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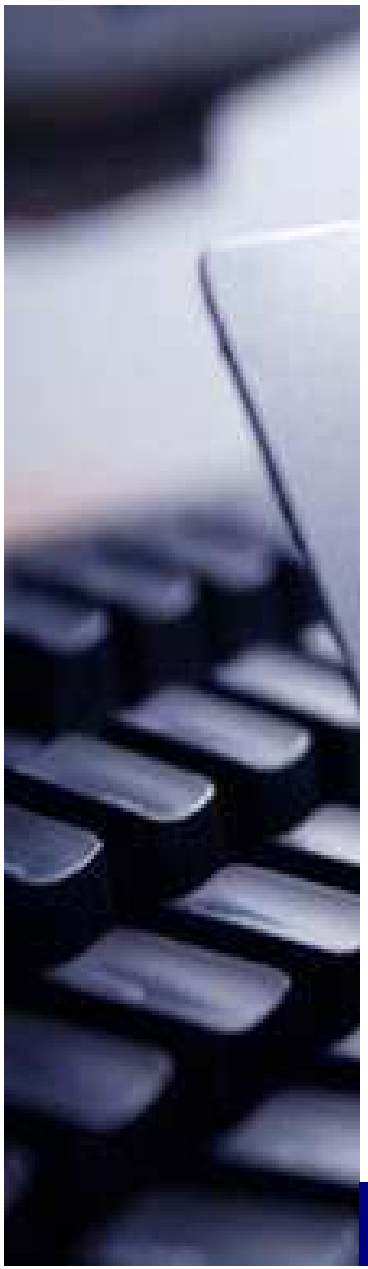


# NEUROECONOMICS AND DECISION MAKING PROCESS

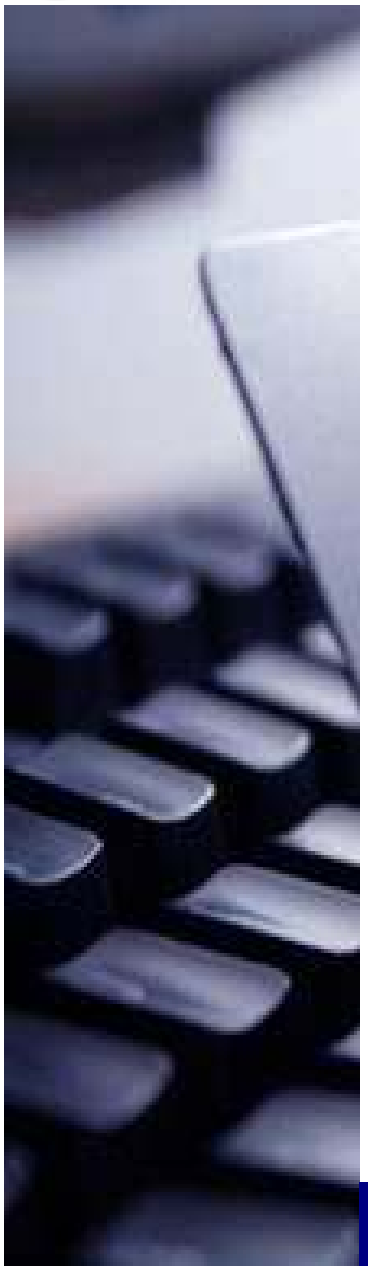
**Mădălina Constantinescu**
***Spiru Haret* University, Romania**
constantinescu_madalina2002@yahoo.co.uk

## Abstract:

Neuroeconomics has further bridged the once disparate fields of economics and psychology. The central thesis of the paper is that the development of behavioral economics in important respects parallels the development of cognitive science – Neuroeconomics has inspired more change within economics than within psychology because the most important findings in Neuroeconomics have posed more of a challenge to the standard economic perspective. The single most important source of inspiration for behavioral economists has been behavioral decision research, which can, in turn, be seen as an integration of ideas from cognitive science and economics. Neuroeconomics has primarily challenged the standard economic assumption that decision making is a unitary process – a simple matter of integrated and coherent utility maximization – suggesting instead that it is driven by the interaction between automatic and controlled processes.

Key-words: neuroeconomics, behavioural economics, affect, behavioral welfare economics, decision making, caeteris paribus.

JEL Classification: A12, D81.

