Volume I

Blockchain for Financial Markets

A Practitioner's Guide to Settlement, Tokenization, and Distributed Ledgers

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Contents

Preface

This book was born from a simple observation made during years of teaching blockchain technology at the University of Paris-Saclay: the people who most needed to understand the subject — those working in financial infrastructure, post-trade services, and financial regulation — were consistently the least well served by the available literature.

On one side sat the purely technical literature: excellent, rigorous, but inaccessible to anyone without a computer science background. On the other side sat the business literature: enthusiastic, visionary, but so distant from the underlying mechanics that it provided no practical guidance for those who had to build or regulate real systems.

This book occupies the space between the two. It is written for the IT architect at a custodian bank who needs to understand what a distributed ledger actually does before proposing one to management. For the regulator at a central bank who must assess a DLT Pilot Regime application without being able to run the code. For the project manager at a central securities depository who is evaluating whether blockchain can reduce settlement fails. For the consultant who has been asked to explain tokenization to a board of directors.

The subject we chose as the book's backbone is settlement — the process by which a securities trade is finalized, money changes hands, and ownership is transferred. Settlement is unsexy, invisible, and absolutely critical. It is also one of the areas where the promise of blockchain is most concrete, most measurable, and most contested. Understanding why settlement is hard, what blockchain offers to fix it, and what it cannot fix, provides a complete and honest picture of the technology in its most demanding financial application.

The book is organized in five parts. **Part I** describes the problem: how settlement works today, where it fails, and what an ideal system would look like. **Part II** builds the technical foundation: distributed ledgers, cryptography, consensus mechanisms, and smart contracts, always illustrated with settlement examples. **Part III** moves to design: how to architect a settlement blockchain, tokenize assets, navigate the regulatory framework, and structure governance among competing institutions. **Part IV** examines what has actually been built: a candid assessment of the major real-world implementations, their results, and their limitations.

Part V is hands-on: complete working implementations of a DVP settlement chain in Python and in Solidity.

About the companion website. This book has a free companion website at `financial-blockchain-project.com`. Concepts that benefit from animation — the propagation of a block through a peer-to-peer network, the step-by-step execution of a DVP smart contract, the structure of a Merkle tree — are illustrated there with interactive diagrams. The full source code for all exercises is available for download. Lecture slides covering each chapter are freely accessible to students and educators. The website is designed to be a living reference, updated as the technology and regulation evolve.

No prior knowledge of blockchain is assumed. A basic familiarity with financial markets — what a stock is, what a trade is, roughly what a custodian does — is helpful but not required; Chapter 1 provides all the context needed. Some sections of Part II contain mathematical details at the level of modular arithmetic and hash functions; these can be skipped without loss of continuity by readers whose interest is primarily architectural or regulatory.

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Volume I

Financial markets settle trillions of euros each day through a chain of custodians, central securities depositories, and central counterparty clearing houses whose inner workings remain largely invisible to most participants. This volume examines what can go wrong in this system — from settlement fails to counterparty and custody risk — and builds the case for a redesigned infrastructure based on distributed ledger technology.

Starting from first principles, the book develops each component of a blockchain settlement system: the data structure, consensus mechanisms, smart contract automation, the tokenisation of securities and cash, and the governance models required for institutional adoption. Two hands-on chapters translate theory into working Python and Solidity code, available on the companion website alongside interactive diagrams and lecture slides.

Topics covered

Settlement infrastructure • DVP mechanisms • Distributed ledgers • Blockchain integrity • Consensus algorithms • Smart contracts • Tokenisation of securities • Regulatory framework • Real-world implementations • Python & Solidity code

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