

Introduction to Financial Technology

Complete Technology Guides for Financial Services

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Jurgen Kaljuvee

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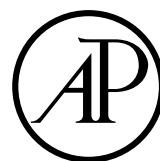
Roy S. Freedman



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Preface

This book is for technologists who want to learn about financial systems and for financial professionals who want to learn about the technology that assists them in their work. The goal of *Introduction to Financial Technology* is to explain how financial systems work — how they came to be and how they evolved — from a technological perspective.

The basic approach presents the various topics of financial technology in an interesting and systematic way. This is different from what is frequently done in most financial technology references. This book is not a collection of disjoint articles or vendor comparisons. The topics in *Introduction to Financial Technology* are illustrated with numerous worked out examples, spreadsheet displays and formulas, graphs, diagrams, historical excerpts, biographies, and news stories. Throughout the chapters, text boxes are used for case studies and special topics. The text boxes can also be read independently of the chapters to get a flavor of the material. Each chapter concludes with an annotated list of references, where extensive use of the Web is made to help readers find reference material. Chapters conclude with a set of discussion questions whose purpose is to provoke thought and argument.

The role of mathematics in the book is at an introductory level for technologists and financial professionals. Finance requires mathematical representations. Notation is crucial and could be something as simple as a colon or a decimal point. *Introduction to Financial Technology* surveys price and time notations used for financial computations. In most cases, there are no formal mathematical proofs: this is not a book on finance nor is this a book on engineering. Instead, we use the technology of computer algebra systems to simply and quickly derive financial formulas, valuations, and relationships in order to show the rationale behind financial models. Programs that implement many financial computations and data representations are shown in C, C++, Java, Visual Basic, the MuPAD computer algebra system, and the AMPL model specification language, as well as various XML dialects.

Introduction to Financial Technology is based on several lectures and courses that were given over the years at Polytechnic University in New York and at other places to a mixed audience of finance professionals and technology specialists. Indeed, one purpose was to facilitate communication among technologist, practitioner, regulator, and manager. Consequently, this book is suitable as a reference for full or half-semester introductory courses.

This includes short introductory courses on market vendor systems; financial products (bonds, futures, options, and swaps); financial message standards; clearing and settlement; and financial systems risk. Material in *Introduction to Financial Technology* can be used in selected topics courses for programs in management of information systems, finance, financial engineering, and software engineering. The nonacademic financial community will also find *Introduction to Financial Technology* useful for in-house courses and as a reference for financial notation, terminologies, models, algorithms, message standards, systems, and regulations.

The basic problem in building reliable and interoperable financial systems, actually systems of systems of communication and social networks, has not changed since the opening of the Amsterdam Stock Exchange 400 years ago. How can we develop trading systems, information systems, payment systems, and regulatory systems for financial products (such as stocks, bonds, and contracts) that ensure — on the average — that buyers get delivery, sellers get paid, everyone gets news and market data, everyone (hopefully) makes money, and everyone follows the rules? Events associated with risk (credit, operational, and market) also need a specification. What happens if there is a settlement error, a system shutdown, or a credit default? Can improvements make things worse?

Financial technology has much in common with the technology found in commercial systems, military systems, auction systems, and gambling systems. However, in order to build and maintain financial systems, developers need to be familiar with terms and jargon such as ticker feeds, yields, patent protection, bid, spreads, back-office, credit, quotation, martingales, short squeeze, and clearing house. All of these terms were known by Thomas Edison, whose first successful business was a consultancy for market data vendors. Today, developers also need to be familiar with newer acronyms and identifiers as well, such as ABA, 30/360, 369604, CRD, CUSIP, FIX, FOK, FRED, “the greeks,” HOF7, IARD, IBMLU, MMID, TCP/IP, VaR, VWAP, and XML. Some of these identifiers describe systems; some describe products; some are parameters; and some are used as database keys. *Introduction to Financial Technology* reviews and describes them.

The trend to replace physical delivery with virtual delivery (sometimes called straight-through processing) has continued for the past 150 years; current market data and financial message standards evolved from the Chappe and Morse telegraph technologies. In the evolving collaboration between people and computers, it is becoming increasingly difficult to tell who is automated — trader, broker, routing broker, market maker, clearing member, regulator — and who is not. *Introduction to Financial Technology* can help the reader assess these trends and help the reader understand how these financial systems work.

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Joseph Mathai, my friend and colleague, worked with me on several innovative financial systems; he was murdered while attending the Financial Technology Conference at Windows on the World on September 11, 2001. May his memory be for a blessing.

Roy S. Freedman
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