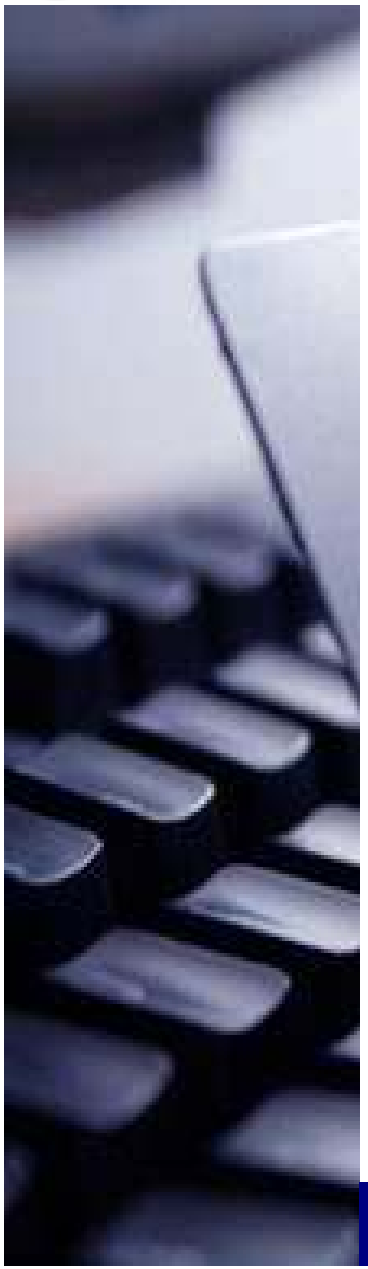


# 1. Aims and scope of the paper

This paper reviews **neuroeconomic** research in areas of interest to both economists and psychologists: decision making under risk and uncertainty, intertemporal choice, and social decision making.

Considerable progress has been made in a couple decades, and increasingly, economists are taking up the challenge of attaching economic theory to psychological foundations.

The findings of behavioral economics appear to offer hope for improving our ability to deal more effectively than heretofore with such complex interdisciplinary matters as health, environmental safety, organizational behavior and national development.



## 2. Review of the Literature

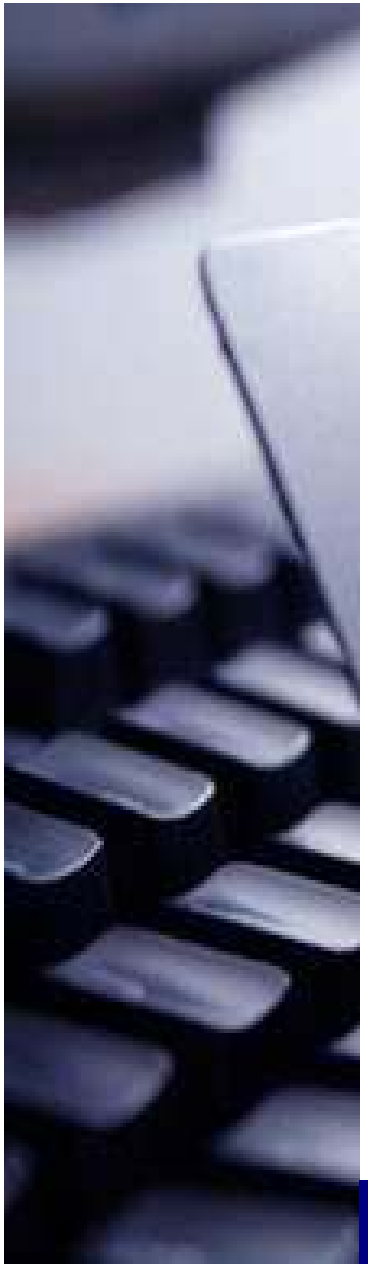
Behavioral economics is an extension that builds on existing foundations, and in that sense, differs from more dissident approaches that would simply deny much mainstream analysis of economic phenomena.

If neoclassical boosters such as Lazear have reason to celebrate, then behavioral economists do as well. In its relatively short lifetime behavioral economists has influenced a wide range of subtopics of economics and allied fields, such as **behavioral law and economics** [Jolls, Sunstein Thaler (1998); Sunstein (2000)] to **behavioral finance** [Shleifer, (2000); Bică and Constantinescu (2007)], **behavioral development economics** [Mullainnathan and Thaler (2000)], **behavioral public finance** [McCaffery and Slemrod (2006)], **behavioral game theory** [Camerer (2003)], and **behavioral macroeconomics** [Akerlof (2003)].

All of these are booming areas of research that not only extend the influence of the ideas coming out of behavioral economics, but also throw back insights and findings that enrich the foundation of the basic science core of the field.

Behavioral economics rests on assumptions about human behavior that reflect the results of psychological studies, and, as they become firmly established, the findings of the other social sciences and biology.

In traditional economic thought, the analysis focuses on how to allocate resources efficiently. That is supposed to maximize welfare for consumers (or the potential of that), enabling consumers to do the best that is possible.



A behavioral approach to economics is essential, not only because the traditional normative model is not entirely realistic – no model ever is – but because the mainstream model does not predict well enough and because its predictions have not been improving much despite major advances in the availability of data, in the creation of programs to deal with data, and in measurement techniques.

