions and for the public policy, of departures of actual behavior from the neoclassical assumptions. A third item on the agenda is to supply the empirical evidence about the shape and content of the utility function (or of whatever construct will replace it in a [sic] empirically valid behavioral theory) so as to strengthen the predictions that can be made about human economic behavior. (Simon 1997: 278)

George Katona, who was a psychologist interested in the foundations of economic behavior, was also critical of the exclusion of psychology from economics and the rationality assumption. His most fundamental critique is on the significance of intervening variables. He argues that the influence of motives, attitudes and expectations of consumers and businessmen, something that is studied by psychology, is important in determining economic behavior. So attention to them will bring bigger understanding, realism and accuracy to the scientific theories. (Angner and Loewenstein 2012: 656-658)

Simon, Katona and many others<sup>1</sup> at the first generation of behavioral economics, shared a dissatisfaction with the (neoclassical) economics of their time and sought to

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<sup>1</sup> Some notable contributors are R. Cyert, J. March, R. Nelson, S. Winter, P.W.S. Andrews, D.M. Lambertson, H. Malgren, J. Marschak, G.B. Richardson, G.L.S. Shackle, N. Kay, B. Loasby, R. Shaw, J. Sutton, A. Tylecote, P. Earl, J.S. Duesenberry, H. Leibenstein, R. Easterlin, K.E. Boulding, D. McClelland, T. Scitovsky.

replace it with an alternative, more empirical science, using the insights of cognitive psychology.

The reasons they failed to do so, have to do partly with their aggressive stance that alienated economists, but most importantly with the thrive that neoclassical economics were enjoying and their enormous success at the time. Success which led to the expansion of rational choice theory to other disciplines, and the economics imperialism over the rest of social sciences (see Becker 1976). Still this first attempt to bring back the psychology in economics stirred the waters and inspired the foundation of the *Journal of Behavioral Economics* in 1972.

### **2.3 Summary**

In what follows, summarizing the different trajectories<sup>1</sup> each science followed, we will evaluate them using the three criteria for a successful (economic) theory, mentioned by Stigler (1950b: 392-396). Those are generality, manageability and realism.

Generality, also related with parsimony, mostly refers to the attribute of a theory to explain a wider range of phenomena. The theory of everything in physics for example, captures the essence of this first criterion. It's easy to see how economics adopted mathematical formalization and simplified human behavior, so to achieve greater generality and parsimony, something which seems was what was mostly wanted by economists in their pursuit for a more legitimate science.

Manageability refers to the ease of application of the theory on specific problems. Stigler (1950b: 393) mentions how “economists tacitly agreed that it is better to have a poor, useful theory than a rich, useless one”. Manageability along with generality appears to be the main concerns of economists while developing their science. The early reluctance by economists to adopt mathematics, can be attributed to concerns of manageability.

Realism, which of course refers to the empirical side of a theory, although it was considered, it didn't really ever transform economic theory. Theory had to answer for

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<sup>1</sup> For a narrative that shows the developments in the two sciences, in a social and historical context of post-war 20<sup>th</sup> century, see Blackhouse & Foutaine 2010: 16-70.



empirical observations but when challenged, economists resorted to reframing the problem as to fit with the theory, as expected by a normative approach. Stigler borrows examples of such attempts from Marshall, mentioning how “a suggested increase of marginal utility from good music, as one acquired a taste of it, was interpreted as a change in utility function” and how when “the marginal utility of the last yard of carpet necessary to cover a floor was greater than that of fewer yards, the theory was modified to make the covering of the entire floor the unit of utility analysis.” (Stigler 1950b: 395)

So in perspective we can conclude that economists, created a predictive model (rational choice theory), which is characterized by its great generality and manageability, but also its struggle with realism. Unfortunately it seems that for economics to achieve these attributes it had to sacrifice one for another, but still economists apparently didn't really care for realism as long as they got the rest. Lucas (1980: 697) points this vividly saying how “on this general view of the nature of economic theory then, a ‘theory’ is not a collection of assertions about the behavior of the actual economy but rather an explicit set of instructions for building a parallel or analogue system – a mechanical, imitation economy. A ‘good’ model from this point of view, will not be exactly more ‘real’ than a poor one, but will provide better imitations”.

Psychology, on the other hand, sought scientific legitimacy in creating highly realistic and relatively manageable theories, which unfortunately lack in generality and parsimony and are pretty much isolated from each other. Hirshleifer disregarded psychological criticism, partially in this manner, because “psychology remains a confusing clamor of competing categories; there is no integrating theoretical structure.[...] such a structure, when achieved, will be fundamentally economic – or more specifically bioeconomic- in nature.” (Hirshleifer 1985: 61-62)

If you were to ask a psychologist to make a forecast, she would need a great deal of detailed and specific information to start with, which would make the process rather unique and hardly repeatable, and in the end, the answer would be based on past experimental studies and linguistic models filtered through personal judgment. An economist on the other hand, would claim to make a prediction, demanding far fewer information and would give her answer using the mathematical form to explain her thought process, making her theory highly repeatable and easier to use.

Through the above lens, we can explain how rational choice theory became so universal and why it was adopted beyond the science of economics<sup>1</sup>, which in its turn was ascending to dominance among the other social sciences. There are even examples of application of the economic view in areas traditionally related with psychology, like family, friendships, leadership, suicide (Becker 1971,1976,1981), drug addiction (Winston 1980, Becker and Murphy 1988) and religious practice (Azzi and Ehrenber 1975). Also it's easy to see how in this environment, criticism from psychology through the form of the old behavioral economics pretty much fell on deaf ears.

The economist's view by then on human behavior, the homo-economicus, is characterized by some key features. The individualistic approach, which dismisses notions of collective action and social utilities, but also distinctions below the individual, like the drives from our genes. The selfish pursuit of our own self interest, especially in the context of anonymous markets. And the sole sensitivity towards (monetary) incentives.

Through these attributes with rationality, consistent preferences, the principles of expected utility and exponential discounting, along with the constraints of income, prices and time, economics develop the central law of demand and market equilibrium.

Strict rationality during the 1970s was overwhelming in economics bringing along great innovations. Macroeconomics developed the rational expectations equilibrium model based mostly on the work by Robert Lucas [1972,1975,1976 (with Prescott in 1971,1974)], who also in 1973 described the Phillips curve using rational choice theories. Also rational models in situations with imperfect information were introduced, mostly due to the work of George Akerlof (1970) and Joseph Stiglitz<sup>2</sup>. Game theory grew in microeconomics with emphasis on correct beliefs and Bayesian<sup>3</sup> calculations, overshadowing more psychological versions like Schelling's (1960). And finally the efficient market hypothesis dominated the financial markets, fertilizing the

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<sup>1</sup> The economic approach became successful even in areas unrelated to economy like politics, law, history and art. It is interesting to point out that Gary S. Becker, the prominent figure in economic imperialism came to speak of notions of bounded rationality in his Nobel Lecture in 1992 (Persson 1997: 38), showing the change of perspective that followed.

<sup>2</sup> See Rothschild and Stiglitz 1976, Grossman and Stiglitz 1980.

<sup>3</sup> The modern form of Bayes' rule was published by Laplace in 1812.

field for the adaptation of asset pricing models. This last development will be elaborated further in this thesis.

By the end of the 1970's most non-rational models were removed from mainstream economic theory and rational choice was already introduced outside economics. Among those who had already researched rational choice in comparison with cognitive models were Daniel Kahneman and Amos Tversky, the persons who along with Richard Thaler are considered the fathers of the modern behavioral economics.

What differentiates this new approach, from the earlier one of Simon and Katona, is the notion of systematic bias. Simon, although he introduced bounded rationality, he wasn't able to show how the bounded rational agent differed, in a predictable manner, from the fully rational homo-economicus. Economists of the time came to accept this irrationality, but by attributing it to an error with random nature, they were able to disregard it from theory, since this individualistic fallacy would even out in aggregate.

When the new behavioral economists managed to show how this error was predictable and not random, they signaled a transition in mainstream economics. The science of economics in the late years is characterized by a reverse imperialism, where it incorporates insights from different fields<sup>1</sup>, and neoclassical dominance as a research programme, is being supplanted by a pluralism of different and independent approaches (Davis 2006).

### **3. Modern Empirical Approach in Economics**

#### **3.1 Behavioral Economics**

What emerged from the cognitive revolution in psychology, was a new branch of behavioral decision making and its research. It was a study of human judgment which started from theories of rational decision making. The purpose was to examine observable behavior, the human cognitive skills and their attributes, and especially how their outcome differed from the expected rational optimization. The systematic and

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<sup>1</sup> The most prominent are Psychology and Biology (Evolutionary Economics).

replicated through experimenting deviations, are those with the highest interest on the part of psychologists, since they can illuminate better the underlying mechanisms of how people make decisions.

The psychologist who founded Behavioral Decision Theory was Ward Edwards, with two major articles in 1954 and 1961. His attempt was to introduce economic theory to experimental psychology, and he didn't question people's rationality. Edwards, through experimentation, wanted to show that humans do follow Bayes' rule, but their adaptation to new information is conservative (Phillips and Edwards 1968).

His purpose was to examine in the laboratory why people sometimes act as if irrational, and how that can be corrected through the implementation of better decision and informational structures and institutions. Inconsistencies from normative theory, according to him, were to be explained from outside the individual.

In later research, the rationality assumption was questioned and challenged. Irrationality became a human characteristic and the deviations from normative forecasts proved to be systematic. The two psychologists who pioneered in this research and were instrumental in bringing it to the attention of the economists, are Daniel Kahneman and Amos Tversky, with their two famous publications of "Judgment under Uncertainty: Heuristics and Biases" in *Science* magazine in 1974 and "Prospect Theory: An Analysis of Decision under Risk" in *Econometrica* in 1979. According to Laibson and Zeckhauser (1998:8) the latter is considered to be the most cited paper ever published in *Econometrica*.

This research in human fallacies and the attempt to create a descriptive theory of rational decision making to incorporate them gave birth to the new approach of behavioral economics. This research in human rationality and its systematic departures from normative economic theory is what is going to be examined in this chapter, starting with the articles by Kahneman and Tversky in 1974 and 1979.

The reason these two articles were successful in being considered by economists, is attributed by Kahneman (2003b) to both the medium used and the message provided. The first article was characterized by its simplicity and its provoking questions without being a direct attack on rationality, and "Prospect Theory" by its mathematical formalization. Colander, Holt and Rosser (2003:492) argue that "modern

mainstream economics is open to new approaches, as long as they are done with a careful understanding of the strengths of the recent orthodox approach and with a modeling methodology acceptable to mainstream”.

### **3.1.1 Kahneman and Tversky - Heuristics and Biases**

Kahneman’s and Tversky’s “Judgment under Uncertainty” (1974) is dedicated to introducing from earlier psychological research, three major heuristics - Representativeness<sup>1</sup>, Availability<sup>2</sup> and Anchoring and the biases attributed to them. A heuristic is a mental process or technique, alternative to Bayes’ rule, used during the act of decision making in order to make the choice as easy, quick or simple as possible. Unfortunately such a way although simpler, often results to systematic errors. The study of heuristics and their biases mainly exposes the human inability to correctly calculate probabilities and of course relates to Simon’s satisficing. A more complete publication was released by Kahneman, Slovic and Tversky (1982) after the research on this subject grew after the years that followed the original, with the latest being the book by Gilovich, Griffin and Kahneman (2002) the year the last won the Nobel Memorial Prize in Economics.

Heuristics are related to decisions made by our intuition or the subconscious, and are the opposite of conscious and rational thinking. The idea of this dualistic separation of cognitive processes is now mostly known as “dual-process theory” (Sloman 1996). Stanovich and West (2000) labeled those two different processes System 1 and System 2, and the reason System 1 often dominates decision making is because it requires less effort and is faster, a reason Kahneman (2003a: 699) later referred to as Accessibility. Essentially the reason people rely on heuristics, is their bounded rationality and mental capacity. In a similar note, Schotter (2006) mentions the emergence of social convections, as the bounded rational way societies evolved to solve their problem. After all, as Schoemaker (1982: 553) notes, people’s “failure to optimize appears to be cognitive, rather than motivational”.

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<sup>1</sup> Also mentioned before in Kahneman and Tversky 1972,1973.

<sup>2</sup> Also mentioned before in Tversky and Kahneman 1973.

Representativeness<sup>1</sup>, the first heuristic, refers to the tendency of people to correlate similarity with probability, and is, in essence, the use of stereotypes. We think that if someone “looks” like a librarian he probably is a librarian, despite prior knowledge we might have on the probabilities. So the first bias related to representativeness, is our insensitivity to prior probability of outcomes, or our base-rate neglect.

Kahneman and Tversky (1974:1124) mention an experiment where this hypothesis was tested. In this experiment, subjects were asked to assess the probability of someone’s personality description<sup>2</sup> as being of an engineer or a lawyer, when that someone was picked from a group containing both, in a ratio of 70-30. Subjects violating Bayes’ law, gave judgments that disregarded the group’s ratio, and instead relied heavily on their perceptions and stereotypes of an engineer and of a lawyer. Without the use of personality descriptions, subjects correctly estimated a probability of 70%-30%.<sup>3</sup>

The second bias related to representativeness is our insensitivity to sample size. We tend to judge probabilities of a sample statistic, without considering the size of the sample. This is because we relate the result of the sample, with the similarity of the same result in the population. One of Kahneman’s and Tversky’s experiments mentioned in the article<sup>4</sup>, highlighted how subjects fell for this bias, even when the sample size was emphasized in the problem presented to them. This initial disregard of information is also related to Edwards’ previously mentioned conservatism.

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<sup>1</sup> Kahneman later separated Representativeness as Judgment by Prototype (Kahneman, Ritov and Schkade 1999, Kahneman 2000) and Similarity (Kahneman and Frederick 2002).

<sup>2</sup> The description provided no evidence regarding the person’s profession. For example it only mentioned name, age, marital status and personality attributes.

<sup>3</sup> The later base-rate fallacy research, questioned the weight of the bias under different conditions, and came to argue about that early high percentage. (see Gigerenzer, Hell and Blank 1988, Koehler 1996).

