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## Preface

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### Socio-Finance

The word “socio-finance” used in the title of this book is meant as a description that catches the underlying nature of price formation in financial markets. Since the term as such does not exist, let us be more precise and define socio-finance to mean that price formation in financial markets is a sociological phenomenon that relates individual decision-making to the emergent social level. We will consider two different levels of this sociological influence. At the first level, socio-finance considers how price formation results from the social dynamics of interacting individuals. Interaction occurs either through the price or by direct communication. An example could be a day trader in a stock market, where the decision choice of when to enter/exit a position depends on the price trajectories created by other day traders. At the second level, socio-finance considers how price formation results from the social dynamics between groups of individuals. An example could be how one financial market uses the outcome of another financial market in order to know how to price an asset properly. In this book, models of both levels of socio-finance will be presented, and it will be shown how complexity theory provides the tools to understand such phenomena.

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### Social Media and the Stock Market

We live in a world of social media. At the time of writing, Facebook has just had its initial public offering (IPO) on the stock market under the scrutiny of media broadcasters the world over. Its less than successful introduction on the stock market, with initial sharp declines in the price over the days following the introduction, has raised new questions about how to determine the proper price of a company, in this case even before it has been quoted for the first time. Just as it would have been impossible 30 years ago to foresee anything of the Internet-based world we live in today, so it seems impossible to know what awaits us in terms of social media and the internet: What is the future “Google”, “Facebook” or “Microsoft” going to look like?

Without trying to offer any clues as to where we are heading, we still think it is safe to say that globalization in conjunction with the appearance of the Internet and social media will introduce a new era for the stock market and the way in which prices are determined in the market. Even for people not interested in the financial markets, it can sometimes be hard to go to a restaurant and enjoy a meal without overhearing a television announcement about the latest price movements in the markets. With the omnipresence of news not only from the stock market but also from other markets like commodity markets (e.g., oil, gold, wheat), one might think that this factor should also play a role in the way professional traders think about financial markets and how to price assets. Not so.

The main theories taught at the universities, and still used in the finance industry (banks, pension funds, insurance companies, hedge funds), date back to the 1960s and 1970s when the core foundations of traditional finance were laid out. These theories still dominate the academic world of finance, and, to a lesser but still important extent, they are what is used by the industry even today. As will be seen shortly, the collective and dynamic formation of opinion on the proper price of a stock does not play any role in such theories. Instead, pricing of an asset happens through decision-making represented via a prototype individual reacting to “quasi-static” information. In the main part of this book, we will argue for the introduction of new tools that take into account the dynamic and social nature of information sharing, not only on the level of individuals but also, as will be seen in Chap. 7, between different markets worldwide.

As we are living in an ever changing and dynamic world, it seems only natural (and prudent) to develop new tools to capture its changing complexity. Such a need would be particularly clear in the case where events occur that go beyond the understanding of the set of tools we currently possess. The 2008 subprime crisis seems to have taken the world by surprise, and clearly the event was not on the cards as far as standard theory was concerned. At least this is the impression you get by listening to the words of the former Federal Reserve chairman, Alan Greenspan, who during the market turmoil of 2008 admitted being in a “state of shocked disbelief” that the free markets could reveal such flaws [76]. The current European debt crisis, which could be considered as a continuation of the United States 2008 subprime mortgage and lending crises, seems to point to a similar lack of tools for understanding and tackling such problems.

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## **The Market as a Voting Machine**

The quote “In the short run, the market is a voting machine, but in the long run it is a weighing machine” [59] is attributed to the American economist Benjamin Graham (1894–1976). Graham himself used the quote to argue that investors should use the so-called fundamental value investment approach and concentrate on accurately analyzing the worth of a given financial asset. That is, he suggested ignoring the short run “voting machine” aspect and instead concentrating on the long run, where somehow the “weighing machine” of the market would ensure that we end up with

a price corresponding to the true worth of an asset. This sounds simple in principle. But even if this was how the markets worked, how exactly can one assess the true worth of an asset before it is determined by the weighing machine of the market? Moreover, assuming that we are able to determine the true worth of an asset, what should we do if the market somehow goes off track for a longer period of time than expected, as is typically seen, for example, during speculative financial bubbles?

In this book we will be concerned with what can best be characterized as the “voting machine” part of Graham’s quote. More precisely, it will be argued throughout this book that price formation in financial markets is a sociological phenomenon and that complexity theory is the tool required to understand this phenomenon. The reader will be introduced shortly to both complexity theory and its relationship to sociology. However, let us begin by defining what we mean by the term “financial market.” We define a financial market to be a place where people can buy and sell a broad range of assets such as currencies, financial securities (e.g., stocks and bonds), commodities (e.g., crude oil, natural gas), metals (like gold, silver, copper), and agricultural goods (e.g., corn, wheat, cattle). We would like to emphasize this definition since it places humans as the main actors. Either directly or indirectly (through programs made by humans in computer trading), there is always a human making decisions behind every trade made in a market. This may sound trivial, and indeed it is something either quickly forgotten or not emphasized in most books on financial markets. In this book it will instead be the main focus.

Human decisions are almost always made in the social context of other individuals. The effect of social context can take different forms. An individual may ask others for advice, he or she may ask others for information, and several individuals may discuss different companies, stocks, and investment options, creating the so-called “shared reality” that guides their individual decisions. Individuals can influence each other, not only in cognitive but also in emotional ways. Multiple influences in a social group may lead to euphoria or fear that can influence individual decisions in a coordinated way. Individuals can also be influenced by observing each other’s behavior and its consequences [14]. It has been demonstrated [18] that copying the behavior of others is one of the prevailing mechanisms in decisions to purchase.