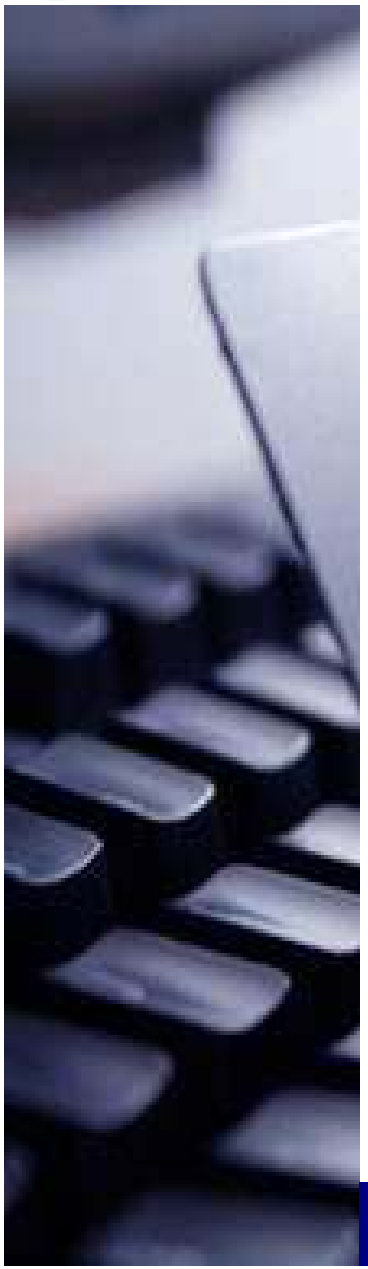
Behavioral economics indicates that there are serious limits to that theory insofar as it describes how humans actually behave. Behavioral economics focuses more modestly on how to move economic behavior away from manifestly poor choices towards better ones – without venturing whether the result comes particularly close to any standard of optimization, which it contends, often is simply not ascertainable, in any event.

Behavioral economics considers whether there are *regularities* in what have been termed *anomalies* – the inconsistencies of what happens in actual life with mainstream economic theory – whether what that theory indicates should happen if we succeed in doing the best possible, fails to occur on a rather predictable basis.

Most behavioral economics has been micro in focus, but some also deals with macroeconomic analysis, most notably with the micro foundations of macro analysis. To the extent that the findings of behavioral economics are incorporated into economic theory, the latter shifts from a purely deductive theory, as has been the case to date, to an increasingly inductive one, relying on empirical findings, much as biology does.

The findings of behavioral economics appear to offer hope for improving our ability to deal more effectively than heretofore with such complex interdisciplinary matters as health, environmental safety, organizational behavior and national development.

# 3. Methodology of research/ approach



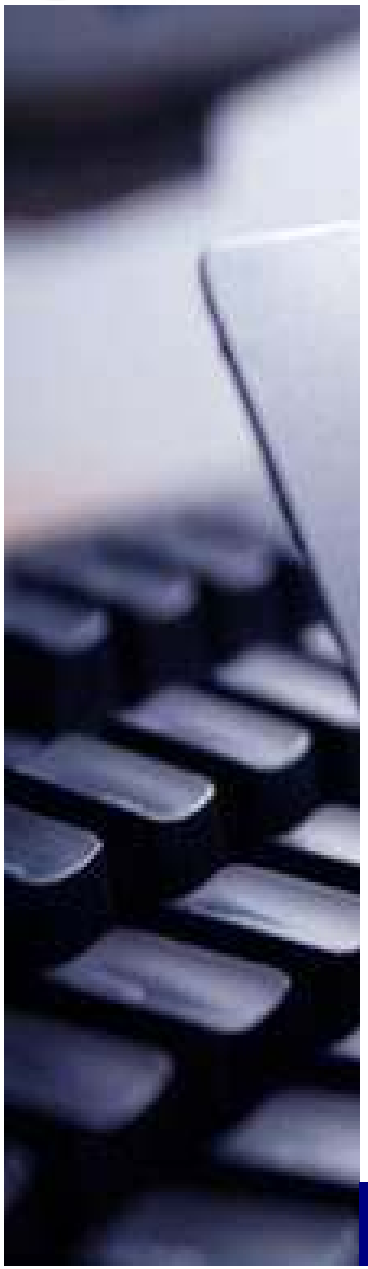
Neuroeconomics explains decision-making as the product of brain processes involved in the representation, anticipation, valuation and selection of choice opportunities.

It breaks down the whole process of decision into mechanistic components: certain brain areas may represent the value of the outcome of an action before decision, other ones may represent the value of the action *per se*, and yet other ones may represent these values at the time of the decision. Although such dispersion of data may appear confusing, economic psychology provides us with a useful framework for understanding the mechanics of rationality at the neural level in a coherent manner.

Kahneman and his collaborators suggest that the concept of utility should be divided in subspecies. While *decision* utility is important (the expected gains and losses, or cost and benefits), decision-makers also value *experienced* utility (the hedonic, pleasant or unpleasant affect), *predicted* utility (the anticipation of experienced utility) and *remembered* utility (how experienced utility is remembered after the decision, e.g. as regretting or rejoicing).

Neuroeconomics should identify neural structures and processes associated with these variables or, if necessary, suggest another typology.