<sup>4</sup> The problem presented to the subjects was: “A certain town is served by two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50% of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50%, sometimes lower. For a period of 1 year, each hospital recorded the days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days? 1.The larger hospital 2.The smaller hospital 3.About the same (that is, within 5% of each other)” (Kahneman and Tversky 1974: 1125)

Also related, is people's misconception of chance, i.e. the false belief that chance is a process which corrects deviations from the equilibrium. The gambler's fallacy is a well known manifestation of this bias<sup>1</sup>, in which people believe that after a streak of consecutive heads in a coin toss, the probability of a tails in the next toss is even higher, as if to restore the balance of the 0.5 chance. Also important is the "Law of small numbers", which refers to the hasty generalization and the drawing of conclusions about a population, based on insufficient data, like a small sample in a scientific experiment. Unfortunately such misconceptions are mentioned to be presented even among educated scientists, with concerning implications for scientific research (see Tversky and Kahneman 1971).

Insensitivity to predictability is also a bias that shows people's ease to make predictions without having enough information, while showing little to no regard for considerations of predictability. Also the illusion of validity is the unreasonable confidence people show while making such predictions.

The final bias mentioned, related to Representativeness, is our misconceptions of regression. We often mistakenly believe that individual results in performance are independent from each other, ignoring the effects of regression towards the mean. We reward a good performance and punish a bad one, while in reality those two, are the extremes around an "average" medium, so we overestimate the results of punishment and underestimate the results of reward. The Gambler's Fallacy mentioned before, is the total opposite, since it regards expecting regression towards the mean where there is not.

The second heuristic is Availability, which is the attribute of a higher frequency granted to things that come easier to our mind. An example of its effects is the irrational fear to go on a flight after we have watched a plane-crash movie. The Availability heuristic relies on Accessibility, the ease that something comes to our mind, but it is an individual concept regarding our misapplication of frequencies.

The biases that spring from Availability are the biases due to the retrievability of instances. Retrievability is related to familiarity and salience, and distorts our perception

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<sup>1</sup> Similar fallacy is the perception of the "hot hand" in basketball (Gilovich, Valone and Tversky 1985, Camerer 1989).

of probability in the sense of the movie example mentioned earlier<sup>1</sup>. Then there are the biases due to the effectiveness of a search set. For example since we can recall easier words that start with a specific letter, we mistakenly attribute a higher number of such words in a dictionary, than words that have the same letter as third. Similarly, when we can imagine a situation easier in our minds, that situation becomes more available pushing us to biases due to imaginability. Malmendier and Nigel (2011) presented how individual experiences affect risk taking, in a case about people that lived during the Great Depression.

Finally illusory correlation<sup>2</sup> is the bias in the judgment of a frequency of two instances to co-exist, and is affected from the strength of their association that we believe they have. This bias is extremely resistant to contradictory data and is a reflection of people's beliefs in stereotypes. This Availability bias does remind the Representativeness heuristic, and actually more recent research places it under the latter (see MacDonald 2000).

Two other well known biases due to Availability, are the "Hindsight bias"(see Hawkins and Hastie 1990) and the "Curse of Knowledge" (see Camerer, Loewenstein and Weber 1989). The former is when after an event has occurred, we have the false belief that we actually did see it coming, so actually sometimes we overestimate the probability we had given an event before it happened. And the latter is the difficulty for people with knowledge about something, to understand how much other people lack that knowledge. Money illusion is also often described in terms of heuristics, especially because of the ease and salience in the use of nominal prices as determinants of value (see Shafir, Diamond and Tversky 1997).

The third and final heuristic in the *Science* article, is Adjustment from an Anchor. What it regards, is that people are influenced in their predictions by abstract and even blatantly irrelevant starting points (anchors). Chapman and Johnson (2002:121) "define an anchoring procedure as one in which a salient but uninformative

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<sup>1</sup> Gigerenzer and Goldstein (1996:653) proposed the recognition principle, were people rely on familiarity to compare uncertain quantities. In this case the heuristic although sprung from System 1, it is adopted by System 2.

<sup>2</sup> The term was coined by Chapman, L. (1967).



number is presented to subjects before they make a numeric judgment". The uninformed nature is important, because in the original experiments mentioned next, subjects are presented both informed (relevant to the task) and uninformed (irrelevant to the task) numbers. While irrelevant information affecting judgment is clearly a bias, experiments regarding informed numbers (like the second mentioned later) also raise questions regarding the weighting and the presentation of a series of relevant information, so in such cases being definitive for the existence of a bias is harder.

The first bias, mentioned in the original text by Kahneman and Tversky (1974: 1128) under this heuristic, is insufficient adjustment, and the two experiments mentioned about it are extremely descriptive. In the first experiment, the subjects were asked to estimate percentages (the example given is the percentage of African countries in the U.N.) after spinning a wheel which would give a random number between 0 and 100. The higher was the number on the wheel, the higher were the estimations. In a related experiment, Ariely, Loewenstein and Prelec (2003) showed how people made decisions about what they would pay for various goods influenced by an anchor (in that experiment, their social security number).

In the second experiment, a group of students was asked to estimate the product of  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ , while another group the product of  $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ . The fact that the first group started the calculation with smaller numbers, created a perception and eventually an estimation of a smaller product than that of the second group. The two different median estimations were 512 and 2.250, while the correct answer is 40.320.

There are also biases in the evaluation of conjunctive and disjunctive events, and that refers to people's tendency to overestimate the probability of conjunctive events and underestimate that of disjunctive events, due to anchoring from the simple-elementary event<sup>1</sup>. That means that plans that tend to have a conjunctive nature, and the

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<sup>1</sup> The experiment elaborating this bias was "subjects that were given the opportunity to bet on one of two events. Three types of events were used: (i) simple events, such as drawing a red marble from a bag containing 50 percent red marbles and 50 percent white marbles; (ii) conjunctive events, such as drawing a red marble seven times in succession, with replacement, from a bag containing 90 percent red marbles and 10 percent white marbles; and (iii) disjunctive events, such as drawing a red marble at least once in seven successive tries, with replacement from a bag containing 10 percent red marbles and 90 percent white ones."

evaluation of risks which has a disjunctive one, are also met with unfounded overestimation and underestimation respectively.

Kahneman and Tversky (1983) also showed how the conjunction bias can appear due to representativeness and availability, along with demonstrating the famous and controversial “Linda” experiment, in which subjects gave an extremely higher probability for Linda to be a bank teller and a feminist, than just a bank teller.

Finally the last bias discussed in the article is Anchoring in the assessment of subjective probability distributions. Basically the variance of the estimated probability distributions is narrower than the actual probability distributions. Estimates often start from median (50%) values, but the adjustment is not enough. It is important to note that not only naïve, but also expert respondents fell into this bias.

A fusion of our inability to comprehend correlation, along with the ambiguity that feeds our stereotyping, is the confirmation bias documented in the 1960s (for a model see Rabin and Shrag 1999), by which we tend to disregard information that contradict our beliefs, and in turn favour information that confirms them. Adding to that is the polarization effect (Kuhn and Lao 1996), by which, due to the confirmation bias, people with different views end up holding even more extreme positions.

Kahneman and Frederick in the last decade redefined heuristics as a mental process that happens when making a judgment, and the individual “assesses a specified target attribute of a judgment object by substituting another property of that object – the heuristic attribute – which comes more readily to mind.” So this Attribute Substitution is what came to define a heuristic, and because the two attributes (the target and the heuristic) differ, that leads to the occurrence of systemic bias (Kahneman and Frederick, 2002:53).

The original term of representativeness, as was elaborated in the earlier research, was used in two different ways. First for describing the prototype, the characteristic of a category (“a representative exemplar”), and second for describing the similarity of the subject with its prototype (“representative of the prototype”) during the probability judgment. So it was necessary to make a separation between them, because of the two different acts of substitution that were present. As Kahneman and Frederick (2002: 73) put it: “the substitution of a prototypical exemplar for a category, and the substitution of

the heuristic attribute of similarity for the target attribute of probability. Perhaps because they share a label, the two processes have not been distinguished in discussions of the representativeness heuristic. We separate them here by describing ‘prototype heuristics’, in which a prototype is substituted for its category, but in which ‘representativeness’ is not necessarily the heuristic attribute”. So now the original notion of the representativeness heuristic is separated in two different heuristics, because of the two separate types of substitutions, the prototype heuristic and the similarity heuristic.

Also the fact that Anchoring doesn’t work by attribute substitution<sup>1</sup>, led to its replacement by the Affect heuristics (Kahneman and Frederick 2002:56) in the list of major Heuristics. Affect is the emotional response, so an affect heuristic is when a decision is influenced by the current emotional state. (For an example see Slovic, Finucane, Peters and MacGregor 2002). Feelings in general, can’t be ignored in decision making, because not only they do exist but also because they are essential in making even the most purely rational decisions (see Damasio, Tranel and Damasio 1990, Damasio 1994).

Of course the Affect heuristic is a subconscious process and is the closest description of the judgment from a “gut feeling”. Zajonc (1980, 2001) argues that affect and cognition are separate and partially independent systems, from which affect is the first reaction to a stimuli and it influences our perception. Epstein (1994:716) mentions that during an event our mind looks in memory for similar past events and their associated feelings. And so, if those feelings are pleasant, that motivates us to think and act in order to reproduce those feelings. And if those feelings are negative, we think and act in a way that avoids them.

Generally the feelings are categorized in pairs of opposites, like good or bad, pretty or ugly, just or unjust, warm or cold etc. Each feeling is associated with its own heuristic, but en masse all positive feelings are closely related, and so are their heuristics. The same also applies to each negative feeling, so essentially we can generalize and treat them all as one, the Affect heuristic.

At this point, it is worth mentioning that the work on heuristics has met criticism throughout the years, with the most recognized figure representing that criticism being

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<sup>1</sup> Instead, it amplifies the plausibility of a specific value of the target attribute.

Gerd Gigerenzer, an evolutionary psychologist. What he introduces, is the “ecologically rational” heuristic (Gigerenzer and Todd 1999), which is a rationally consistent heuristic, in the sense that decision is bounded not only by the human cognitive limitations, but also by the premise and environment in which the decision is being taken<sup>1</sup>. That’s an idea that stems from Simon (1990) and of course is still questioning the normative nature of rational choice theory.

Gigerenzer et al. also went on to provide examples where heuristics are part of an evolutionary developed “Adaptive Toolbox” (Gigerenzer and Selten 2001) and so they are actually beneficial and don’t always act as fallacies. They are “fast-and-frugal”: they enable us to make decisions as accurate and as fast as possible, while being bounded by our lack of information and cognitive capacity (see Gigerenzer and Goldstein 1996, Gigerenzer, Todd and The ABC Research Group 1999, Gigerenzer 2008).

An example, and perhaps the most famous heuristic introduced by Gigerenzer, is the “recognition heuristic” (Goldstein and Gigerenzer 2002) which states that when a comparison is made between two objects, the one that is more easily recognized is also attributed the higher value. The difference in this case with similar heuristics proposed by Kahneman and Tversky, is that the recognition heuristic is a consciously accepted and deliberate, better than nothing, strategy that is helpful for a bounded rational individual. Still its automatic component regarding familiarity, and the fact that it could lead to systemic biases, make the distinction more abstract, even if the heuristic substitution was intentional.

In the end what Kahneman and Tversky managed to do after publishing “Judgment under Uncertainty”, was to demonstrate effectively how humans often fail to make sound probability judgments<sup>2</sup> and to launch the heuristics and biases research in the study of intuitive judgements. In the recent years Kahneman and Frederick revisited

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<sup>1</sup> The fact that the environment acts as a bound, preventing people from acting optimally, although it sounds profound, is often overlooked from economic policy’s perspective. It means that for example poor people make bad decisions because they are poor, and not that they are poor because they make bad decisions. An interesting view on how scarcity in general, affects our daily lives, is presented by Mullainathan and Shafir (2013).

<sup>2</sup> Kahneman and Frederick (2000:69-73) proposed solutions as to how to make biases disappear.

this concept (Kahneman and Frederick 2002) and their newer approach departs from the original formulation of heuristics in three ways: "(a) It proposes a common process of attribute substitution to explain how judgment heuristics work, (b) it extends the concept of heuristic beyond the domain of judgments about uncertain events, and (c) it includes an explicit treatment of the conditions under which intuitive judgments are modified or overridden by the monitoring operations of System 2" (Kahneman 2003a:707).

### **3.1.2 Kahneman and Tversky - Prospect Theory**

With their 1979 paper "Prospect Theory: decision making under risk", Kahneman and Tversky demonstrated individual violations of expected utility theory (mainly disputing the concavity of the utility function) and offered an alternative theory which took account of the psychological insights in order to explain these violations.

As Kahneman and Tversky (1979:1) put it: "The present paper describes several classes of choice problems in which preferences systematically violate the axioms of expected utility theory. In the light of these observations we argue that utility theory, as it is commonly interpreted and applied, is not an adequate descriptive model and we propose an alternative account of choice under risk."

The first violation they document is the certainty effect, which is demonstrated by a series of experiments based on Allais' paradox. What it means is that people tend to overweight certainty against probable outcomes, which, as it will be shown, is a violation of the substitution axiom of utility theory. What this axiom says is that if A is preferred over B, then any probability mixture of (A.p) is also preferred over (B.p).

The first experiment mentioned in "Prospect Theory" regards a group of 72 subjects that were asked to choose between two pair of gambles.

The first pair was,

A: 2.500 with probability 0.33, 2.400 with probability 0.66, 0 with probability 0.01

B: 2,400 with certainty

And the second pair was,

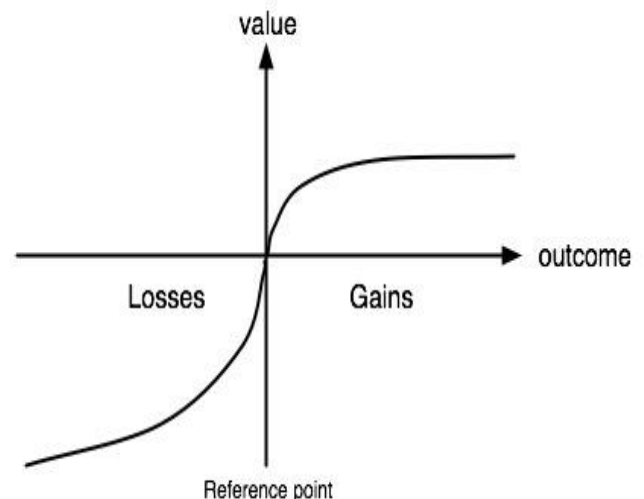
C: 2.500 with probability 0.33, 0 with probability 0.67

D: 2.400 with probability 0.34, 0 with probability 0.66

The interesting results were that in the first problem people chose A by 18% and B by 82%. While in problem two, they chose C by 83% and D by 17%. In reality though, the two problems in terms of probabilities are the same, so people reversed their preferences from the first problem to the second and the reason was that an outcome that is presented as certain is also more desirable. This violation of expected utility theory is in part explained by the well accepted risk aversion of individuals, expressed by the concavity of individual utility.

