Preface

AN OVERVIEW OF FINANCIAL INFORMATION SYSTEMS

Financial markets around the world can affect each other in merely a matter of seconds as financial information systems are programmed to buy or sell stocks and financial derivatives automatically when activated by sudden changes in global market trends and conditions. Information systems are highly critical in managing the trade of stocks, options, futures, foreign exchange, metals, and commodities. They are also critical in managing financial institutions and banks. Because of these systems, volatile movements in one major financial market (NYSE, Nikkei) can have drastic effects on the global prices of financial instruments. There are also financial information systems that serve as intelligent systems, expert systems, and knowledge-base systems, providing algorithms and tactical information for predicting price movements and providing decision-support for traders, investors, and bankers. Several fund managers, hedge funds, individual traders, and bankers depend on these systems daily to monitor their assets, trades, and capital. Trillions of dollars go through global financial trading systems, and yet not enough academic research has been devoted to information systems for financial markets and institutions. This book hopes to add and enrich the academic literature of the critical role of financial information systems.

The vision for creating this body of research in one book is to take a much deeper look inside the systems and technologies that (1) provide intelligence and expertise to traders, investors, bankers, and (2) facilitate the agile ordering processes, networking, and regulation of global financial electronic markets. How these systems work to manipulate, move, and provide intelligence to the finance sector is still a mystery to many business students, and it is the intent of this book to provide real-world cases and examples that can unveil these systems to students interested in financial trading, the dynamics of financial electronic markets, financial institutions, and the tactical technologies that facilitate financial decisions. There is a growing demand for IT jobs in the financial sector, making this body of research very timely for university students.

This book is essential to both information systems and finance students and practitioners, who are looking forward to a profession that deals with technology-enabled systems in the finance sector. Several universities have their own finance trading room, where students enrolled in some courses are asked to manage stock portfolios using these systems. In such context, this book is an ideal reference or supplement for courses that deal with stock trading and investments using financial systems. IS students, practitioners, and faculty are also beginning to realize that the Finance sector is a sector that information systems graduates can work with due to the increasing demand for technical skills in this sector. Likewise, students of finance are aware that information systems are critical and necessary tools in their discipline.

The first chapter by Crooks, Slayton, and Burbridge provides a good introduction to the history of the market. This chapter analyzes how Information and Communication Technology (ICT) contribute to the volatility of global markets. The chapter begins with a history of the exchanges and the emergence of technology and its influence on trading. Secondly, the chapter explores the impact of sophisticated
quantitative techniques empowered by ICT on financial markets. The birth of the Quants and the origins of such techniques in the 1980s will be discussed. Since that time, the ability to model and simulate market actions has progressed only a few high-level quantitative types can now understand the complexity of the models and the simulation programs that are employed.

The second Chapter, by Yap, discusses the importance, advantages, and disadvantages of the interfaces of ubiquitous trading systems, which enables U-commerce (ubiquitous commerce) in financial markets. Enabling ‘anytime anywhere’ transactions, communications, and dissemination of knowledge in electronic financial markets is becoming an increasing practice considering the volume of stocks, options, futures, forex, metals, and commodities traded run in the trillions of dollars worldwide. However, different ubiquitous financial systems may or may not work for all types of traders, and this chapter discusses the best fit between ubiquitous systems and trading strategies.

The third chapter, by Kamouridis, Chen, and Tang, covers the Market Fraction Hypothesis, which basically predicts a short duration for any dominant type of financial-based agent strategy model based on genetic algorithm. There are several agent-based strategies, based on either a stock’s fundamentals or technicals (charting). The authors contend that in the short run, the fraction of different clusters of strategies keeps swinging over time, which implies a short dominance duration for any cluster. In the long run, however, different clusters are equally attractive, and thus their market fractions are equal, and it is not possible for a single strategy type to dominate the market by attracting an overwhelming fraction of market participants for many consecutive periods. In short, there is no one winning strategy. Sometimes fundamentalists will dominate the market. But eventually there should be a “switch,” and chartists would take over as the dominant strategy in the market.

The fourth chapter, by Deng, Wang, and Dong, introduces the concept of algorithmic trading, trading strategies that are automated, defining a sequence of instructions executed by a computer based on sets of algorithms. A good trading strategy should be profitable, which includes identification of what to trade and how to trade. Algorithmic trading strategies have been an important issue in current financial markets. There has been a vast array of algorithms developed across financial markets in order to achieve different trading strategies. This chapter introduces several principal algorithms for algorithmic trading strategies. Particular attention will be paid to methodology design with comparisons with other trading methodologies.

The fifth chapter, by Yap and Synn, investigates service innovation in the electronic brokerage sector. The discussion covers the theories of “technology bundling” and how bundling different technology services creates value-added in servicing the players in the electronic markets. The proliferation of different e-trading systems raises the question of which systems provide better or more comprehensive services to online stock traders. Many online brokers now provide low-cost transactions and financial research capabilities, so where is the next level of innovation? The objective of this chapter is to show that several innovations in broker e-services are critical in the following areas: a) how order processes are efficiently managed in financial e-markets; b) how responsive e-trading systems are in handling trading rules and regulations; c) how different systems address unique niches in financial e-markets; and d) improving systems stability and reliability.

The sixth chapter, by Schumaker and Chen, discusses the ability to predict stock market movement as a source of interest for many researchers. Difficulty in prediction comes from the complexities associated with market dynamics where parameters are constantly shifting and not fully defined. One area of limited success in stock market prediction comes from textual data. Not all data begins first as quantitative data and ratios. Information from quarterly reports or breaking news stories, which can dramatically affect
the share price of a security, begin as qualitative data and must be translated to numeric form before many computational systems can process it. This information lag could be capitalized on by applying computational methods to the textual data, and it forms the basis of financial text mining. Most existing literature on financial text mining applies a representational technique to news articles where only certain terms are used and weights are assigned to the terms based on the direction the stock price moves. Prediction then applies these weighted terms to a new article to determine a likely direction of movement.