The main contribution of neuroeconomics to decision theory so far is a new picture



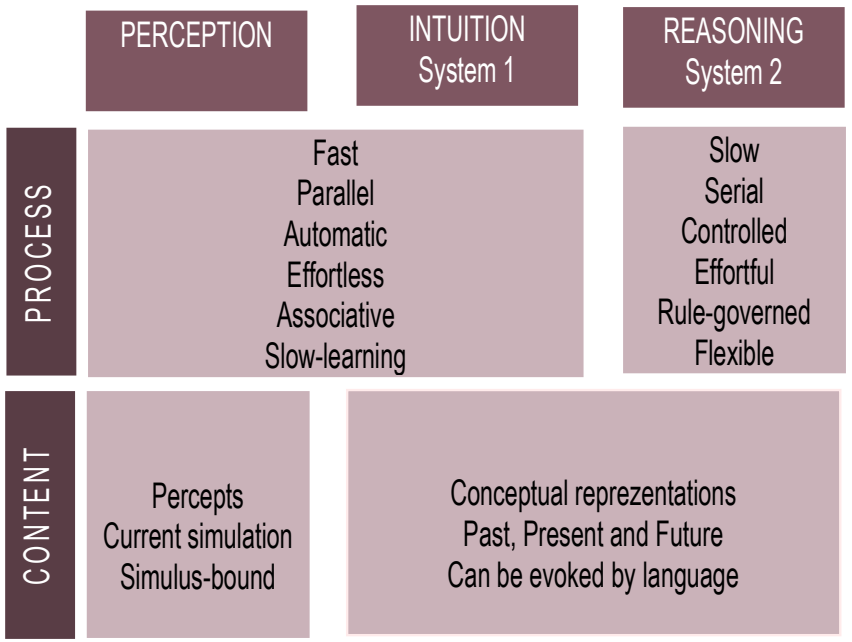
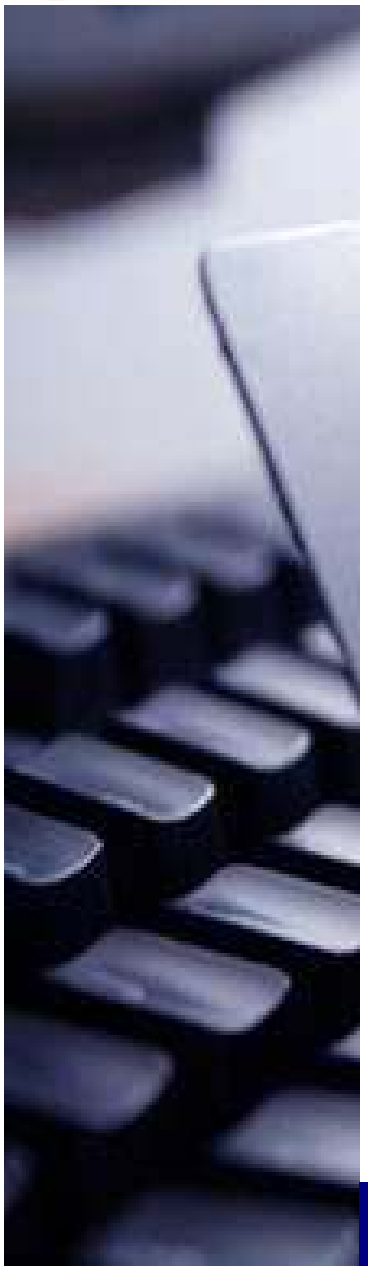



**Figure 1.** Kahneman's description of cognitive processes

*Homo Neuroeconomicus* is a fast decider that relies less on logic and more on a complex collection of flexible neural circuits associated with affective responses.

Everyday utility maximization is more about feelings and less about the objective outcome of a decision: we use emotions to anticipate emotions in order to control our behavior toward a maximization of positive emotions and a minimization of negative ones.

The neuroeconomic picture of individual rationality is thus affective through and through.



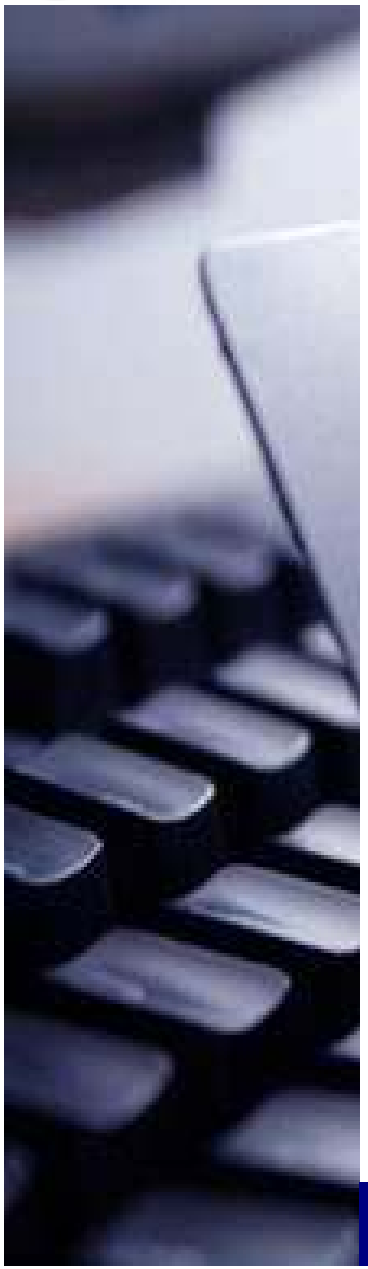
**1. Utility computation in decision making**. Utility is a key concept in economics. Economists assume that people assign a utility for each option and then make choices by comparing these utilities.