Kahneman and Tversky went on and showed more experiments in similar formats that reveal how a certain profit is preferred over a probabilistic profit, but also show how a probabilistic loss is preferred over a certain loss. These strengthen even more the notion that people don't act as the theory suggests. Adding to that, Kahneman and Tversky also introduced the "Reflection effect", by which the risk aversion regarding gains is the equivalent to risk seeking regarding losses, and the "Isolation effect" by which people often isolate consecutive probabilities.

The biggest consequence of such facts is that people don't place their utility on absolute numbers of wealth, but rather on how those levels relate to their current status. People have a "reference point" by which they judge whether an outcome is preferable by its deviation from that point. That creates an s-shaped utility curve that is characterized by the reference point, concavity for gains above the reference point and convexity below the reference point, with the curve being steeper for losses than for gains because of what was later labeled as loss aversion (Kahneman and Tversky 1984:342).



Loss aversion<sup>1</sup> is the bias by which a loss is weighted more than a gain of same proportions. Other cognitive biases related to that are the Endowment effect (Knetch 1989) by which the possession of something makes it more valuable for the owner, Sunk cost fallacy<sup>2</sup> (Arkes and Blumer 1985) by which old irreversible costs influence our future decisions, and the status quo bias (Samuelson and Zeckhauser 1988) which is the preference for the current state of affairs.<sup>3</sup>

The above research can also show the power of framing when someone is presented a choice. Due to the reflection effect, if a choice is framed as a gain it will be favourable while framed as a loss it will be not. The important fact in these cases is how their results are large and systematic and although not universal, they do apply to non-hypothetical situations and are not restrained by the use of monetary incentives (see Tversky and Kahneman 1981:453).

An interesting bias related to the reference point is the outcome bias. In this case, people who make predictions base the quality of their decision process on the accuracy of their prediction. The problems occur when the outcomes were produced by random factors that were independent of the decision. So if for example two persons made a risky gamble and the one won while the other lost, the thinking of the winner would be treated as more legitimate, even though the outcome was highly random (see Boles and Messick 1995).

So what really happens is that people chose outcomes less based on probabilities and more based on semantics, with the result being a change of preferences, even preference reversals (see Lichtenstein and Slovic 1971, 1973, and Grether and Plott 1979). Of course such a concept is not unknown to marketing and politics, but that was what made “Prospect Theory” such a revolutionary paper. Since it suggested how utility is actually based on the individual’s subjective perception, it brought back ideas forgotten after the dominance of neoclassical economics.

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<sup>1</sup> Tversky and Kahneman (1973) went on to adapt and a reference-dependent theory, based on the central assumption of loss aversion.

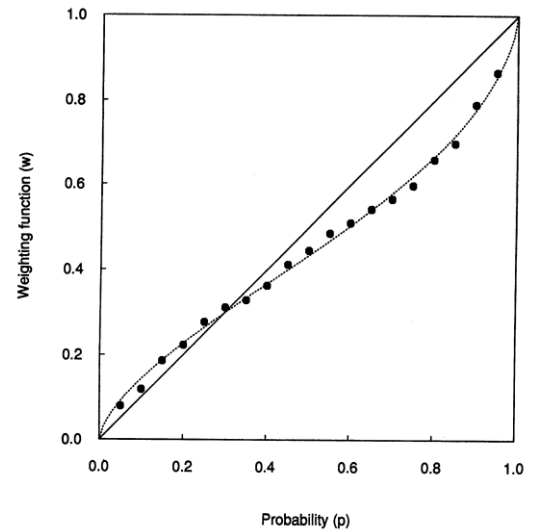
<sup>2</sup> McAfee, Mialon and Mialon (2010) argue that sunk costs are actually a rational approach due to “informational content, reputational concerns, or financial and time constraints”.

<sup>3</sup> See also Kahneman, Knetsch and Thaler 1991.

People's preferences are so extremely adaptable, biased and based on context, that they definitely don't resemble the prefixed indifference curves suggested by mainstream economic theory. People of course still make choices in every situation, but that happens through a constructive and not revealed nature of preferences (see Payne, Bettman and Johnson 1992).

Lastly Kahneman and Tversky (1979) mention that when people compare probabilities, they tend to overweight the small ones. Further research enriched this observation and suggested that people also underweight the big ones.

This biased comprehension of extreme probabilities means that people have an s-shaped weighting function and the theory behind it is based on observations about risk seeking behavior, nonlinear preferences, and source dependence (Tversky and Wakker 1995:1255).



This helps to explain, for example, why people are willing to pay more for an insurance that would drop a small chance to zero, than paying for an equal drop from a higher probability. Essentially what they actually do is overpaying the certainty of 0% chance. Similarly, people pay money for a lottery that would raise their chances from zero to something, while they wouldn't pay the same to raise their chances from a higher probability by an equal amount.

Prospect theory thus becomes a descriptive and behaviorally realistic alternative to expected utility theory. Choice is split in two phases, the editing and evaluation. During editing, individuals assess the outcomes as a loss or a gain based on the reference point, which as previously mentioned, is influenced from various biases. And in the evaluation phase, the individual evaluates each of the edited prospects based on a value function that incorporates the outcome based on the reference point (if it a loss or a gain) and a probability weighting function.



### 3.1.3 Thaler – Mental Accounting

The two psychologists, Kahneman and Tversky, shook the waters in the late 70's but still in the 1980's the psychological insights weren't adopted in economics. Richard Thaler, an economist, incorporated those insights into economics during that period, and signaled the turn in the profession. His column, called "Anomalies" in the *Journal of Economic Perspectives*, was run in collaboration with many other scientists for some years in the late 1980's, and its purpose was to document various occurrences where mainstream microeconomic theory and especially expected utility theory (EUT) was contradicted. A collection of that work is his book *The Winner's Curse* (1992).

The first notable paper by Thaler regarding behavioral economics was the "Towards a Positive Theory of Consumer Choice" in 1980. In it, he challenged the normative stance of economic theory and offered examples where people deviated from that normative prediction. He proposed not the elimination of normative theory, since it is rather helpful in predicting the behavior of near perfect experts, but since it is lacking in predicting the behavior of an average man he called for the alternative prospect theory. Later he went on to ask economists to concentrate on the development of descriptive models of choice under uncertainty and to recognize expected utility as an ex-hypothesis (Rabin and Thaler 2001:229-230).

Thaler also introduced the metaphor of "mental accounting" (see Thaler 1980,1985), to describe the set of rules which dictate how people actually comprehend different outcomes and how they evaluate their financial transactions. Kahneman and Tversky (1981:456) define a psychological (mental) account as "an outcome frame which specifies (i) the set of elementary outcomes that are evaluated jointly and the manner in which they are combined and (ii) a reference outcome that is considered neutral or normal". Belsky and Gilovich (2010:52) mention mental accounting and prospect theory as the two pillars of behavioral economics.

The most well known example of mental accounting is the experiment done by Camerer, Babcock, Loewenstein and Thaler (1997) with New York City cab drivers. The drivers spent a fixed amount to rent their cars for twelve hours and kept all the income during those hours. During the day then, they had to manage the hours they would spend working. The rational and maximizing approach would be to work more

on the “good” days, when there are more customers (for example rainy days) and higher earnings per hour, and to work less on “bad” days when the earnings per hour are less. What actually happened was that the cab drivers had in their mind a target amount of earnings for each day, so if that amount wasn’t met they felt that they were in a loss. In the end their behavior was to work more on the bad days to reach their target and less on the good days since their target was met sooner.

### **3.1.4 Self Control, Hyperbolic Discounting and Saving**

Mental accounting also applies to current versus future assets. The idea is that people apply different utilities to each group, enormously favouring instant gratification against a future one. Ainslie (1992) coins as “Picoeconomics” this human and animal tendency for stronger preferences towards instant rewards. Such a notion derives from Thaler’s earlier research on self-control<sup>1</sup> (see Thaler and Shefrin 1981) and of course deals with our inability to control our emotions. This vice, although it appears to weaken with age, is observed to be qualitatively similar throughout our lifespan (see Green, Fry and Myerson 1994).

The related rational approach is the life-cycle hypothesis which assumes that people desire a steady lifestyle and steady consumption habits, so they plan how much they are going to spend and save throughout their lifetime, in essence creating a steady-permanent income. What should happen is that when people are younger, they will borrow from their future higher earnings while in middle age they will increase their savings to cover past and future consumption, because that’s the time when incomes are usually at their top. This assumption requires people to be able to calculate how to optimize and maximize a lifetime utility function and also to have the self-control needed.

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<sup>1</sup> Self control in general is described in various models. Most psychological and economic models treat it as the ability to not weigh immediate motives over the long term ones. For example to not watch TV and instead study the night before an exam. An alternative approach though is the “conscious monitoring of one’s decisions and actions, inhibiting automatic or habitual responses to stimuli and events”. This self-control regards habitual (and so no longer conscious) behaviors that are no longer desirable (for example smoking), and is determined by the availability of conscious will. Lastly self-control is also modeled as the domination of the rational self over the impulsive one, like in System 2 vs System 1. (Fujita, Trope and Liberman 2006: 193-195)

In reality, what happens is that when we “calculate” our savings plans we rely on heuristics and mental accounting (Benartzi and Thaler 2007), and also consumption is extremely sensitive to income, which means that we spend more when we have more, and spend less when having less<sup>1</sup>. Also different forms of income are not perfect substitutes, a notion that means people have different propensities to consume over those different forms of income (Thaler 1990). One of the biggest consequences of mental accounting, is the inability to treat money as fungible.

An occurrence of our tendency to treat money as infungible is the “flypaper effect” (Hines and Thaler 1995), which is a problem for stimulative government policies. Governments give coupons to families to get food so they will spend more on other products, but what often happens is that families budget their money in different categories based on where they want to spend them, so coupons end up as an extra income gone for food and not as a substitute for different purchases.

Related to mental accounting discussed above is the “narrow bracketing” bias (see Read, Loewenstein and Rabin 1999). Bracketing refers to how we categorize and create groups for our decisions, and narrow bracketing means we treat our choices in isolation, oblivious to the interdependencies between them.

Shefrin and Thaler (1988) using as a key assumption the non-fungibility of household’s wealth created the “Behavioral Life-Cycle Hypothesis” which is a behavioral approach to the life-cycle theory because it embodies notions of self control, mental accounting and framing. Regarding wealth, it is assumed to be divided into three different mental accounts: the current assets, the current income and the future income. Each account has different properties and propensities to spend, which specifically are greatest for the current income and minimum for the future income.

Mainstream economic theory also assumes exponential discounting between intertemporal decisions, which means that people evaluate future choices just like financial institutions evaluate the present value of their future transactions. Exponential

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<sup>1</sup> Banks, Blundell and Tanner (1998) plus Bernheim, Skinner and Weinberg (2001) show that consumption suddenly falls in retirement (in the U.S.A.), and Crawford and Tetlow (2012) show that such a drop in income, for a large part of the population (of England), is unexpected since most people are either clueless or over-optimistic about it.

discounting uses a constant discount rate that reflects rational calculations and also predicts that the only factor determining the relative evaluation between two payments is the length of time between them. Exponential discounting was introduced by Samuelson (1937) and is directly related to his notion of utility as an ordinal measurement of revealed preference (see Samuelson 1948)<sup>1</sup>.

Unfortunately empirical evidence suggests that people instead of constant rates have declining rates (hence hyperbolic discounting<sup>2</sup>) that even vary across different choices. Prelec and Loewenstein (1991) mention the immediacy effect, by which discounting is at its highest when immediate consumption is delayed, a concept related to procrastination. Additionally, gains against losses, large amounts against small amounts, and explicit series of multiple outcomes against singly considered outcomes are all discounted differently (Frederick, Loewenstein and O'Donoghue 2002: 360).

The hyperbolic function reflects people's difficulty to control themselves and it assumes declining rates as time lengthens. So the discount rate of an immediate sacrifice for a future reward is the highest, and shortens over time as the sacrifice is transferred into the future showing how people become more patient as the outcome is projected down the road. Impulsiveness of course is familiar to most social sciences (see Ainslie 1975) but for economics it's mostly interesting due to its implications on people's savings. Since present consumption is more salient, people procrastinate about saving.

Procrastination takes two forms, naïve procrastination and sophisticated procrastination, and the difference between the two models is the subject's acknowledgment of his own self control problem. In real life though people act as having a mix of both, which often translates to an understanding of our future self-

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<sup>1</sup> The combination of those two is the exponential discounting utility model.

<sup>2</sup> Thaler (1981) asked students how much money they wanted to receive in different time horizons (one month, one year and ten years) in order to give up 15\$ now. Their replies indicated a hyperbolic discount. This observation was also replicated by several other researchers (see Benzion, Rapoport and Yagil 1989, Redelmeier and Heller 1993, Green, Fry and Myerson 1994, Chapman and Elstein 1995, Chapman 1996, Kirby 1997, Ashraf, Karlan and Yin 2006). Rubinstein (2003) suggests that experimental findings dispute hyperbolic discounting as much as they dispute exponential discounting, and goes on to suggest the similarity heuristic as a solution.

control problems but underestimating their magnitude (see O'Donoghue and Rabin 2001).

The naïve procrastinator is affected solely by a present-bias effect and for example he keeps postponing doing his homework today, while mistakenly believing he will do it the next day, only to surprisingly postpone it again then. He has the incorrect notion that tomorrow will be different from today and realizes his problem only when near the deadline.

The sophisticated procrastinator, on the other hand, knows his limitations and can foresee his future self control problem. He acts as if he is time consistent (exponential discounter), but instead he has a smaller reward for completing his task (hence hyperbolic sophisticated discounter). Such a person is the one more inclined to self impose a deadline, and among the two models is the one with the most attention from Economists.

