

# Chapter 1

## The Fundamentals of Neuroeconomics

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### ABSTRACT

*Neuroeconomics is an emergent multidisciplinary field that strives to understand how and why humans make decisions. The field brings together behavioral methods and sophisticated computational theories from microeconomics, an understanding of emotional influences on behavior from psychology, and human functional neural imaging from neuroscience. This chapter presents the fundamentals of neuroeconomics, thus describing the concept of neuroeconomics; neuroimaging applications; neuroeconomics and loss aversion; neuroeconomics and temporal discounting; neuroeconomics of decision making in humans and animals; neuroeconomics, behavioral economics, and irrationality; neuroeconomics and utility theory; neural systems in economic decision making; neural systems in reward system; neural systems in cognitive control system; game theory, strategic interaction, and neuroeconomic studies; and the types of evidence about economic behavior.*

### INTRODUCTION

Neuroeconomics is an interdisciplinary field that incorporates psychology, economics, neuroscience, and computational science to investigate how people make decisions (Sharp, Monterosso, & Montague, 2012), and Davis (2010) states that the field is a new research program in economics in virtue of its adoption of neuroscience as a basis for the investigation of economic questions. Neuroeconomics focuses its approach in identifying some neuronal correlations specific to choices (Sebastian, 2014), and is the newest area of the economic sciences focusing on how the human brain interacts with its institutional and social environment to make economic decisions (McCabe, 2008).

Zak (2004) forwarded that neuroeconomics is a natural extension of bioeconomics, and the former is the study of evolved mechanisms that are in decision making at the neural level of the brain (Vromen, 2007). The application of conceptual structure and experimental techniques widely used in neuroscience to the study of economic behavior (Glimcher & Rustichini, 2004), neuroeconomics includes the

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theoretical and methodological developments of cognitive neuroscience, computational neuroscience, psychology, and economics to accomplish the examinations of the brain processes when individuals make economically relevant decisions (Montague, 2007; Sanfey, Loewenstein, McClure, & Cohen, 2006).

The strength of this chapter is on the thorough literature consolidation of neuroeconomics. The extant literature of neuroeconomics provides a contribution to practitioners and researchers by describing a comprehensive view of the functional applications of neuroeconomics to appeal to the different segments of neuroeconomics in order to maximize the business impact of neuroeconomics in the decision-making process.

## **BACKGROUND**

Neuroeconomics is a new field in economics (Glimcher, 2003; Montague & Berns, 2002), and its original program was to provide a test for a large number of competitive theories of decision making (Rustichini, 2009). Neuroeconomic methods combine behavioral economic experiments to parameterize aspects of reward-related decision making with neuroimaging techniques to record the corresponding brain activity (Sharp et al., 2012). In economics, the transfer of neuroscientific insights and methods led to the emergence of neuroeconomics (Hubert, 2010). Whereas traditional economic research explains behavior primarily through theoretical constructs such as utility or preferences, neuroscience considers the physiological aspects and somatic variables that affect decision making.

Neuroeconomics makes the positivistic assumption that the key to explaining human behavior is to understand the neural and physiological processes (Riedl, Hubert, & Kenning, 2010). Neuroeconomists recognize the specific brain activation during the perception of different marketing stimuli (Koenigs & Tranel, 2007). One of the most important intellectual challenges of neuroeconomic research is the translation of theoretical constructs into neurophysiological categories (Hubert, 2010). The integration of neuroscientific approaches and methods into economic research has led to the preliminary findings regarding economic marketing theory and practice (Kenning & Plassmann, 2005). In marketing research, the notion of neuroeconomics has gained attention because the interdisciplinary perspectives to explain the buying decisions are accepted in consumer research (Lee, Broderick, & Chamberlain, 2007).

## **THE FUNDAMENTALS OF NEUROECONOMICS**

This section describes the concept of neuroeconomics; neuroimaging applications; neuroeconomics and loss aversion; neuroeconomics and temporal discounting; neuroeconomics of decision making in humans and animals; neuroeconomics, behavioral economics, and irrationality; neuroeconomics and utility theory; neural systems in economic decision making; neural systems in reward system; neural systems in cognitive control system; game theory, strategic interaction, and neuroeconomic studies; and the types of evidence about economic behavior.

### **Concept of Neuroeconomics**

Neuroeconomics has its root in behavioral economics, a scientific subfield of economics that has adopted psychological research on social, cognitive, and emotional factors to better understand economic

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