One important area where neuroeconomics can contribute is in identifying neural substrates associated with economic concepts and in understanding their psychological functions. Kahneman *et al*. distinguish between "decision utility," which refers to the weight of an outcome in a decision, and "experience utility," which refers to its hedonic quality.

Breiter *et al*. (2001) visually presented several gain and loss prospects and outcomes using different roulette wheel "spinners". With fMRI, these authors found that responses to prospects and outcomes were generally, but not always, seen in the same regions.

Using a gambling task in which the gamble would not be resolved immediately, Tom *et al*. (2007) further show that potential losses (decision utility) are represented by decreasing activity in gain-responsive regions rather than by increasing activity in regions associated with expected and experienced negative outcomes.

Neuroeconomic studies also support previously discovered economic rules concerning utility computation. The expected utility theory proposes that the expected utility of a choice is the sum of probability-weighted utilities for each possible outcome [von Neumann and Morgenstern (1944)].

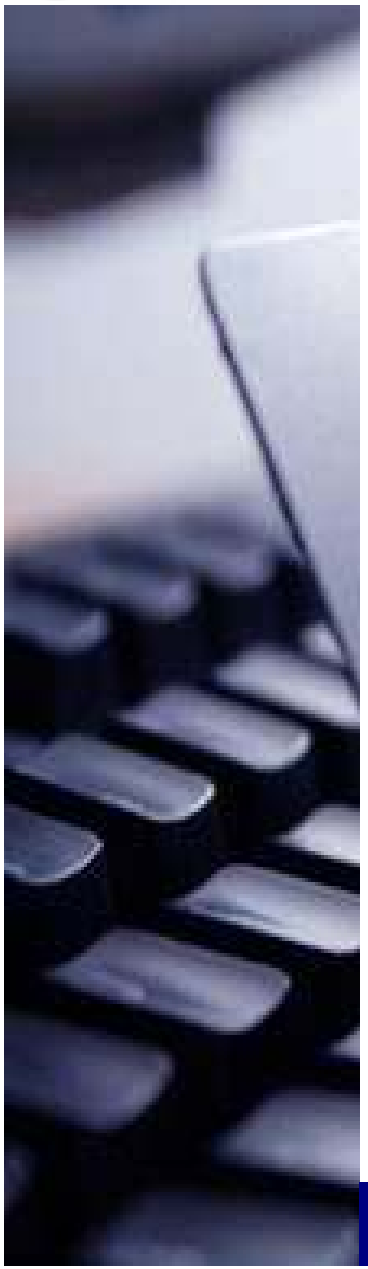


**2. The role of emotions in decision making**. Emotions influence our decisions.

Since it is not easy to measure emotions quantitatively, traditional economic studies usually ignore such influence and leave emotion outside the scope of decision making research. Behavioral economics begins to pay attention to the role that emotions play in decisions.

The regret theory proposes that decision-makers can predict the regret they would experience when they realize that the chosen outcome is disadvantageous compared with alternative outcomes available if they choose alternative choices. The regret theory also states that people would choose options that would minimize future regret [Loomes and Sugden (1982); Bell (1982)]. Neuroeconomic studies on regret support these assumptions.

The role of emotions is also highlighted in the framing effect. The framing effect refers to the phenomenon that human choices are remarkably susceptible to the manner in which options are presented [Kahneman and Tversky (1979); Tversky and Kahneman (1981)].



## 3. Economic decisions in social context.

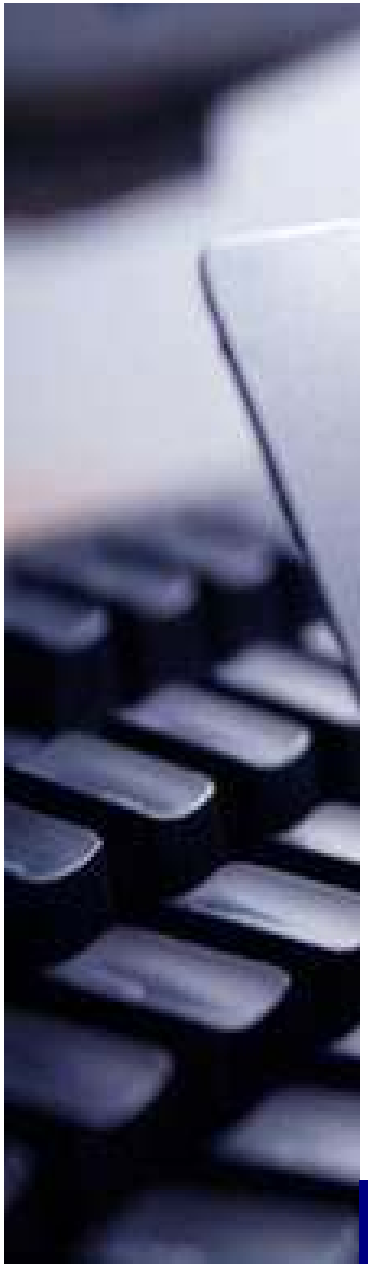
Human always make decisions in social situations

The game theory proposes that people make decisions based on the prediction of others' possible actions and the associated outcomes.