The role of commitment and its effect on economic outcomes has originally been researched many years before by Robert H. Strotz (1956). Experimental studies on the use of deadlines though are quite recent and the effort to understand and model self-control, will power and commitment is ongoing.

Ariely and Wertenbroch (2002) found that people are willing to self impose deadlines, which are found to be effective in task performance, although they are suboptimal in contrast with externally imposed deadlines. Having no deadlines at all produced the worst performance. Burger, Charness and Lynham (2011), on the other hand, found deadlines to hamper performance since they get in the way of completing the task. Overconfidence from the subjects and not only procrastination may also be a factor for such low completion rates (see Bisin and Hyndman 2014).

David Laibson's work on the intertemporal behavior of a time inconsistent consumer and his quasi-hyperbolic discount model (Laibson 1997) are the most prominent in the field. His approach is mathematical and his research regards experimental and systematic violations of the traditional exponential discounting model.

In "Golden Eggs and Hyperbolic Discounting" (1997), Laibson created a model of hyperbolic discounting and an imperfect commitment technology: "an illiquid asset

whose sale must be initiated one period before the sale proceeds are received”. What this model manages to predict, is that individuals’ consumption relates closely to the rises and drops of income and also explains their “asset-specific marginal propensities to consume” (Laibson 1997:1). But also by using that “commitment technology”, such individuals can commit to a savings behavior and counter their unfavourable hyperbolic discounting.

Financial innovation in this sense, interpreted literally but also more broadly as anything that can increase liquidity to an individual, can make commitment even more difficult and thus affect negatively saving rates in an economy. This model also explains why ricardian equivalence<sup>1</sup> should not hold in an economy independently of the individual’s wealth, and why financial innovation can weaken welfare.

Harris and Laibson (2001) went even further and tried to connect the short-term hyperbolic discounting with the long-term exponential discounting. In this model people with a stochastic income and a borrowing-liquidity constraint, expect to discount hyperbolically in the future and so they try to prevent it. The analysis then, is an interpersonal game between the current and future self with present hyperbolic discounting ending up being its result, triggered by the expectation of future hyperbolic discounting.

In general the hyperbolic utility function has been adopted in a wide range of problems such as “growth, self regulation, information acquisition, job search, choice of retirement age, procrastination, addiction, investment in human capital etc. Phenomena that ‘cannot be explained by standard discounting utility functions’ appear as equilibrium outcomes once the decision maker is assumed to use hyperbolic discounting” (Rubinstein 2003:1209).

### **3.1.5 Social Preferences**

As mentioned before, one of the characteristics of the economic man is his self-centrism and individualistic pursuit of personal gain that reveals his utility maximizing

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<sup>1</sup> Ricardian equivalence is the notion that when government increases spending to stimulate demand, households in anticipation of a future tax increase that will pay off that initial spending, increase their savings and demand remains unchanged. The idea originates from David Ricardo and it was elaborated further by Robert J. Barro (1974,1979).

behavior. The rational individual knows what he wants and how to get it, by engaging in economic exchanges and choosing the option with the greatest payoff. Despite the shortcomings discussed this far in this thesis, what such a view also ignores is people's preferences towards interpersonal welfare, fairness and reciprocity.

Fairness is the drive to achieve “an equitable distribution of resources between parties in an exchange relationship”, and reciprocity means that people respond to kindness with kindness and to unkindness with hostility, even at their own cost (see Frey and Benz 2008:14).

Fairness was examined by Adam Smith in *The Theory of Moral Sentiments*, where he considered it the source of the virtue of justice which he viewed as the fabric of human society [see Smith 1777 (1759): 133]. It is understandable how fairness, altruism, reciprocity and trust, are essential for a transactional society to occur and how that can also shape a certain kind of morality. In reality people make choices not only taking into account their individual preferences, but also their social beliefs. Even the individual intentions matter (see Falk, Fehr and Fischbacher 2008); we care not only for the outcome but also by which way it was achieved. This fact is examined by the literature on procedural and distributional justice (see Tyler 1988 for an example on legal procedures).

Rabin (1994) mentions how the traditional expected utility theory ignores the influence of morality in decision making, and goes on to adjust it. When preferences collide with beliefs and social pressure, to maximize utility the consumer will either have to change his beliefs or his preferences<sup>1</sup>. Rabin (1993) also has tried to adjust game theory, so that it includes fairness. One of the ways was to incorporate an increased individual utility for when a socially beneficial outcome is achieved.

In contrast to the sole extrinsic motivation reflected in mainstream economic theories, there is also a great volume of empirical research from various social sciences that witnesses the existence of intrinsic motivation (see De Charms 1968) and its

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<sup>1</sup> A product of the former case can be the phenomenon of “cognitive dissonance”, by which people try to convince themselves that immoral activities are in fact moral. Rabin (1994) mentions that since each person's beliefs can influence that of others, such an instant can lead to more acceptance for immoral activity and an increase of it in a society.

influence over individual decision making<sup>1</sup>. Most of the experimental research in all of these cases revolves around a handful of social dilemmas games, mainly the prisoner's dilemma, the ultimatum game and public goods games. Related to this research is the concept and the importance of self-identity for human behavior (see Hogg and Abrams 1988, Akerlof and Kranton 2000).

Related to fairness is altruism<sup>2</sup>, whose main characteristic is the acceptance of a cost for the benefit of another person. In reality what act is defined as purely altruistic is a bit more subjective if we account for any personal satisfaction (see Andreoni 1990) or social benefits (see Glazer and Konrad 1996). Meier and Stutzer (2008) for example, examine volunteering and find that as an act it gives greater life satisfaction to its practitioners. Altruistic theories have also been formulated by the assumption that another person's utility can affect positively our own (see Becker 1974). The problem with rational theories that include pure or impure altruism is that they still assume stable preferences, a fact that doesn't stand even for altruistic behaviors (see Dawes and Thaler 1988).

The evolutionary approach is probably best fitted to explain the existence of altruism, since the perspective is broader than the single individual's and more that of the species' or society as a whole. As a collective driven from our genes, human and animal altruistic behavior can be a manifestation of rooted selfish purposes (see Dawkins 1971).

The man though, through the lens of economic science, has his own free will and cares only for his economic gain. So in this case, it is obvious that almost any form of altruism won't fit easily in a (mainstream) economic model. The same applies for fairness, trust and reciprocity.

It is important to mention the Prisoner's dilemma, which is a game formalized by Albert W. Tucker. It is the paradox that made Game Theory famous during the 1950s and demonstrated a tragedy of rationality. In this well known game, the two prisoners in

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<sup>1</sup> The dichotomy between extrinsic and intrinsic motivation is capital in defining the economic versus the psychological approach and interpretation of the empirical observations that suggest violations of rationality.

<sup>2</sup> Krebs (1970,1982) demonstrates psychological evidence for altruism and motivation to help.



pursuit of their own personal optimization have a dominating strategy that ends up yielding an inferior outcome<sup>1</sup>.

A representation of such outcomes in real life, are showcased by the free rider problem and the tragedy of the commons. Akerlof's (1970) famous paper on the market of used cars examines the results of the lack of trust between buyers and sellers, which leads to a market of "lemons" and Bowles (1985) examination of the job contracts where the lack of trust between employer and employee can lead to an at least stressful work environment.

From our own experience, we can attest that people do cooperate, and although selfish behavior sometimes appears prevalent, it rarely dominates totally. So the question then becomes whether this observed cooperation violates game theory. The answer would come from empirical and experimental research<sup>2</sup>.

Coleman (1983) mentions thousands of experiments, in which the results varied. A violation though would be if in a static, and not a repeated game, people choose to trust each other. Such violations were demonstrated by Frank, Gilovich and Regan (1993), through experiments which also raised the question of whether teaching economics to students makes the students less cooperative.

In further experiments it was shown how giving the ability to the subjects to communicate before the experiment, raised their tendency to cooperate. Dawes and Thaler (1988) elaborate such an experiment, where communication directly relates to the effect of cooperation. Batson (see Batson and Moran 1999, Batson and Ahmad 2001) attributes such altruistic behavior to empathy between the participants.

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<sup>1</sup> An accepted solution to such a problem is the ability to punish the one that won't reciprocate. Such ability, will promote the wanted outcome, but to do so, first it mutates the unwanted one. That is the reason that Hobbes (1651) proposed why (rational) people gave up part of their liberties to the state, and how the Social Contract emerged. In the original dilemma though such an option is not available.

<sup>2</sup> Experimental work in game theory comes mostly by three fields which differ mainly on the experimenter's approach. Those are experimental economics, behavioral economics and behavioral game theory.

In general, experimentation with the prisoner's dilemma is one of the easiest ways to demonstrate reciprocal (and not pure) altruism. Shafir and Tversky (1992) clearly showed evidence of reciprocal altruism, when in a prisoner's dilemma situation, they informed their subjects whether their anonymous partner had cooperated or not.

The answer to the above, and the questions raised over the validity of game theory, would have as a main argument that game theory is a normative theory, and is not explaining how people behave, but rather how they should behave. Not acting as game theory dictates, means that people either cannot comprehend their benefit, or their preferences depart from the financial incentives prescribed by the experimenter, so the subjects essentially are not participating in a prisoner's dilemma (Hargreaves-Heap and Varoufakis 2004:184). Also it can be argued that people never really play a static game because it can't be encountered in nature, and so they treat every game as if it is to be repeated.

In the end, what tackles all these perils of rationality are the interpersonal trust, altruism and natural sympathy. Howard (1971) and Gauthier (1986) go on to suggest that true rationality actually dictates that people will see through the trap in a prisoner's dilemma situation and will actually chose to cooperate as a meta-strategy.

Public goods games (see Ledyard 1995, Camerer 2003) are similar, since they examine people participation and the free rider effect which are manifestations of the existence or not of altruistic behavior. In this case rationality dictates to not participate in the cost of a public good and just leech the benefits, since others will pay for it. Such is the free rider mentality and its effect is that no one will end up paying for a public good. Examples of the effects of this are minimal participation in blood donations and environmental carelessness. In reality though, since no-one wants to be a victim, reciprocal and pro-social behavior is correlated with the group's total reciprocity and contribution (see Andreoni and Scholz 1998).

Voting and paying taxes is en part paying for public goods and people do it despite what their self interest dictates (see Shabman and Stephenson 1994 Andreoni, Erand and Feinstein 1998, Mueller 2003). They also volunteer and contribute to charities (see Anheier and Salamon 1999, Andreoni 2002), and even though crowding

out of private contributions due to government spending does occur, it is definitely not absolute (see Andreoni 2006).

Reciprocity in public goods can also appear as the will to punish the free riders again and again, with the punishment to increase as someone's contribution lessens (see Fehr and Gächter 2000). People appear willing to bear the cost of punishing a behavior that rational theory deems inevitable (Fehr and Gächter 2002, Fehr and Fischbacher 2004).

As morality drives people to obey the social norms, certain emotions motivate them to enforce those norms. Rozin et al. (1999) especially mention that violations of social norms trigger contempt, anger and disgust in a relatively universal and intercultural manner. Each emotion is associated with different violations of the three moral codes of community, autonomy and divinity and their respective norms regarding community rules, customs, individual rights, liberties, traditions and religious beliefs. Rilling et al. (2002) using brain imaging show how our brain "lights up" when we reward cooperators and De Quervain et al. (2004) show similar results when we punish defectors, apparently both acts feel good. Frank (1988, 2004) and Hirshleifer (1987) have also proposed that emotions operate as commitment devices.

Empirical work on fairness is also vast. Schroeder et al. (2003) review the notion of distributive fairness in social dilemma games as a result of people's preference for equality, an approach that can be incorporated in the rational model<sup>1</sup>. Fairness is also used as a mean and an instrument during a negotiation, instead of just an end (see Van Dijk, Leliveld and Van Beest 2009). A differentiation that reminds the distinction between true and not true altruism.

Ultimatum games and the related dictator games are the ones to better demonstrate how people regard fairness. The ultimatum game, first studied by Güth, Schmittberger and Schwarze (1982) is between two unfamiliar and anonymous players, the Proposer and the Responder. The Proposer is given the choice to suggest a split of a

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<sup>1</sup> This theory has been elaborated as the social utility model (see Messick and Sentis 1985, Loewenstein, Thompson and Bazerman 1989, Handgraaf, Van Dijk and De Cremer 2003) by the assumption that people derive utility from equity and are affected by inequity aversion (see Fehr and Schmidt 1999, Bolton and Ockenfels 2000). Inequity aversion for someone that has more can lead to altruistic behavior, while for someone that has less can lead to envy (for a model incorporating envy see Mui 1995).

monetary amount to the Responder, and if the Responder agrees, each one gets what the Proposer suggested. If the Responder rejects the offer, then both get nothing.

The rational choice for the Responder would be to accept any offer since otherwise his gain would be zero, and the Proposer knowing that, he would offer the minimum amount possible (like a penny). In various experiments in many different countries, what happens is that “the vast majority of Proposers offer between a third and a half of the total, and Responders reject offers of less than a fifth of the total about half the time” (Camerer and Loewenstein 2004:27). In essence people tend to make fair offers because either they have a preference for being fair, or because out of fear of retaliation against their unfair offer.

What is even more amazing is the Dictator game (see Kahneman, Knetsch and Thaler 1986a), an alternation of the ultimatum game. Here the Proposer acts as a Dictator and his will is the outcome of the game<sup>1</sup>. In this case, it is even more irrational for the Dictator to not claim everything for himself, but this is exactly what happens in experiments (for example see Bolton, Katok and Zwick 1998). Even children appear non-selfish, with preschoolers giving even half of the resources (Gummerum et al. 2010).

Intercultural variations occur due to societies being differentiated in their levels of trust and reciprocity. Reasons for that stem from the social fabric that is characterized by its formal institutions, social polarizations and economic growth (see Knack and Keefer 1997: 1277-1283). Well known global research reflecting that differentiation and the universality of the results on the games discussed this far are by Henrich et al. (2001), who examined fifteen small tribal societies and Roth et al. (1991) who examined modern western societies. In the former a surprising finding is that the more people participate in market transactions, the more they appear to share equally.