Chapter seven, by Kelly, introduces the use of virtual reality as an emerging visualization tool for understanding the complexity of financial data and simplifying data into 3D representations. Over millennia, humans have adapted to their environment by using 3D vision, 3D sound, touch, smell, taste, etcetera. The human brain is highly attuned to these sensory inputs. Survival has often been dependent on split-second perception and quick decisions while under stress. Trading is a similar setting with 42% of all trading occurring within milliseconds. Losing traders have gone bankrupt and become extinct without exploiting their full sensory capabilities to perceive and understand the trading environment. Most traders have relied on simplistic 2D graphs, text, tables of numbers, and vanishing sounds of the trading floor. More recently, vendors have tried to help traders use more of their senses. Modern computer technology allows traders to better assess the markets, make faster and better decisions, and to get an edge in trading.

Chapter eight, by Kersch and Schmidt, discusses trading decisions in financial markets supported by the use of trading algorithms. To evaluate trading algorithms and how they play a role in the ordering process of financial trading systems, this chapter defines the individual investors’ requirements on trading systems and evaluates various systems alternatives. The chapter analyzes 17 trading systems from an individual investor’s point of view and looks at different alternative solutions. The results of the study point out that the best alternative for an individual investor is not one single trading system, but a combination of two different classes of trading systems.

The ninth chapter, by Kelly, talks about the Grid and other distributed computing approaches as a good match to computing-intensive financial applications, which are, or should be, agent-based. Financial networks consist of agents (traders) buying and selling derivatives and other assets in various asset markets. The trading, valuation, and management of financial derivatives and other assets requires quantitative measures of risk. The huge size of these portfolios means that they have a huge impact on the overall economy. This study looks at a large-scale computable general equilibrium model of the macro-economy that includes modern features such as financial derivatives. This model can be used to examine proposed new economic policies that involve large structural changes in the economy. Low cost grid computing is a proven success and has allowed more scientific problems to be studied.

Chapter ten, by O’Riaain, Harth and Curry, discusses the challenges of financial data integration, provides the component architecture of Web enabled financial data integration, and outlines the emergence of a financial ecosystem based upon existing Web standards usage. Introductions to Semantic Web technologies are given, and the chapter is supported with insight and discussion gathered from multiple financial services use case implementations. Best practice for integrating Web data based on the Linked Data principles and emergent areas are described. With increased dependence on efficient use and inclusion of diverse corporate and Web bases data sources for business information analysis, financial information providers will increasingly need agile information integration capabilities. Linked Data is a set of technologies and best practices that provide such a level of agility for information integration, access, and use. Current approaches struggle to cope with multiple data sources inclusion in near real-time, and have looked to Semantic Web technologies for assistance with infrastructure access, and dealing with multiple data formats and their vocabularies.
In Chapter eleven, van Daalen Fuente talks about the transition from face-to-face trading markets to electronic trading technologies, understanding how traders act in these new electronic conditions. The chapter discusses how traders will have to develop new strategies to understand the market’s new operations. This is required due to the differences in visual and auditory contexts of open-outcry pits, as opposed to the electronic interface on the electronic exchange. Also, traders and the companies that support them consider the dynamics that can emerge from the low-cost, globally distributed information available beyond the confines of the physical stock exchange. Overall, it can be said that while the human element to stock trading might never be lost, the social and material practices that encompass it will never be the same. This chapter focuses on the social and technological changes following the wide-spread introduction of the ECN to the stock market’s trading floor and operations.

Chapter twelve, by Kelly, presents an extensive dynamic financial model that encompasses most models used today in finance and economics. The chapter will show that this model is a good match to the capabilities of Digital Signal Processor (DSP) chips. Particularly, DSP is able to perform the high-speed Monte Carlo simulations that are required to solve many large-scale, intractable financial problems. By simulating a sufficiently large number of future scenarios, DSP chips can rapidly achieve a good approximation of the probable future joint probability distribution function of modeled variables. This probability distribution can be used for the valuation of financial derivatives, computing value at risk, studying macroeconomic policy decisions, and many other purposes. DSP enables such simulations to be faster, cooler, greener, and cheaper than ever before.

Chapter thirteen, by Kelly, proposes the use of FPGA (Field Programmable Gate Arrays) to solve the nearly insurmountable computational challenges of Financial Network Models. Flow of funds models have been discussed for decades, but recently, the research activity has picked up due to international financial crises and the increased power of computers, mathematics, and economic models to address these crises. The chapter surveys many of these developments and discusses how FPGA can provide the critical technology to provide answers fast enough to be useable by managers in banks and regulatory agencies.

The fourteenth chapter, by Garcia-Almanza, Martinez-Jaramillo, Alexandrova-Kabadjova, and Tsang, discusses corporate bankruptcy as an active area of financial research. After the Lehman Brothers’ default and its consequences on the global financial system, this topic has attracted even more attention from regulators and researchers. This event has brought an imperious urge to change the regulatory framework regardless of whether this is good or bad. Consequently, the need for timely signals for supervisory actions and the development of genetic programming and neural network systems that help to determine which financial information is more relevant to predict distress are very important. During crisis periods, the bankruptcy of a bank or a group of banks can make things far worse if contagion effects are transmitted first to other participants of the financial system and then to the real economy.

In summary, the intelligence, expertise, and automation that financial information systems provide is radically changing the way the financial players behave and how global electronic financial markets operate. I have personally learned a lot from the insights of various authors and their cutting edge work and research in this area. I honestly say that this is a great collection of seminal research work, which will pave way for more research and development in this sector.

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