Neuroeconomic studies have found evidence to support this view. Recently, a number of studies showed that decisions in social context are closely related to theory of mind, which is the ability to attribute various mental states to self and others in order to explain and predict behavior.

Cooperation behaviors, especially those that happen among strangers are common but still not well-understood by economists.

Reputation is an important factor that determines our intention to cooperate.



## 5. Results and Discussion

Some economists believe that the work of neuroeconomists threatens standard economics (SE).

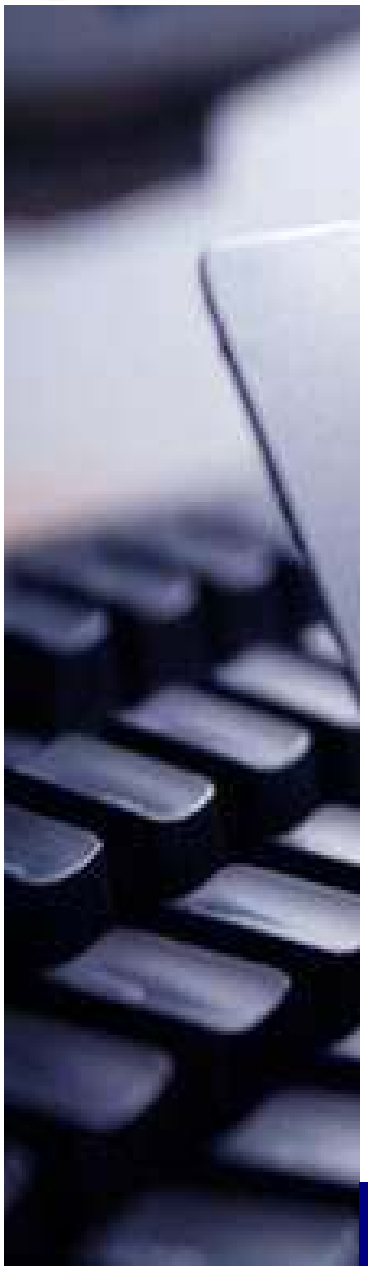
SE is based on the foundation of many great thinkers, including von Neumann and Morgenstern, who established the four axioms of the expected utility theory that is so much questioned these days. SE is based on many assumptions of human behavior that were derived from observing the outcome of human decision-making. Such outcome is available to all economists from government databases and they portray what the population has consumed in the previous months and years.

Contrary to popular belief in many economic circles, neuroeconomics is neither psychology nor the study of functional magnetic resonance imaging (fMRI).

Neuroeconomics is the scientific process of economics by which researchers from many disciplines cooperate and share methods in order to generate various scientific experiments that specifically prompt certain human or animal decision-making processes in order to evaluate the outcome in a controlled environment.

Neuroeconomics contains methods that were developed by psychologists, neurologists, anthropologists, biologists, geneticists, mathematicians, physicists, and many other fields, including experimental and behavioral economists.

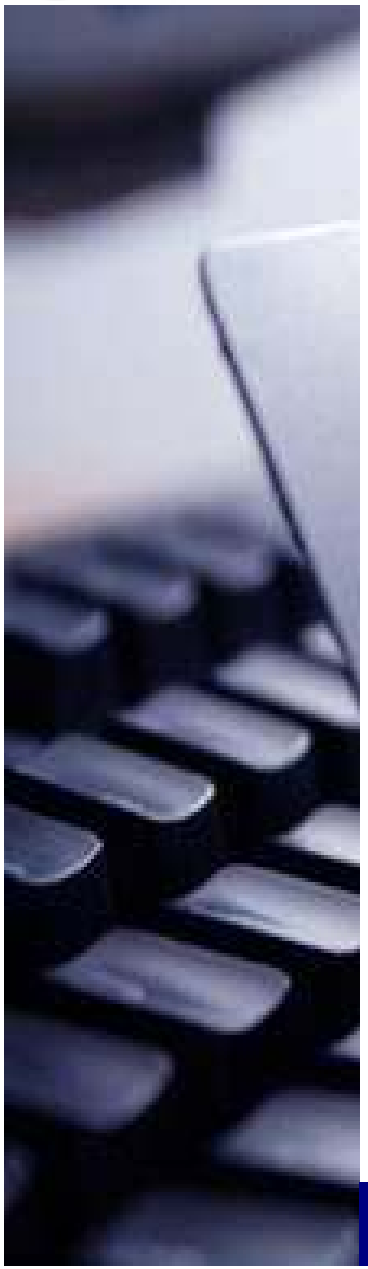
# 6. Concluding Remarks



In conclusion, we should stress that behavioral economics is not meant to be a separate approach in the long run. Nevertheless, behavioral economics is more like a school of thought or a style of modelling, which should lose special semantic status when it is widely taught and used. Our hope is that behavioral models will gradually replace simplified models based on stricter rationality, as the behavioral models prove to be tractable and useful in explaining anomalies and making surprising predictions.