Interesting implications are revealed by Thaler (1985) and Kahneman, Knetsch and Thaler (1986a,1986b) who have examined how a perceived as unfair price from a monopoly can lead consumers to avoid products that are indeed worth such a price, and how monopolistic firms are led to operate at a price lower than the one predicted by

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<sup>1</sup> What actually happens is that the Dictator decides, while the partner has a passive role without an opinion on the outcome. In this sense the Dictator game doesn't really fit in the definition of game theory.

standard economic theory<sup>1</sup>. Also Yaari and Bar-Hiller (1984) performed an experiment, in which the subjects preferred to distribute their resources fairly even at the cost of total welfare and against utilitarian expectations. People apparently are willing to accept inferior outcomes provided that they were achieved in a fair manner (Lind and Tyler 1988)<sup>2</sup>.

### **3.1.6 Final mentions – Happiness, Individualism, Choice Architecture**

An obvious conclusion from the empirical evidence discussed this far, is how people seem to divert from the assumptions of economic theory in a predictable and systematic way. Apparently economic theory couldn't ignore individual bounded rationality and social preferences as it did in the days of H. Simon. So eventually a great research flourished, both from an economic and a psychological point of view, regarding those themes, and empirical research expanded in a plethora of settings.

We mentioned the Affect heuristic, where the emotional state can alter individual judgment. Emotions were regarded as just a hindrance for many years in economic literature and were ignored, but nowadays the perspective has shifted. Theoretical and empirical research on the role of emotions on decision making is progressing in a way that goes back to Adam Smith's *Theory of Moral Sentiments* (see Ketelaar 2006). Emotions now are related with human automatic processes like intuition and perception and are the drive behind processes that were believed to stem from rational and logical inference (see Haidt 2001). The traditional focus of decision theorists on cognitive errors like biases, framing etc, in the recent years has turned towards the role of affect.

The huge literature regarding the economics of happiness must also be mentioned (see Frey and Stutzer 2002) Interest is turned towards things that actually make people happy, and divert from sterile profit seeking and consuming. Happiness is linked to hedonic psychology which rose with the psychologists' research on utility. Critical here is that happiness is subjective and is measured through surveys, while

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<sup>1</sup> Thaler (1980) and Kahneman, Knetsch and Thaler (1986a,1986b) also showed how fairness is related to loss aversion and how the reference point acts as an obligation of the firms, regarding prices and wages.

<sup>2</sup> Charness and Rabin (2002) have demonstrated with dictator games how unequal payoffs can be preferred if they are socially efficient.

essential is that as people are unable to predict their preferences, they are also unable to predict what makes them happy, with obvious implications for welfare economics.

Aspiring to financial success appears counter-productive in the pursuit of happiness, as it often comes with neglect for better activities like time spent with family (see Kahneman et al. 2006). Family, relationships and love from childhood to old age appear to be the stronger indicators for a happy life (see Vaillant 2012). Higher income on the other hand gets used to, and no longer gives pleasure to the individuals, a fact that can help explain why U.S.A. for example, with increasing G.D.P. per capita in the last decades, can also have decreasing rates of self-reported happiness (see Blanchflower and Oswald 2004, Myers 2000:61).

Also what we think has made us happy is also subjected to fault (see Schkade and Kahneman 1998). Measures based on memories are not a good indicator so it is recommended to measure on the spot, with a measurement that focuses on current self-reports or physiological techniques (Redelmeier, Katz and Kahneman 2003). What makes us think we have had a happy life is apparently a collection of imprecise memories.

Behavioral economics showed how people's behavior can be foreseen and modeled more accurately, but also showed through experimentation how people differ in an individual and a social level. Such heterogeneity is against standard economic theory where it is assumed that preferences are homogeneous. Small variations could possibly be expected but there have been situations of extreme polarization. Andreoni and Miller (2002), after conducting dictator games characterized the subjects into two, almost 50-50, groups of selfish individuals (47%) and others (53%), while Fischbacher, Gächter and Fehr (2001), in a public good game, separated people as 30% free riders and 50% as cooperators. Fehr and Gächter (2000) record similar differentiation in the people's will to punish non-cooperative behavior, and Ketelaar and Au (2003) on people's temptation to defect.

Such an observation raises questions regarding the social institutions setting. People interact with each other and influence one another, but whether a pro-social behavior prevails over a more selfish one, and vice versa, depends on the established institutions.

The latest development in behavioral economics regards the attempt to manipulate the established institutions through the knowledge that the already mentioned psychological examinations have provided. Choice architecture (Thaler and Sunstein, 2003, 2008) is the paternalistic approach to provide the appropriate stimuli mechanism that will incite the socially and economically wanted and efficient outcome, while keeping the freedom of choice intact (see Camerer et al. 2003). It is an attempt that has already been adopted in the U.K. since 2010 with the partially privatized “Behavioral Insights Team”<sup>1</sup>, while in the U.S.A. a similar initiative was just launched as part of a bigger effort to make government more efficient by applying behavioral insights<sup>2</sup>. In the European Union behavioral economics have also contributed to alter competition policy (see Ciriolo 2011).

Because it is accepted that people are bounded rational with weak willpower and incomplete information, the choice architects try to provide the context that will ‘nudge’ people to the right direction. The deviations from rationality, in this case, are not expected to be corrected through market mechanisms, which even when the stakes are high, they appear inadequate (see Camerer and Hogarth 1999, Shiller 2000).

The best nudges are default options and information mechanisms. The former regards the exploitation of the status quo bias and that means making an optional but efficient choice as default while changing the suboptimal default to optional choice. Great examples of such policies are the automatic enrolment in saving plans (see Thaler Benartzi 2004), which help counter the inefficiencies discussed before with people’s future retirement funds, and also making organ donation as default while giving the choice to opt out (see Johnson and Goldstein 2003). Both of these policies steer people to more socially efficient outcomes without hampering their freedom of choice or the incentives of the market.

The second type of nudge has the government to regulate the market for adequate information disclosure devices that will feed people all the necessary information to make better decisions. Such a policy is mostly suited for services that are characterized by complex pricing, such as mortgages, insurances and cell phone plans.

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<sup>1</sup> <https://www.gov.uk/government/organisations/behavioral-insights-team>

<sup>2</sup> <http://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-17.pdf>

That means more details, reminders and feedbacks regarding fees and charges that will help people to make the most suited choice. This is especially important since the providers of such services often have the incentive to keep people uninformed. Related to this also, is providing information regarding the social norm in order to incentivize people through their herd mentality and need to conform<sup>1</sup>. The British government by informing people that their neighbors had already paid their taxes, increased tax repayment rates by 15% during 2010-2011 (see Behavioral Insights Team 2011: 15-18).

Nudging in a larger scale falls under applied behavioral science or behavioral design. This refers to the design of development programs and policies, in areas like health, education, productivity, agriculture, finance and public services, using the insights of behavioral economists. It also applies to the incorporation of such insights into already existing programs, all in order to increase their effectiveness (see Datta and Mullainathan 2014).

It is important to note that these approaches, although some could call them as interventional, are in no way challenging the current institutional setting<sup>2</sup>. Still though, choice architecture is a tool that requires political involvement and is subjected to political influence. In the end, the purpose that remains is to create policies that benefit the population that acts irrational, without hurting the people who act rationally. So such policies should appeal to all economists regardless of their belief in human rationality.

Rational people though don't make errors in their choices, so how someone defines this benefit in welfare is also interesting. In this case, preference based utility appears problematic because anything that someone chooses is meant to maximize his welfare. An interesting proposal, and related to what has already been discussed, has been made by Kahneman (1999) and is the use of objective happiness.

In the end having the full picture of all the suggestions brought forward by psychology and behavioral economics, it is important to understand how some of them can be an enhancement to the standard model, while others ask for its revision.

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<sup>1</sup> As demonstrated by the experiments on conformity by Solomon Asch in the 1950s.

<sup>2</sup> Design economics, which will be discussed later, are aiming to form the institutions.



Camerer (1999) mentions how prospect theory, hyperbolic discounting and social utility offer better alternatives over expected utility, discounted utility and own-payoff maximization. Rabin (1998) though goes on and distinguishes what can be incorporated in the standard utility maximizing model and what can not, in a way describing which kind of behavioral research has been met with more acceptance.

He mentions how reference points, adaptation, loss aversion and prospect theory, as the Allais paradox, led to modifications of the expected utility model that incorporated non-linear utility functions, while reciprocity, altruism and fairness can also be accommodated by creating models with a more pluralistic view over utility. Even heuristics and biases can be added, if the modeler incorporates systematic errors into maximization.

As the research on happiness though showed, people are unable to perceive and predict what they want. Adding to that, their preferences, as demonstrated by framing, are fluid and appear to change in an instant with frames actually ending up determining those preferences, causing even preference reversals. All these and other psychological findings, plus the lack of self-control that created the research on hyperbolic discounting, all point out to the need of an alternative to maximizing utility.

In the end, behavioral economics is a relatively new field of study, but it has already influenced many more subfields in economics as finance (see Shleifer 2000), public finance (see McCaffery and Slemrod 2006), development economics (see Mullainathan 2005), even macroeconomics (see Akerlof 2003).

### **3.2 Experimental Economics**

Many of the observations discussed in the previous pages come from psychological experimentation, but parts of them also come from economists in the field of experimental economics. Experimental economics is an approach with a history that can be dated back to the 1930s (see Roth 1993) but it was essentially formalized by Vernon Smith in the mid 1970s<sup>1</sup> in two articles. The “Experimental Economics: Induced Value Theory” in 1976 and “Microeconomic Systems as an Experimental Science” in 1982.

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<sup>1</sup> During the same time that Kahneman and Tversky published their own revolutionary papers.

Smith and Kahneman shared the 2002 Nobel Prize<sup>1</sup>, the first “for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty” and the second “for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms”<sup>2</sup>. This Nobel appears to have sealed the reversal of economic imperialism towards the rest of the social sciences, and the invasion of psychology in the economic mainstream.

Although at first glance it seems that both fields of behavioral and experimental economics are identical, in reality they only share the empirical approach. They both deal with games and situations with economic consequences, but they differ greatly on methodology and interpretation. It is important to mention this distinction because since they make similar experiments and are interested in the same problems regarding individual behavioral patterns, each does it in its own unique way which represents a different point of view and agenda.

An example demonstrating this diversity is the first experimentations that revealed “preference reversals” by Lichtenstein and Slovic (1971). In 1971 these researchers showed, through the course of three experiments, violations of expected utility theory attributed to anchoring and adjustment. Economists took notice, but were reluctant of the significance of the results for economics, as expressed in a paper by Grether and Plott<sup>3</sup> (1979).

That paper’s purpose was to “discredit the psychologists’ works as applied to economics” and “explain the results as artifacts of experimental methods” (Grether and Plott 1979:623). Their objections against Lichtenstein and Slovic varied, but the most important aspects of their criticism were a) the “misspecified incentives”, which means that the stakes were not high enough to incentivize the subjects to perform, b) “confusion and misunderstanding” by the subjects, c) “low frequency”, which suggests

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<sup>1</sup> Amos Tversky had already passed away since 1996.

<sup>2</sup> [www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/2002/press.html](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2002/press.html)

<sup>3</sup> Charles R. Plott went on to become a distinguished figure in the field of experimental economics.

that further playing would convert behavior to rationality<sup>1</sup>, d) “unsophisticated subjects”, since the subjects were specifically psychology undergraduates, and e) “the experimenters were psychologists”, meaning that they practice unaccepted methods in experimenting like using deception (Grether and Plott, 1979:623-629)<sup>2</sup>.

Grether and Plott’s (1979) attempt was fruitless in discrediting the psychological findings, and although similar research continued and gave some validity to the objections initially expressed by the economists (see Pommerehne, Schneider and Zweifel 1982, and Reilly 1982), those objections against the psychological approach on experimenting is what defines the difference between experimental economists and experimental psychologists in their method. Smith (2002:100-101) also mentions how low stakes, subject sophistication, subjects need for time to learn, and inadequate instructions are among the objections that economists face for their economic experiments.

Further examining the differences in methodology, Croson (2005) lists incentives, deception, context, subject pools and data analysis. Focus will be given mostly on the use of incentives by economists and the use of deception by psychologists. While both approaches are used as a way to transfer the real world in the laboratory, their difference creates “a gap in abstraction” (Ariely and Norton 2007) which limits interdisciplinary connection.

In market experiments, in order to test a hypothesis in a game-theoretical manner, it is critical for the experimenter to control the subject’s preferences. To do so Chamberlin (1948) proposed the use of monetary incentives, a proposal which Smith (1976) developed to his “induced-value theory”, by which the subjects get compensation in response to their choices in consistency with the theory that is being tested.

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<sup>1</sup> Although whether the experienced individuals act more rationally is still a subject of research, psychologists rightly argue that “stationary replication overstates the frequency, speed, and clarity of feedback the world actually provides” (Camerer 1995:600).

<sup>2</sup> Even if higher stakes and expertise eradicate irrationality, it is bold to believe that the only economically important behavior is that of sophisticated individuals in high-stakes activities.

Since economists test theories that are derived from utility maximization, it is important for them to have their subjects administered with as enough information and financial incentives as possible, in order to ensure that they can and will bother to maximize their utility. Since people in the real world are expected to make decisions by weighing costs and benefits in a utility maximization manner, then similarly aligning incentives in the experiment should mean a more realistic experiment (see Levitt and List 2007). Also, cognitive effort in this sense is a cost that has to be compensated. By doing all that, performance variability will be reduced (see Davis and Holt, 1993:25) and the outcome will be closer to the theoretical predictions (see Smith and Walker, 1993).

Psychologists on the other hand believe that people's behavior is depended on context and specific situations, so in order to make laboratory experiments more realistic, they use deception to create those different contexts. Also they are not dogmatically against incentives<sup>1</sup>, like economists are of deception, but they warn against them in certain situations, since their use can affect the individual self determination, identity and intrinsic motivation. Eventually that can lead to the "hidden costs of reward", which are counter-productive results that are triggered by the crowding out of intrinsic motivation from an activity due to the use of monetary incentives (Frey and Stutzer, 2001/2:14-15).

Except for the theoretical reasons, the use of monetary rewards by psychologists has been argued against also for pragmatic<sup>2</sup> and ethical reasons (see Hertwig and Ortmann 2003:256-257). But the question that still remains is whether financial incentives really matter. Camerer and Hogarth (1999) examining studies from both fields got mixed results, with different effects for each of the three types of experiments on "judgment and decisions", "games and markets" and "individual choice". The use of incentives appears to have an effect about half of the time, with a few times that effect being the opposite of what the theory would expect.