All of these mechanisms are social in nature. The link with sociology then comes naturally when one considers the financial market as a “voting machine” and the price as the outcome of the vote. It is of critical importance, however, that the outcome of the social mechanisms is not equivalent to the sum of individual decisions. The fact that individuals influence each other makes the outcome of the group process very different from the counterfactual outcome of individuals making their decisions in isolation from each other. In this book we will argue that social process shapes financial markets in a more pronounced way than the individual features of decision-making. Thus, although psychological processes influence individual decisions, direct and indirect influences between individuals play an even more important role.

Clearly, the “election” going on in a financial market is not democratic: those entering the market with the most money will move prices the most. Furthermore, the pool of voters, the market participants, is something that changes over time. Such

dynamics and the impact it can have on the pricing in markets is little understood and rarely discussed in the general literature on finance. Finally, the “election” is ongoing, so that the outcome at a given instant of time reflects the latest beliefs of the market participants.

Our main emphasis in this book will be to point out that the way prices are discovered by the market is a sociological process, where the decisions made by a given market participant depend on the decisions made previously by other market participants. This can happen in one of the two following ways:

- Market participants make a decision to buy or sell based on the past/present price value of an asset. This is the case for market participants who trade using technical analysis of past price movements, as well as fundamentalists who enter the market whenever they think the market is over- or undervalued.
- Through communication with other market participants, a decision is made which triggers a trade.

Actually, the only situation where price dynamics is *not* determined through a social process is in direct reaction to headline news concerning interest rate decisions made by central banks, earnings announcements for stocks, or other global news announcements considered relevant for financial markets. One can, for example, think of political news announcements, natural disasters such as earthquakes, or the sudden onset of human disasters such as war and terrorism. As soon as a given announcement is made public and the markets have seen the initial reaction to it, the price dynamics becomes a social process of deciding how to react to the initial reaction of the market. Some market participants will see the initial reaction as an overreaction, and, in the case of bad news, a potentially good buying opportunity, whereas other market participants may instead see the initial reaction as part of a longer-term deviation from the present price trend, and hence as a good time to sell.

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## **Neo, *The Matrix*, and the Market: A Complexity View**

Imagine for a moment that we could be like the hero Neo in the cult film *The Matrix* and observe the world in slow, slow, slow motion. We would then be able to distinguish and observe the chronology of orders to sell and buy assets as they arrived electronically at the world’s different stock exchanges.

Maybe we would see orders arriving from a trader of a major investment bank who wanted to take a large position on the Standard & Poor’s 500 (S&P 500) index before the opening of the markets in the United States. We could see how this order changes the electronic order book of the S&P 500 index, and we could follow how specially designed supercomputers from several banks and hedge funds would immediately update their limit buy and sell orders in the order book of the S&P 500 index to try and profit from the impact.

Then perhaps we would see a trading Japanese housewife pressing the enter button and make her trade of the day by submitting an order to convert her entire holdings of US dollars (USD) into Japanese yen (JPY). The small blip this would create on the JPY/USD rate could be the tipping point for a trader in a proprietary

hedge fund in London, who would subsequently begin to get rid of large holdings of US dollars, converting them into what is considered to be a more secure holding of Japanese yen. The resulting impact and the beginning of the decline in the JPY/USD rate would be spotted by traders in a Russian bank. As a flight to safety measure and having long hesitated to reduce the percentage of stocks in their portfolio, they would then begin to sell out stock holdings worldwide.

Meanwhile, around a table in Washington D.C., eight men and four women would go over the latest available information on the US economy and employment data. Their decision on whether to change the federal fund rates and the following explanation in a communique would hours later result in a huge storm of trading activity. However, this activity would be dwarfed by the beginning of a stock market fall a few weeks later. But was it the decision of the trading Japanese housewife to convert her yen into US dollars, the meeting in Washington D.C., or the Russian bank's stock sellout that would later mark the beginning of a decade-long decline in the stock markets?

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## Outline and Purpose of the Book

The purpose of this book is threefold. First, we give a short but broad introduction to the standard economic theory of financial markets. This should enable the reader to understand the traditional way of thinking, illustrated by examples. Secondly, the reader will be introduced to the concepts of behavioral finance and a psychologically defined view of financial markets. Finally, complexity theory and models which take into account behavioral decision-making will be introduced as a tool to give new insights into price formation in financial markets. The main part of the book is written accessible for a broad audience. More specific and quantitative explanations are made in grey boxes.

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## Acknowledgements

Jørgen Vitting Andersen wishes to thank the following people. Heartfelt thanks to Jasmine, Anna, and Mia for their support. A special thanks to Didier Sornette for having introduced me to the field of econophysics and for our many collaborations. Both authors would like to thank Barbara Piper for her outstanding editing, and to Lisa Tognon for her nice pencil illustrations. Finally, the authors would like to thank the following colleagues for insightful discussions: Lucia Bellenzier, Serge Galam, Dominique Guégan, Stephen Hansen, Justin Leroux, Sebastian Martinez, Michel Miniconi, Lael Parrott, Philippe de Peretti, Giulia Rotundo, Magda Roszczynska-Kurasinska, Sorin Solomon, and Maxences Soumaré.

Paris, France  
Warsaw, Poland  
September 2013

Jørgen Vitting Andersen  
Andrzej Nowak

An Introduction to Socio-Finance

Vitting Andersen, J.; Nowak, A.

2013, XIII, 185 p. 44 illus., 9 illus. in color.,

ISBN: 978-3-642-41944-7