Economics stands only to gain from the tools of neuroeconomics. Of course, similarly to the standard supply and demand model taught in every introductory economics class, the benefits accrue to the average and not to each individual. It is possible that some economic theories will be proven wrong and those who coined them will feel hurt and bruised. On the flip side, there will be many whose theories will be proven to stand taller than ever.

This article reviews three research fields in which the neuroeconomic endeavor can make important contributions to economic theories. Neuroscientific methods offer the promise of identifying neural substrates that support the emotional and high level cognitive process. Thereby neuroeconomics has the advantage of providing direct tests of existing as well as new economic theories. To facilitate the build up of more revealing models of decision making, it should be taken into



Neuroeconomic studies can deepen our understating of various decision making phenomena and the clinic symptoms such as addictive gambling, compulsive shopping, and so on. It also has great applicable implications in areas such as making more effective advertising, building cooperative relationship in economics trade, and designing more reasonable payment protocol to enhance the work efficacy and happiness of workers. But there are several challenges ahead for neuroeconomic research. First of all, each of cognitive neuroscience methods has it own inherent disadvantages [Shiv, Bechara and Levin (2005)].

More importantly, cognitive neuroscience studies usually cannot establish the causal relationship between a pattern of brain activity and a particular psychological function.

Cognitive neuroscience methods, such as fMRI, reveal only a correlation between brain activity and a task manipulation or behavioral response. Such correlations should be taken with caution and must not be misunderstood as a proof of causality.

Furthermore, high level cognitive processes such as cooperation are challenging to emulate and control in the psychology or neuroscience laboratories.

Researchers have to be cautious when they extend conclusions from neuroeconomic studies in the laboratory to the real social life.

Nevertheless, it is clear that although neuroeconomics is still far from opening the “black box” of the brain completely, it offers tremendous potentials to shed new and important insights on the mental and neural processes underlying economic behaviors.

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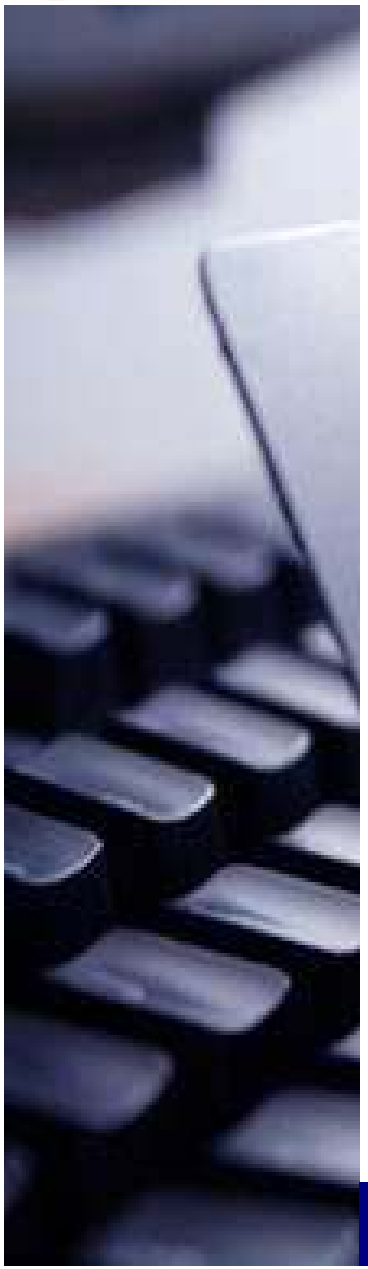


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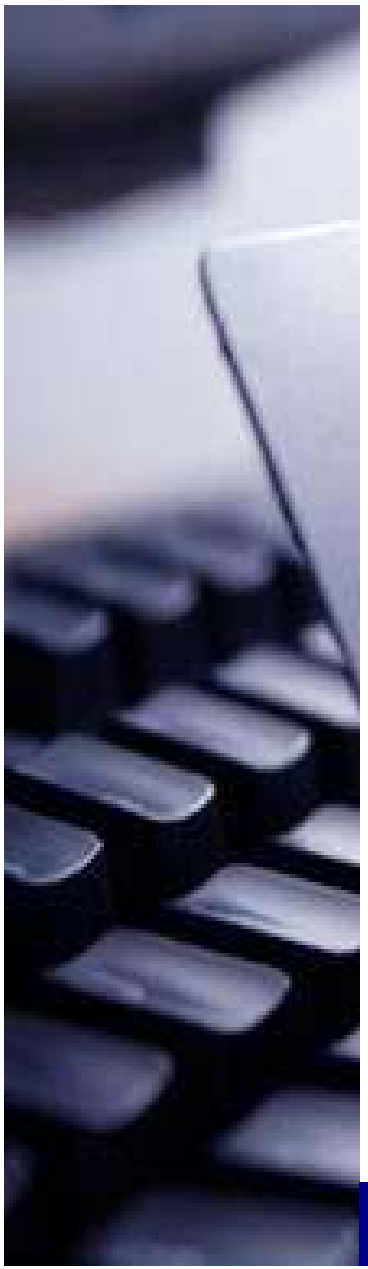