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<sup>1</sup> Providing financial incentives in psychological experiments although it has happened, it is a pretty rare approach (see Hertwig and Ortmann 2001).

<sup>2</sup> They make experiments more expensive and hence harder to do.

Still the criticism from economists regarding the realism of psychological experiments has been heard by behavioral economists, and experimentation through the years has shifted. From hypothetical questions, to experiments with real outcomes, to today's field experiments, all of which gradually brought greater external validity to the research since the distance between laboratory and real world has shortened. The current ideal appears to be the randomized field experiment (Angner and Loewenstein 2012: 669-673).

In the end though, the difference in the two approaches is that, even the fact that both come to the same initial observations regarding human behavior and decision making, psychologists (and by extension behavioral economists) accept human irrationality as a given, while experimental economists treat it as a variable based on context, with institutions serving "as social tools that reinforce, even induce, economic rationality" (Smith 2000:11).

In a sense economists are arguing that the appearance of irrational behavior in experiments mostly happens because either the subjects are not indicative of a general population, or the experiments regard a short time frame which doesn't give enough time for subjects to familiarize with the game, or the experimenters haven't explained the game properly, or the incentives are not high enough to motivate effort. With the lack of any of the above pointing out an experiment with low external validity.

But even when an experiment satisfies all the above and still reveals systematic individual irrational behavior, even then, that is of little concern regarding real life economic consequences. That is because "human subjects in the laboratory frequently violate the canons of rational choice when tested as isolated individuals, but in the social context of exchange institutions serve up decisions that are consistent (as though by magic) with predictive models based on individual rationality" (Smith 1991:894).

So, experimental economists' purpose is to document "a growing body of evidence that is consistent with the implications of rational models, although there are many important exceptions. In the latter, often the data can be comprehended by modifying the original models. The result is to deepen the concept of rationality and simultaneously increase consistency between the observations and the models." (Smith 1991:878).

This diversity between economics and psychology is of great importance, since from experimental economics and game theory the “economic design” was developed, an alternative view to “choice architecture”. Also the debate between the economic and the behavioral approach in the field of finance and especially on the effectiveness of markets is more heated than ever.

### **3.2.1 Market Design**

Smith’s first experimental article (Smith 1962), regarded a market setting in which subjects eventually came to trade in a price close to the one he had predicted using economic theory. Several more experiments were carried out that supported those findings but in 1978 Plott and Smith added one extra but important parameter, the fact that institutions matter. The experiment was able to reveal that by having the market environment held “as a constant”, while the market institution was modified in a controlled manner.

Economic design is the process of creating new markets or fixing existing ones. The motivation behind this approach is that although all markets are dictated by the law of supply and demand, in real life various markets work under different rules and procedures that influence their function, making them perform either good or bad. The goal of the economic designer is to establish or correct such mechanisms, using insights from game theory and experimental economics. Alvin E. Roth is a prominent figure in this field and won the Nobel memorial prize in economics with Lloyd S. Shapley in 2012 “for the theory of stable allocations and the practice of market design”<sup>1</sup>.

The main developments in economics and tools used in market design are Game theory and experimental economics (Roth 2007: 118). In this sense, laboratory experimentation serves not only as just a plain theory test, but rather as a test for real life applications. Experiments help to bridge the gap between the conception of a market and its implementation.

The attributes that are essential in the performance of a market are its thickness, which refers to the sufficient participation of individuals, its congestion, which can

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1 [www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/2012/](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2012/)

arrive from thickness and needs to be minimal in order for the transactions to be as fast and fluid as possible, and its safety-simplicity for the participants (Roth 2008:286).

The market designer essentially is for economics, what is the engineer for physics (Roth 2002). Especially using the means of the internet and auction theory, successful applications of market design have existed in the medical labor market (see Roth 1984), high school admissions (see Abdulkadiroglu, Pathak and Roth 2005), the auctioning of radio spectrums by the U.S. government (see FCC 1997), even in kidney donor exchange (see Roth, Sönmez and Ünver 2005)<sup>1</sup>. Roth and Shapley's work, although based on general theories and principles, it is definitely dependent on each particular case.

The focus towards experimentation in general and market design in particular illustrates how economics as a science has partially abandoned the vastly generalized theoretical research and in contrast has turned towards empiricism while it is addressing practical matters. It is critical to point out though that even as these economists study markets, how they work, how they fail and how to fix them, their research is exclusively over non-commodity markets.

Markets who work through the mechanism of price are considered ideal. The price where supply meets demand, acts as a mean and tool for choice. Labour markets for example require engagement and persuasion between the two parties, while commodity markets are faster, easier and anonymous. Thus the epitome and aspiration for every market is for it to function as the highly regarded by economists financial markets.

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<sup>1</sup> For a longer list of applications see A.E. Roth's Nobel lecture.

## **4. Modern Finance**

### **4.1 Efficient Market Hypothesis**

The rationality of the marketplace, which is a doctrine in economics as discussed this far, is most dominant and widespread in the field of finance as the Efficient Market Hypothesis (EMH), a theory developed independently by P.A. Samuelson (1965) and E. Fama (1963,1965a,1965b) in the 1960s, but popularized by Fama in the 1970s<sup>1</sup>. It is based on the random walk hypothesis and assumes three forms of efficiency, weak, semi-strong and strong (Fama 1970). The hypothesis assumes that the prices of the traded assets in a financial market incorporate available information, from the already past information securing weak efficiency, to the most secret and “inside” information thus providing strong efficiency. The average semi-strong efficiency is the one most accepted, as it means that current prices incorporate all past information and will instantly change to reflect any new but unpredictable information that become available.

All the above mean that investors can't predict future performance based on past performance (weak form), they can't profit from any available public information like announcements and reports even after their release (semi-strong form), nor they can expect profits from inside trading, since even that information is reflected in the asset's price (strong form). During the 1970s the theory went through thorough testing and eventually it was concluded that “There is no other proposition in economics which has more solid empirical evidence supporting it than the efficient markets hypothesis. That hypothesis has been tested and, with very few exceptions, found consistent with the data in a wide variety of markets” as Michael Jensen (1978:95) argued.

The random walk hypothesis for which Fama (1965a:98) stated that it is supported by “strong and voluminous evidence”, can be dated back to the French economist Jules Regnault (1863) who first suggested a modern theory of stock price changes and used a random walk model, and Bachelier (1900). Generally the theory that

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<sup>1</sup> As an idea it can be dated back to G.R. Gibson (1889:11) which stated that when “shares become publicly known in an open market, the value which they there acquire may be regarded as the judgment of the best intelligence concerning them.”



stock prices are characterized by random movements<sup>1</sup> was proposed by Kendall and Bradford Hill (1953), while Roberts (1959) went on and demonstrated how a time series created from a sequence of random numbers looks identical to the prices of U.S. stocks. In the end what this hypothesis proposed was that past stock prices are irrelevant in predicting future movements, since those movements are dependent only on new information that are expectedly random. Fama (1965b:76) using this idea, he expanded it further by asserting that efficiency means that the randomness revolves around the “intrinsic value” of the security and its real time price is a “good estimate” of that value.

The early empirical research for the random walk hypothesis supported weak market efficiency, while semi-strong and strong efficiency testing was made possible with the “Capital Asset Pricing Model” by Sharpe (1964) and Lintner (1965), an offspring of Markowitz’ (1959) portfolio model. Fama, Fisher, Jensen and Roll (1969) and Ball and Brown (1968) were the first such studies, which all of them gave strong support for semi-strong market efficiency. Since those first studies, numerous papers have demonstrated that early identification of new information can provide substantial gains, which translates to inside trading being profitable, violating the strong form of efficiency. What killed the strong form was the paper by Grossman and Stiglitz (1980)<sup>2</sup>, which also spawned further literature on “information externalities”. Still though, financial professionals do not appear to beat the market (Dimson and Mussavian 1998: 5).

Burton Malkiel (1973) popularized the theory to the investing masses, while Sharpe did it for Wall Street by creating a simple measurement of risk based on past volatility named “beta”, which was used to create portfolios. That device was significant because in an efficient market the only possibility to outperform the market is by taking excessive systematic risk (beta) and “getting lucky” (Malkiel 2003:60). Various indicators were also proposed to measure a financial manager’s performance, like Treynor’s (1965) ratio, Sharpe’s (1966) ratio and Jensen’s (1968) ‘alpha’.

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<sup>1</sup> Daily fluctuations are characterized as noise, and are the depictions of various, but massive in total volume, actions of investors, who use the exchange for their own individual reasons often unrelated to the emergence of new information (Black 1986).

<sup>2</sup> Fama (1991:1575) flat out agrees that strong form efficiency is false since it requires zero cost for information.

The biggest consequences of rational expectations and the EMH were the strengthening of the argument against government intervention, the development of various products and theories in the financial markets, but also the creation of significant pricing models, like the famous one by Black and Scholes (1973) and Merton (1973) (see MacKenzie 2006). MacKenzie and Millo (2003) illustrate how all these pushed further the financial evolution by describing how the Chicago Board Options Exchange (CBOE) came to be.

After the crash of 1929, speculation on prices was stigmatized, and even certain financial transactions were illegal in the U.S.A. as they were considered the same as gambling. The Securities Exchange Commission (SEC) was then established to regulate the market and make sure that a similar event won't happen again. By the 1960s, that regulation had slowed down exchange and barriers were established, which the Chicago Board of Trade (CBT) met when it first considered a new market for Options.

The solution then came from the science of economics and econometrics which demonstrated how prices could be modeled effectively and the US stock exchange was an "efficient market". Then Malkiel and Quandt (1969) argued that options were not only unjustly opposed, but also a "rational" and useful tool for any investor, despite any possible market inefficiencies. CBT hired consultants that supported the same idea (see Nathan Associates 1969), and from that point on SEC started to weaken its stance until William Casey was appointed as chairman by the Nixon administration, which favoured less government intervention. The CBOE opened in 1973<sup>1</sup>.

The Black Scholes and Merton model gave more legitimacy to hedging and efficient pricing, strengthening the argument against notions of gambling in financial markets. And although the pricing model was slow in its adoption in the trading floor practice, it eventually became so widespread and more successful in predicting market prices that it raised questions regarding whether it eventually acted as a self-fulfilling prophecy (see Rubinstein 1985,1994).

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<sup>1</sup> An interesting fact regarding the creation of CBOE, is that it was based on the collective and altruistic effort of its first participants. It also went on to be such an effort even after its members' number grew (see MacKenzie and Millo, 2003: 116-120).

For individual investors specifically, the existence of market efficiency meant that no-one should bother trying to beat the market, unless maybe if he has inside information. That gave rise to the passive investment in index funds<sup>1</sup> which are collective investment schemes aimed to replicate a specific market index, like the Wilshire 5000 or the S&P 500. This way the investor isn't expecting the performance of a specific stock but rather the collective performance of a whole economy.

Generally, the theoretical basis of EMH lies in rationality and wealth maximization. For a market to be able to be efficient, it means that either all of the participants in the market are rational individuals with perfect information or that their irrational behavior is random and so it is canceled in aggregate.

After irrationality became accepted as a widespread and predictable systemic phenomenon, the theory stands using only the assumption that the majority of smart and rational individuals will sweep to take advantage of any chance of arbitrage created by the irrational ones,<sup>2</sup> eventually leading them out of the market, so in the end the market acts as if it is constituted only by rational participants in equilibrium. That is an assumption that originates in Friedman (1953).

The exclusion of individuals that don't act optimally has already been expressed through the Experimental economists' view. The pluralism and volume of individuals, their knowledge and the sufficient timeframe are all objections for the validity of lab experiments because those are the attributes that differentiate them from real life markets. Still though, this type of exclusion of investors demonstrates clearly the shift that has happened in economic mainstream after the criticism from psychologists. Since economic irrationality could not be characterized as random individual behavior and be disregarded as before, now it is disregarded only as a behavior that won't last in a market setting.

Competitive markets in general have their limitations in correcting irrational behavior. Akerlof and Yellen (1985) show how deviations from rationality can have

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<sup>1</sup> The first index fund for institutional investors was started in 1971 by Wells Fargo Investment Advisors (now Barclays Global Investors) in San Francisco. The first such fund for retail investors -the Vanguard Index Trust - was launched five years later (Justin Fox 2002).

<sup>2</sup> Irrational traders are termed as 'noise' traders.

important impact in a market, while Haltiwanger and Waldman (1985) and Camerer (1987) find that in various types of market settings the reduction of irrational behavior doesn't happen and even sometimes it is amplified. Fehr and Tyran (2005) separate the different effects rationality and irrationality make in a market setting, and refer to the determinants of which will dominate, as “strategic substitutability” and “strategic complementarity”. The only exception could and is expected to be the financial markets.

In the financial markets, traders in their chase for profit rush to take advantage of any new information that they have, and for that to be reflected instantly on prices it is also required for trading to be costless and markets to be ‘frictionless’. Both of these requirements, aggregate rationality and frictionless markets, are subjects of debate and are also disputed by behavioral finance.

## **4.2 Anthropology of Financial Markets**

Before delving deeper into behavioral finance, it seems important to examine what is the status inside the financial institutions through the investigation of social studies in financial markets<sup>1</sup>. By such it will be easier to understand how the people inside them function and under which conditions, since most of the research is been done by scientists working side by side with them. This is critical, because as R. Shiller (2000, 2008) has pointed out, to better understand human behavior we have to first understand the institutional setting. The two characteristics where research focuses are the relationships and networks of communication within those institutions and the ways and norms of behavior of the people inside them, both of which relate to the rationality and the constraints on each individual within a market.

The first and foremost important observation regards the web of social networks. Hertz E. (1998), for example, spent time with traders in Shanghai's Stock Exchange and reported on those cultural, historical and socioeconomic foundations that formed the actions of the traders while giving extra attention on the struggle between big players, small players and the state which controls the market. Abolafia M. (1996), on the other hand spent time in Wall Street where she also saw how the social network between

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<sup>1</sup> In this case economic anthropology (see J.G. Carrier 2014).

traders affected the actions even of the most aggressive ones, despite the free market and competition rhetoric.

