Chapter 24
Neuroscience Applications in Financial Markets:
A Practitioner's Perspective

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ABSTRACT

The 2007-2008 Global Financial Crisis provided strong evidence of social dynamics in global financial markets which challenge basic rationality of independent decision makers when choices invoke short term trade-offs as opposed to sustainable long term socio-economic value creation and its ethical implications. Individual market participants are drawn into a Darwinian review of today's decision making environment in which they are called to make choices under systemic uncertainty. Sophisticated visualization tools from fMRI to PET scans allow for brain functions and decision making behaviors to be analyzed in an evolutionary context. From the theory of bounded rationality to its modern critiques by behavioralists, this chapter investigates how social learning may be at its best right at this moment, when ambiguity and known unknowns are extensive and expected utility frameworks are being replaced by local optima findings and "good enough" solutions.

INTRODUCTION

As an emerging field of research, *neurofinance* brings together socioeconomic theories and novel experimental findings from the cognitive behavioral sciences. Through the study of individual biases, social learning, cognitively engrained behaviors, and mere intuition, decision makers today are urged to overcome ambiguity and uncertainty by establishing cooperative networks to learn from, while allowing the simplest, evidence-based heuristics to guide them toward satisfactory outcomes. Social capital theory and mindfulness studies introduce a powerful means to an end: "good enough" outcomes at the individual decision level are indeed most likely to contribute to the rise of cooperative networks in today's fast-paced, fully interconnected system represented by global capital markets.

Background

In the context of this chapter, the term *neurofinance* encompasses all financial applications of neuroscience disciplines, ranging from market microstructure to the behavior of the decision makers that commit to transactions through capital markets. Among practitioners, neurofinance has emerged as an independent field of study in the aftermath of the Global Financial Crisis (GFC) of 2007–2008. The ethical aspects of short-term seeking behaviors faced unparalleled scrutiny as a result of the crisis. In particular, the GFC brought about the need to reassess the essence of decision making and what makes decisions value accretive or not and to whom. Since then, the focus of market participants (e.g., investors, regulators, and the broader investment community) has shifted from the evaluation of short-term outcomes to the assessment of long-term consequences on economic growth, with the ultimate goal of benefiting society at large. As a result, the market participant him/herself goes from being thought of as a pure utility-driven economic agent to a human decision maker. Personality traits, heuristic tendencies, and inner biases take center stage. The commonly accepted assumption of fully rational economic agents comes to question at the same time as new frontiers in academic research blend empirical findings with existing intuition from a wide variety of disciplines (e.g., biology, psychology, chemistry, ecology, and sociology, to name just a few).

For over a century, the founding principle of traditional finance, the *Efficient Market Hypothesis (EMH)*, had postulated the maximization of expected utility measures as a key driver behind individual decision making. New empirical processes, which directly challenge the EMH, continue to be evaluated and tested. Challenging economic theories are nothing new to industry practitioners. Businesses that adopted the computational principles of mathematical finance, as well as its complexities, throughout the 1970s and 1980s found themselves challenged by the myth of full rationality assumptions when behavioral finance studies brought about the principle of bounded rationality (BR) in the 1990s. Coined by Stanford University professor Herbert A. Simon, BR encompasses all the theoretical work and experimentations that deal with "constraints on the information processing capacity of the actor" (Simon, 1972, p. 162).

Today, neurofinance aims to address BR by bringing the economic agent and his/her learning models (or inhibitors thereof) to the forefront of an astounding multidisciplinary field of research. Thanks to advances in computational ability, as well as the theory of decision making coupled with sociology findings, neurofinance promises to have wide implications for industry practitioners. The future of its direct applications has just begun.

MAIN FOCUS OF THE CHAPTER

Issues, Controversies, Problems

Homo Economicus and the Environment

Some of the immediate applications of neurofinance studies deal with the concept of *value creation* in capital markets and how to improve the impact of investment decisions by learning more about the physiological functions that support decision-making behaviors. Specifically, the latest empirical findings that support the theory of the brain and its functions have successfully investigated the process of selective information gathering, which each homo economicus (the economic agent) undergoes to make decisions.

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