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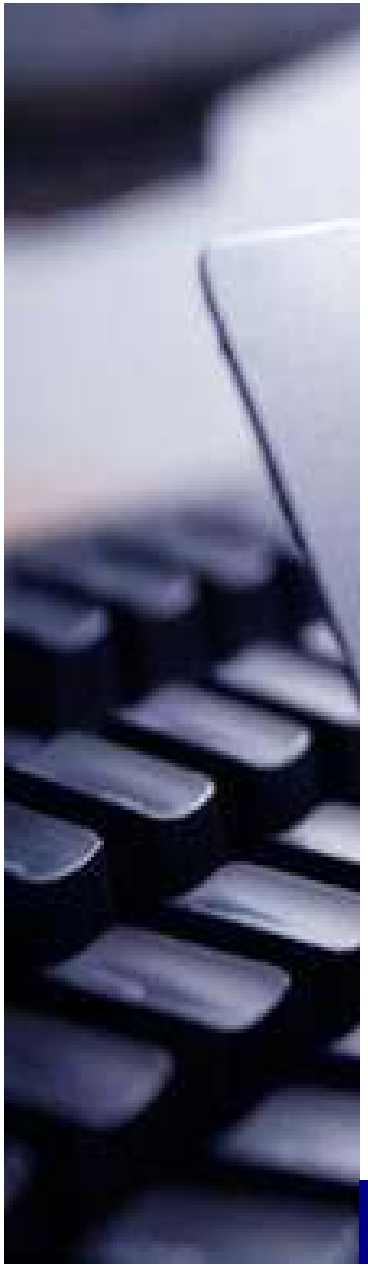

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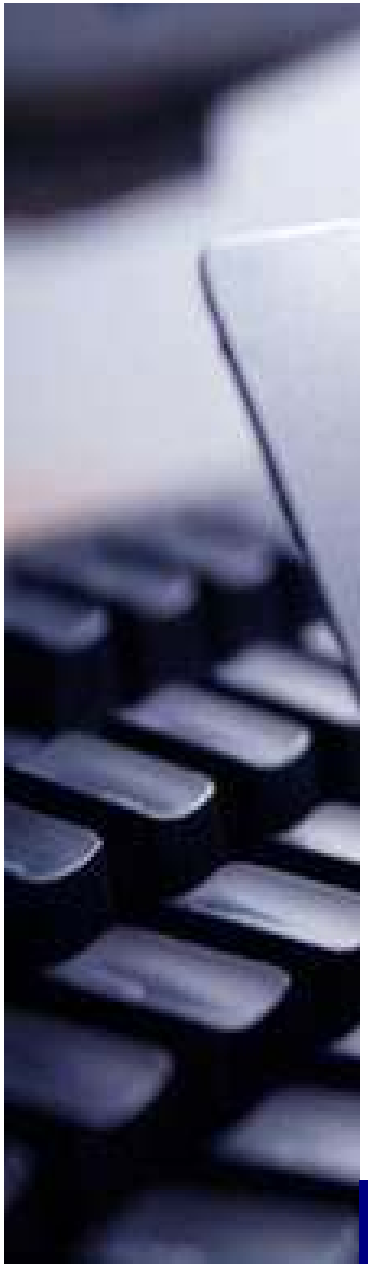

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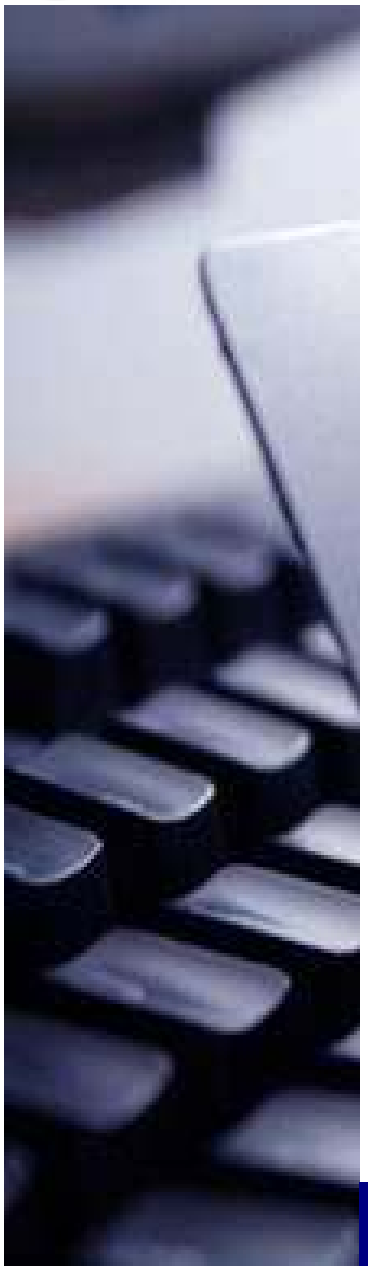

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