Knorr Cetina and Bruegger's work (2000,2002) is even more fascinating since they explore how such networks form and function in a global scale. The traders in their study appear to create "relationships" with their objects of work, like their cell phone and computer, making the market look like a sum of couples characterized by the traders' expectation of reward from a screen.

Moving on to ethnographic research inside the derivative markets of Chicago and London, one can observe how technology has affected traders' performance and perception. Zallom (2003) points out how numbers in the trading place, which should signal the transparency of information, are a vague standalone entity. Traders in both markets have actually little information about what they are trading and no perception at all about the economic factors that shape those numbers. Transaction by itself is a mechanic activity.

More specifically, in Chicago, the successful trader is the one that can handle the chaos of the trading floor while thinking and logically calculating his transactions as little as possible, since that is regarded as a hindrance. In London on the other hand where each trader is sitting in front of a computer, despite the instant access to information the traders not only have lost the vibe of the trading floor but most importantly they have created a culture of interpreting alleged patterns about the movements of the numbers on the computer screen. The successful trader here is the one that can see such patterns and explain them effectively.

Finally in Japan, Miyazaki H. (2003) worked among arbitrageurs and noted how when they saw an opportunity for arbitrage they entered the dilemma of whether to improvise and instantly act so to not lose their chance, or to perfect their strategy and lose precious time. Riles A. (2004) worked in the same market but among government regulators<sup>1</sup> during a transition period between two settlement systems. The "Designated Time Net Settlement" (DTNS), by which banks transacted with each other during the day but the net results were accumulated only at a specific time, and the newer and

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<sup>1</sup> An interesting fact is how these people referred to the Bank of Japan as "their Mother".

more dynamic “Real Time Gross Settlement” (Real Time). Riles noted the radical changes that followed. She pointed out how in the former system the regulation and individual responsibility between banks was encouraged, while the DTNS was characterized as restraining risk and promoting planning. Real Time, on the other hand, was essentially a track record for the markets and it stopped analysis while also representing a shift from the virtues of planning to the “vagaries of risk”.

### **4.3 Behavioral Finance**

Behavioral finance refers to research on financial markets from a broader social science perspective that takes into account the details of human behavior, including psychology and sociology” (Shiller 2003: 83). Investors through this perspective don’t act as rational individuals, but they are rather subjected to various psychological factors like fear, hope, confidence, optimism, etc., also information isn’t freely available and markets are subjected to frictions. Such observations oppose challenges for the efficient markets model.

#### **4.3.1 Market Anomalies**

Cases where empirical evidence seem to suggest violations of market efficiency are termed as ‘Anomalies’, and their examination which started to cast doubt over market efficiency boomed after the late 1970s<sup>1</sup>. Even Fama, to his credit, mentions such anomalies in his famous 1970s paper, although he regards them as too small to matter. Behavioral finance contributes to this research by trying to explain these anomalies using insights mainly from psychology<sup>2</sup>, and Shefrin (1998) categorizes the relevant factors into three broad themes: Heuristic-driven bias, Frame dependence and Inefficient markets.

Usually anomalies arise through examinations that use pricing models like the CAPM and unfortunately this makes their conclusions vague since each anomaly could either mean failure of theory, or failure for the experimenter’s tool, e.g. the CAPM. This

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<sup>1</sup> Siegel (2002) provides a thorough discussion over many of such anomalies and the evidence for them.

<sup>2</sup> Behavioral finance as its parent behavioral economics, are products of the interdisciplinary approach that began with the cognitive revolution. As such, insights from relative sciences like sociology are also considered.

problem was mentioned by Fama (1970,1991) as the ‘joint-hypothesis problem’, by which, because testing the theory is jointly done by making extra hypotheses about the equilibrium expected asset returns, like the investors’ risk preferences, or the information structure, all of them can be pointed out as the reason a research fails the empirical test. It is also worth mentioning that the CAPM measures efficiency by comparing between different asset prices without taking any notices about the fundamentals.

Adding to this, some interesting findings regarding these anomalies are that some of them tend to be dependable on the sample period and many of them disappear after they are revealed, while investors exploit their implications. Some of the most famous of such irregularities are mentioned by Schwert (2003: 941-949): The well-known “size effect” (see Banz 1981 and Reinganum 1981), by which the small-capitalization firms in NYSE earned higher average returns during the period of 1936-75, than the CAPM predicted<sup>1</sup>. “The turn of the year effect” (see Keim 1983 and Reinganum 1983), by which a lot of the irregular returns of the small firms happen during the first two weeks of January<sup>2</sup>. “The weekend effect” (see French 1980), by which stock returns on Mondays are significantly lower than those of the preceding Friday, and the famous “momentum effect” (see De Bondt and Thaler 1985), by which stocks with low returns for the past few years tend to have higher average returns in the future years, essentially doing better than past stocks that were ‘winners’.

“Momentum effect” is related to “mean reversion” (see Poterba and Summers 1988, De Bondt and Thaler 1989) whereby a long period of underperformance is followed by a period of overperformance around a mean, and vice versa. This fact leads to the contrarian investing strategy where someone is looking for stocks that underperformed in the past and are expected to keep underperforming, or overperformed in the past and are expected to keep overperforming (see Lakanishok, Shleifer and Vishny 1994). The mirror effect of this was illustrated by Jegadeesh and Titman (1993), where buying winner stocks that have been performing for a couple of

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<sup>1</sup> Fama and French (1992) made the same observations, and their response was to expand the CAPM, by adding size and value factors in addition to the risk factor of the CAPM, effectively making their “three-factor model” (see Fama and French 1992,1993).

<sup>2</sup> Such market inconsistencies that appear in certain periods within the years are termed as seasonalities.

months and holding them for a period of a few months more, is an effective strategy to beat the market. In this latter case, investors exploit the short term market trend.

Explanations for such price movements have been offered and revolve around psychological interpretations regarding the overreaction, i.e. the overconfidence and pessimism of the crowd (see De Bondt and Thaler 1985,1987, Shiller 1984). Such psychological factors can also lead to excess volatility that can't be explained by the efficient markets model as Shiller (1981) and LeRoy and Porter (1981) first argued. Shiller's paper is pretty revealing since it shows how the eventual dividends of stocks, that were supposed to be the "fundamental value", fluctuate less than the initial stock prices. The standard deviation of stock prices was five times larger than the standard deviation of the discounted dividends. .

De Bondt (1998) in his survey places anomalies into four classes that have to do with the investor's perceptions of the stochastic process of asset prices, investors' perceptions of value, the management of risk and return, and trading practices (see De Bondt 1998:832-833). In the same paper he also presents how many people discover naïve patterns in past price movements, share popular models of value, they are not properly diversified, and trade in suboptimal ways (De Bondt 1998: 831).

It's pretty clear how this psychological perspective started to emerge some time after Kahneman and Tversky released their revolutionizing papers. What followed was the incorporation of such insights into financial theory, especially delivering criticism on the rationality and the free markets assumptions, slowly creating the new field of behavioral finance which its birth Shiller (2003:90-91) places in the late 1980s, early 1990s. At the time, along with R. Shiller, the economists R. Thaler, H. Kunreuther, J. Lakonishok, W. De Bondt, M. Statman and H. Shefrin also begun to publish research relevant to behavioral finance (Olsen 1998:10).

Two of the most relevant cognitive biases for finance, are overconfidence and overreaction, these refer to the unreasonable confidence on ones abilities (Taylor and Brown 1988) and the unreasonable reaction to unexpected news (De Bondt and Thaler 1985). Overconfidence in particular is a problem in human judgment, because it creates



miscalculation of probabilities and odds (see Fischhoff, Slovic and Lichtenstein 1977) and it is also presented as unrealistic optimism about the future<sup>1</sup> (see Weinstein 1980).

Harrison and Kreps (1978) were among the first to put this bias in a financial perspective. They assumed confident investors with heterogeneous beliefs which are willing to overpay for an asset, because they expect that in the future someone will value the same asset more than them. The difference between the price that the investor pays and what he discounts as the asset's expected dividends is the speculative premium, which represents the motive of the investor and is actually a mini bubble.

Such an observation actually makes sense, because if everyone was rational and that was common knowledge, how could there be any trading? Or as Milgrom and Stokey (1982:17) put it, "it is common knowledge [...] that the equilibrium trade is feasible and individually rational", so risk-averse traders "at a Pareto optimal allocation" that receive private information "they still can never agree to any non-null trade". The fact that the volume of everyday trading is globally massive, is an indication of lack of textbook rationality.

Overconfidence as already mentioned is related to market under- and overreactions (see also Daniel, Hirshleifer and Subrahmanyam 1998). In a market where the participants are overconfident, there exists "increased expected trading volume", "market depth", and decreased "expected utility of overconfident traders" (Odean 1998: 1887). Investor overconfidence specifically can lead to too much trust to the individual's predictive abilities, which can also result to weak diversification of portfolios and increased volume of trade, both of which are not optimal strategies<sup>2</sup>. Men especially have been found to be more prone to overconfidence and excessive trading than women (see Barber and Odean 2001).

Overreaction is also a bias, and Shefrin (1998) relates it to representativeness and the use of stereotypes. It is a violation of Bayes' rule, and it refers to people's tendency to overweight recent information and underweight prior data and events. As such, overreacting to unexpected and dramatic events causes mean reversion (De Bondt

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<sup>1</sup> Such a bias can lead to unreasonably risky choices (see Shepperd et al. 2002).

<sup>2</sup> Why excessive trading is hazardous for the investor's performance, see Barber and Odean (2000).

and Thaler 1985). The question is whether overreaction can be a sufficient explanation for the behavior in stock prices and returns and if it poses a sign for market inefficiency. In the former question De Bondt and Thaler (1985) answer positively, although their results are under debate (see Jegadeesh and Titman 1993), while Fama and French (1991) are pretty dismissive of momentum and other anomalies as threats to market efficiency and point out that price variations could also be rational reflections of expected returns through time. They also created a three-factor model (see Fama and French 1996), which they believe can answer for the overreaction evidence from the efficient markets' point of view.

If overreaction though was the norm, then EMH would have been already dismissed and replaced by a behavioral overreaction model. But as often people overreact, they also under-react, especially to news like stock earning announcements in a period of one to twelve months (see Shleifer 2000:112-127). Underreaction to news has as a result slower incorporation of new information to market prices, while overreaction, which is present in a yearly time horizon, causes overpricing. Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998) and Hong and Stein (1999) have tried to create behavioral models that contain overreaction in the long run and underreaction in the short run.

Still though, as people seem to overreact and underreact in a similar way, Fama (1998) rightly questions if, in the long term, such observations are significant enough for the EMH to not be a viable model and be discarded, especially in the absence of a better alternative theory. Thaler (1999) also appears to agree, although he points out the empirical validity of behavioral finance, especially in explaining areas most at odds with theory, like market volatility, trading volume, the relevance of dividend policy<sup>1</sup>, the equity premium puzzle<sup>2</sup> and of course predictability.

As already elaborated in the previous chapters, the notion of systematic irrationality has already been established. Bounded rationality, bounded self control,

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<sup>1</sup> Why most large companies pay cash dividends, while due to taxation (in the US) it would make more sense to repurchase shares, and why stock prices rise when dividends are initiated or increased?

<sup>2</sup> The difference in return between bonds and equities is so large that it couldn't be explained by risk alone (see Mehra and Prescott 1985). M. Weitzman (2007) showed how uncertainty and fear about unexpected events makes the risk for stocks even larger.

social interested etc., all are good arguments against the individual rational investor, but for finance what is far more important, are the implications of such irrationalities on the markets. Also the implications of the barriers that exist in the markets due to such irrationalities, that support the perseverance of suboptimal outcomes and hamper market correction. Behavioral finance focuses then on specific feedback models, and also points out to the limits of arbitrage

### **4.3.2 Limits of Arbitrage**

The second type of criticism from behavioral finance targets the “free” markets, and evolves around the apparent difficulties in weeding out irrationality through the market mechanisms, i.e. the limits of arbitrage.

Arbitrage is the exploitation of a price imbalance between different markets for the same product. Related to this are “the Law of one price” (LOP) which states that “a good should trade for the same price in all locations” (Mankiw 2011: 686). It also applies on different assets with identical cash flows, and in the case of derivatives the price is a discounted future value. Billingsley (2005:4) notes how arbitrage, hedging, and the Law of one price are the backbones of asset pricing in the modern financial markets.

The main argument of behavioral finance regarding arbitrage is that although a price imbalance may exist and people can see it, markets work in such a way that profit cannot be made<sup>1</sup>. That is because despite what theory demands, arbitrage is not riskless and not free. But also arbitrage is mostly done by a relatively small number of professionals who put in their own knowledge but manage the capital of others.

Barberis and Thaler (2003) point out three different reasons that arbitrage is limited:

a) The fundamental risk, which refers to the basic risk that traders face of having unexpected news that will negatively affect their position. Of course the trader should look for ways to hedge his choice, but in reality there are no perfect substitutes, eventually leading to taking some kind of risk.

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<sup>1</sup> The case of Royal Dutch Shell (see Froot and Dabora 1999) is an extremely interesting case of a persistent mispricing

b) The noise trader risk, which is the risk of a mispricing to get even worse because of the mass of irrational traders will get even more optimistic/pessimistic, inflicting even short term losses to the trader.

This is extremely critical. In models where traders are independent, their actions are getting more aggressive as prices deviate from fundamental values (see Grossman and Miller 1988), in the case though where the trader acts as a manager of other people's money, those people, as long as the bet is not paying off and the trader is losing money may decide to back off, release the trader as incompetent, and actually lose money on a trade that had its expected return increased (see Shleifer and Vishny 1997).

Being a competent trader is to understand what others think is important<sup>1</sup> and surf the trend. The most extremely important aspect is the incentive of the traders to "jump the bandwagon" and bet on the further expansion away from the fundamental value in order to profit from the short term feedback traders, who will also participate in the same way, essentially all rationally inflating the destabilization (see De Long et al. 1990b).

Being a great trader though would be to know how the trend is wrong and stubbornly go against it, but by doing that, the great trader would look no different than a bad one who just can't understand or find a trend. In the end since everyone is judged the same, at least in the short term, the great trader is punished equally as the bad one. The result is that just the competent ones end up trading.

Such a risk can actually remove rational individuals from the market when they are most needed and it can also incentivize money managers to act sub-optimally, in order to impress or mislead their investors (see Lakonishok, et al. 1991, Allen and Gordon 1993).

Of course, even if the rational traders weren't under the command of irrational investors, still their ability is bounded by the liquidity they possess. In this way arbitrage can be quite profitable and effective when the mispricings are small, but in those extreme circumstances where the prices are too far from fundamental, and

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<sup>1</sup> In the way that Keynes (1936:156) described the markets as a beauty contest.

arbitrageurs are needed the most to stabilize the market, then arbitrage becomes extremely difficult and its effect is at its weakest. Abreu and Brunnermeier (2003) point out a synchronization problem, by which arbitrageurs fail to eliminate a bubble in time because of their difficulty to coordinate their selling strategies. Individual arbitrageurs apparently make money only on average and not always, and that also means that they would also prefer to have an active presence in markets with limited volatility, as long as they are risk averse.

Related to that, De Long, Shleifer, Summers and Waldmann (1990a) showed how because of uncertainty, non-rational traders can outperform rational ones in an overlapping generation, by taking a disproportionate amount of risk, because rational traders are unwilling to bet against them in case they don't live enough to see their bet paying off.

c) The various implementation costs on trades, like transaction fees, commissions, holding costs and legal limitations in "shorting" an asset exist in financial markets. Add to all that and the cost of acquiring the relevant information that points out to the arbitrage opportunity, and it becomes understandable how trading is not exactly cheap.

These arguments of course are challenging the empirical relevance of economic theory, since they remind how even in the freest of markets available, traders are still limited in their capital, there are no perfect substitutes to cover positions and the market is subjected to various barriers and frictions.

### **4.3.3 Herd Behavior**

As it was pointed out earlier when mentioning morality and choice architecture, people do affect each other's behavior, and the anthropological research showed that social networks and interactions are also present in all aspects of everyday life. Social psychology examines how human emotion, thought and behavior is influenced by other people (see Kenrick, Neuberg and Cialdini 2004). Ross (1908) wrote one of the first books on the subject. In it, he also mentions the tulip mania of 1637 in the Netherlands, during which people were willing to sell houses to buy some tulip bulbs. To explain such an event, he argued that it was an occurrence of psychology of the mass. MacKay (1841) believed that people think in groups, while Le Bon (1895) reported that the masses collect the individual mediocrity rather than its intelligence.

People tend to conform to the behavior of their environment (Asch 1956), and social norms dictate individual behavior (see Duflo and Saez 2002). Social interaction occurs through “word of mouth” and/or “observational learning” (see Banerjee 1992, Bikchandani et al. 1992, Ellison and Fudenberg 1995), while “group thinking” refers to a way of reasoning with the opinion of the majority. All of these are of extreme importance for finance.

Behavioral finance then, expands its perspective from the individual psychology, to group psychology, and pays strong attention to the bias of herd behavior<sup>1</sup> as presented into the financial markets. This bias refers to mutual imitation between traders and conversion of action (see Welch 2000, Hirshleifer and Teoh 2003). It is presented as a coordinated movement from a group of individual investors, over a specific investment in a particular point in time.

Scharfstein and Stein (1990) were among the first to examine this behavior among financial professionals, and found how under specific conditions, many of them simply copy the choices of others, ignoring important personal information. Such a behavior appears illogical and ineffective, but under the prism of social acceptance it makes sense, since even a bad choice that was also made by others, is forgiven more easily.

#### **4.4.4 Financial Bubbles**

“A bubble is an upward price movement over an extended period of fifteen to forty months that then implodes. Someone with ‘perfect foresight’ should have foreseen that the process was not sustainable and that an implosion was inevitable.” (Kindleberger and Aliber 2005:29). Economically speaking a bubble is a price that cannot be explained by ‘fundamentals’. The most famous of such bubbles, are the archetypical tulip bubble of 1630s and the ‘Black Friday’ of 1929. While the most

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<sup>1</sup> It is important to distinct between the intentional and the spurious herd behavior, since the first is the result of conformity, while the latter can be a result of rational group action (see Caparelli et al. 2004)

recent and significant for today, are the dotcom bubble of the late 1990s and the U.S. housing market bubble that popped in 2008.

Looking back, as the research of cognitive limitations and the discoveries of various market anomalies were growing, in October of 1987 the DJIA unexpectedly fell by 22,6%. Cutler, Poterba and Summers (1989) motivated by the crash, did a search for any information during the previous decades that could trigger any relevant stock price movements and their cause was fruitless. Only a fraction of the variance in aggregate stock returns could be explained by news and also major market moves often happened when there were no significant news at all. Adding to that, Scholes (1972) had already shown that stock prices move even in absence of information, while Roll (1988) found little correlation between relevant information and price movements. So apparently a similar case of price shift unexplained by information was and the 1987 crash. For a crash like that to happen and not being able to be explained by new information, something must have not worked according to theory.

Vernon Smith et al. (1988) made one of the most famous experiments regarding the formation of bubbles. In a controlled environment where the fundamentals were known by the experimenters and explained to the subjects, what happened was the prices would rise above those fundamentals and crash afterwards. This paper was the initiative for later research in experimental finance, but still such an experiment lacked external validity because after all the market was just a few college kids with a few hundred dollars. But the question that remains is what can be the cause of a price shift that doesn't seem to be explained by a change in information and 'fundamentals'.

For the proponents of the efficient markets, a "bubble" is an empty word. For Fama the latest housing bubble was actually a rational reaction to recession, although how that recession came to be is unexplainable. He also mentions how always people are warning about bubbles although most of the time they are wrong. So essentially something is a bubble only in hindsight, and as such, because it is really something unpredictable, it is irrelevant (see Cassidy 2010).

Robert Shiller, is the person that had forecasted not only the housing market bubble but also and the dotcom bubble. To explain both of them, he turned to

psychological factors, like “irrational exuberance” and “animal spirits” (see Shiller 2000, 2008, Akerlof and Shiller 2010).

Regarding the late 1990s, he mentioned irrational exuberance, the wishful thinking on the part of investors that blinded them from what was actually happening. Stock market prices were held ‘too high’ due to investors’ enthusiasm, rather than rational estimations. People truthful to their herd behavior were investing in the stock market, because everyone was doing it and the prices were increasing partly due to a self fulfilling prophecy that was also being fueled by the media.

Such is a case of a speculative bubble, where investing raises prices, which in turn raises confidence, which will once again increase investing (see Statman et al. 2006). All that, while people who haven’t invested yet, envy the gains everyone else is having and are incentivized to enter the market (see Bell 1982). These increases are deemed to bust as demand alone will stop being enough to sustain them, but despite that, and regardless of people’s understanding of such a fact, people are still willing to invest just for the short term before the bubble pops.

Competition among financial institution can also further fuel such dangerous practices, in a way that Charles Prince<sup>1</sup>, described to the Financial Times in July 2007, as a game of musical chairs, where music is liquidity. Also during the technology bubble, hedge funds tried to ride the bubble instead of standing against it as Brunnermeier and Nagel (2004) found.

Akerlof and Shiller (2010: 59) also explain Depressions in psychological terms as a “crash of confidence, associated with remembered stories of economic failure, including stories of growth of corruption in the years that preceded the depression; a heightened sense of the unfairness of economic policy; and money illusion in the failure to comprehend the consequences of the drop in consumer prices’.

In the end, EMH is actually a useful approximation of the market’s performance. But when it really matters it falls apart, and that is because it chooses to ignore the people’s thought patterns, their changes in confidence and trust, their social preferences,

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<sup>1</sup> Former chairman and chief executive of Citigroup.



the impact stories have on the public perception, and the significance of corruption (Akerlof and Shiller 2010: 167).

Shiller and Fama, along with L.P. Hansen, controversially shared the Nobel Prize in 2013, for their contribution in understanding the financial markets. Despite the differences in the two approaches, it is actually interesting to realize how for the average individual investor their implications are about the same. Both efficient markets and behavioral finance discourage active trading, the first because there can not be any chance for profit and the second because humans are unfit to trade optimally due to their nature.

## **5. Conclusion**

After every major financial crisis, the domain of economics enters a period of doubt, where dominant theories and ideas become the subject of introspection. Before 2009 the field was self assured and everyone was calm during the Great Moderation, while being blind to a chance of a crash like the one we experienced. Based on ages of theoretical background that promoted the idea of rational individuals and efficient markets, financial markets were considered to work near perfectly without any worry about the apparent irrationality of humans. To understand how that belief came to be we went back to the creation of the science of economics and moved towards today.

Historically, all the today's social sciences have a common past. Going back to Adam Smith we saw how psychological notions were incorporated in his ideas, in both the *Wealth of Nations* and *Theory of Moral Sentiments*, especially in mentions similar to altruism and the conflict between conscious rationality and subconscious irrationality. Bentham in the same period also introduced utility, which was highly dependable on introspection and had hedonic qualities.

Both psychological and economical views later, kept being related with the works of G. Fechner and the marginalists respectively, although both in the same time started to depart from each other by adopting different perspectives on what would make each one a science parallel to the natural sciences. That shift was completed with the ordinal revolution and neoclassical economics, and behaviorism in psychology.

Although both approaches are parallel in purpose, they differentiate enormously in practice. Economics turned to theoretical examinations disregarding experimental research, while psychology became highly experimental. Economics had finally evolved to the new neoclassical paradigm, which is characterized by its mathematical formalization, the homo economicus, rational choice theory and normative nature. Criticism over the theoretical realism was tackled by tricks, as the “as if” assumption, by which a theory should only be judged by its effectiveness and not its hypotheses.

Psychology in the 1960s abandoned behaviorism and once again turned its attention back to the research of the mind. From this new cognitive approach, the first major criticism towards economics was made. It came mainly from H. Simon and regarded the bounded nature of individual rationality. Simon also pointed out to the importance of experimental validation for all the neoclassical assumptions, along with G. Katona who pointed out to psychological motivations regarding behavior. Their criticism was ignored as individual irrationality was considered a random phenomenon that will negate itself in aggregate.

Economics at that time thrived on having created a theory of choice that was applicable in situations that expanded the domain of economics. Economic imperialism was at its height and the science was more successful than ever. Although theory lacked in realism, it was big in universality. Psychology on the other hand was committed to realistic examination of human behavior, although it lacked in generality. The two disciplines were at the furthest point from each other.

After the failed attempt by the old behavioral economists, a second attempt was made by D. Kahneman and A. Tversky. This time the psychological criticism was successfully heard, since it pointed out how individual irrationality was not random as it was previously assumed. The paper that made the first impact was “Judgment under Uncertainty” (1974). In it, three heuristics were introduced, the Representativeness, Availability and Anchoring heuristics, along with their respective biases. The heuristics were mental rules that stem from the illogical part of the human psyche and as such they can lead to acts of irrational judgments, especially in miscalculations of probabilities. The groundbreaking characteristic of these is that they reveal how irrationality is systematic, and people en masse fall in the same errors.

The second paper by D. Kahneman and A. Tversky that made a big impact was “Prospect Theory” (1979). In it, they presented experimental appearances of violations of expected utility theory, and offered an alternative theory more in touch with those experimental findings. The loss aversion bias is pointed out and a new utility s-shaped curve is proposed using the “reference point” at its center. Framing is also mentioned, by which the way a choice is presented is influencing the individual’s response.

The psychological research since then will boom. R Thaler, an economist, will write about “mental accounting”, and how people calculate different outcomes, while keep a series of columns named “Anomalies”. Problems regarding self control and its implications on saving will also be examined, along with notions of altruism fairness, social preferences and the role of emotions.

Experimental economics will arise at the same time with behavioral economics and will become the parallel economic approach that will examine individual irrationality and practice experimentation. Despite the similarities, behavioral and experimental economics disagree on the implications regarding theory, since each discipline holds different views regarding the importance of the experimental findings on real life market situations and the field of finance.

In finance the efficient markets hypothesis dominated the last decades, and revolutionized the field by promoting how prices reflect the ‘fundamentals’, while individual irrationality is driven out by the rational traders through the act of arbitrage. Psychological criticism now comes from behavioral finance which gives attention on the various market anomalies, instances of apparent violation of the efficient market model, and the limits of arbitrage. All of which point out to market inefficiency and the appearance of market booms and busts. This last conclusion is what has gained enormous attention after the financial crisis in 2008, which as the previous crash of 2000 was predicted by a behavioral finance professor, Robert Shiller.

It is necessary though to notice an important distinction between behavioral economics and behavioral finance. The latter isn’t defined by its acceptance of psychological interpretation and individual irrationality, but rather by its research that criticizes the EMH. The term behavioral in this sense stuck because it is assumed that

market anomalies, which are studied by behavioral finance, are formed due to psychological biases.

But the field examines anything that poses a threat to EMH, from market anomalies, to informational frictions (which contradict perfect information and help explain why there is so much trading in the world), to noise trader bubble models (which take account of the limits that exist within the markets and allow financial bubbles to appear and persist). These different directions of criticism, although all enhanced by empirical research, are not really dependent on psychological interpretations.

In general, by examining the history between psychology and economics we witnessed how the first definitely influenced and guided modern microeconomics, contributing greatly in the decline of theoretical research and the rise of experimentation and empiricism. Unfortunately though, behavioral economics have not managed to provide an alternative to rational choice theory, although limited theories (as prospect theory) have tried to make sense of the real world. This is the reason behavioral economics appear to have lost steam during the last decades and are not incorporated into mainstream economic theory.

In the state of macroeconomics though, the impact was minimal from the start despite the insight of behavioral finance on asset value, which has important implications on wealth, consumption and investment. After the events of 2008 we expect that to change, and just like what happened in microeconomics, macro-empiricists should influence the change. It also helps that the ‘behavioral’ approach in finance is becoming more and more mainstream day by day, a task easier achieved because of its pluralistic research that extends beyond attacking the assumption of individual rationality. Whether the behavioral movement will eventually topple or just enhance the current state of economics is a matter of debate, but in the end it will definitely shape its future.

The latest empirical approach on trying to understand the human behavior comes from neuroscience. Neuroeconomics is a recent experimental field that scans into the brain of subjects while they are occupied in activities of economic interest. Attention is turned to that direction, especially after the B.R.A.I.N. Initiative in the U.S.A., which is based upon the Human Genome Project that unlocked the D.N.A.

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