

Central Banking at the Frontier

The emergence of digital financial services and, in particular, Central Bank Digital Currencies has changed the way we think about the role of Central Banks. Thammarak's insights drawn from around the globe makes this book an essential read for anyone interested in the topic.

—*Tim Allen*
Sales Director, EMEA, Consult Hyperion

Digital disruption is a complex, multi-faceted issue. Writing in a remarkably readable style, this book shows, compares, and illustrates the evolving developments and the paths on which central banks might choose to tackle current and future challenges from digital disruption. An essential read for central bankers, practitioners, academics, students, and market participants who want to understand and help shape the emerging digital financial landscape.

—*Dr Vachira Arromdee*
**Former Deputy Governor and Executive Advisor to
Digital Currency Unit, Bank of Thailand**

Many of us take for granted that the economy of the country we live in remains healthy and stable; in large part this is down to the role played by the Central Banks. But Central Banks are facing new challenges on multiple fronts. A new digital financial landscape is emerging fuelled by new technologies, BigTech and FinTech innovators and changing customer expectations. For the first time, Thammarak Moenjak has taken a Central Bank lens to these developments and provides an authoritative guide to the challenges, responses and future outlook. The author's personal experience has positioned him well to study the nature of these developments from multiple perspectives, and his global outlook is well demonstrated by multiple examples which support his narrative.

Of undoubted huge benefit to Central Bank readers, this book will also help policy makers, financial services practitioners and academics understand the challenges faced by Central Banks and the role they will need to play in the evolution of the digital financial landscape.

—*Keith Bear*
**Fellow, Cambridge Centre for Alternative Finance,
Judge Business School, University of Cambridge**

This book is a superb guide to the implications for central banking of the emerging digital financial landscape which the author, quite rightly, sees as an exciting new frontier of central banking. The book goes beyond merely providing a list of the challenges that the central banks are facing. Importantly, it focuses in detail on how the central banks might respond to those challenges to ensure that risks posed to monetary and financial stability are mitigated while at the same time enabling consumers and businesses to benefit the most from the new technologies.

—*Robert Dixon*

**Professorial Fellow, Faculty of Economics and Commerce,
Department of Economics, University of Melbourne**

There is no better introduction to the frontiers of digital finance for policymakers, researchers, and market participants than Moenjak's masterful new treatment. Drawing on his immersive grounding in the subject as a central banker with deep first-hand experience, Moenjak covers the waterfront of crucial topics, including digital identity, novel payment systems and currencies, financial stability, banking disruption, and regulation.

—*Darrell Duffie*

**Adams Distinguished Professor of Management and Professor of
Finance at the Graduate School of Business, Stanford University**

A comprehensive analysis of the role of central banks in a rapidly evolving financial landscape driven by digitalisation of payments, financial services, regulation and even money itself. Whether you are a practitioner, regulator, or teacher of financial markets, this is an essential source of information on the most recent developments.

—*Hans Genberg*

**Professor of Economics and Senior Director of Monetary and
Financial Programs, Asia School of Business, Kuala Lumpur,
Malaysia**

Digital identity is foundational to a safe, secure, privacy respecting and inclusive digital economy. It is however a complex and fragmented topic with many previous attempts to establish ecosystems and much work ongoing both in the private and public sectors. Thammarak's survey of this work will be invaluable to central bankers as they seek to understand the role digital identity should play in financial services and the digital economy more broadly and consider the role that central banks

should play in developing, promoting and regulating policies and frameworks in this area.

—*Steve Pannifer*

**Managing Director, and Digital Identity Subject Matter Expert,
Consult Hyperion**

Thammarak has identified and described some of the most critical areas for central banking in the next decade. The rapid pace of development in digital payments, and central banks' involvement in them through instant payment and settlement systems and – potentially – both wholesale and retail CBDCs will change the global payment landscape permanently. Increasingly central banks will have the means and opportunity to directly influence payment markets, and the way they use this influence will have profound implications for regulation, competition, resilience, financial stability and inclusion. *Central Banking at the Frontier* set out the challenges and identifies the tools that will be needed by central banks to meet them. As Thammarak makes clear, the future will be very different from the past.

—*Tim Richards*

**Principal Consultant, and Digital Payments Subject Matter Expert,
Consult Hyperion**

As the book demonstrates, the task of the central banker has changed radically and rapidly with the digitisation of the financial system and new skills must therefore be acquired and new tools deployed. Thammarak develops his arguments in detail and at a practical level rather than simply setting out a general overview and thus provides readers with concrete guidance as to how to deal with these new challenges. *His book should be required reading for all senior staff at the World's Central Banks.*

—*Dr Bill Roberts*

Fellow, Cambridge Centre for Alternative Finance, Judge Business School, University of Cambridge; Former Head of Open Banking at Competition and Markets Authority, UK

“*Central Banking at the Frontier: Creating a Digital Financial Landscape*” provides a remarkably comprehensive and clear guide to the new technologies, players, and financial instruments reshaping the future of finance and money globally, considered from a central banking perspective – all from the unique vantage point of somebody who has been deeply involved for many years, with a commendable attention to detail and commitment to open inquiry. The book is

timely and important given the pivotal role central banks are poised to play, and the weighty decisions they must undertake to navigate and shape this evolving frontier while upholding their core mandates of financial and monetary stability amidst the tumult of change. This authoritative work can be an invaluable guide for policymakers, regulators, industry practitioners and researchers alike, who are seeking to equip themselves to navigate with confidence and clarity this emerging landscape where complexities abound.

—*Professor David R. Skeie*

**Gillmore Centre for Financial Technology and Warwick Business
School, University of Warwick**

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Central Banking at the Frontier: Creating a Digital Financial Landscape

BY

THAMMARAK MOENJAK

Bank of Thailand



United Kingdom – North America – Japan – India – Malaysia – China

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INVESTOR IN PEOPLE

*This book is dedicated to the Bank of Thailand and the central banking profession
for their sincere attempts to help make the world a better place.*

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List of Abbreviations

AI	Artificial Intelligence
AISP	Account Information Service Provider
AML	Anti Money Laundering
API	Application Programming Interface
ARTs	Asset-Referenced Tokens
BCB	Banco Central do Brasil
BIS	Bank for International Settlements
BoE	Bank of England
BOT	Bank of Thailand
CBDC	Central Bank Digital Currency
CBUAE	Central Bank of the United Arab Emirates
CFT	Counter Financing of Terrorism
CMA	Competition and Markets Authority
CPMI	Committee on Payments Market Infrastructures
DEPA	Data Empowerment and Protection Architecture
DLT	Distributed Ledger Technology
DMA	Digital Markets Act
DORA	Digital Operational Resilience Act
DSA	Digital Services Act
DvP	Delivery-versus-Payment
ECB	European Central Bank
e-CNY	Electronic Chinese Yuan
EMTs	E-Money Tokens
EU	European Union
FCA	Financial Conduct Authority
FMI	Financial Market Infrastructure
GDPR	General Data Protection Regulation
HKMA	Hong Kong Monetary Authority
ID	Identification

xiv List of Abbreviations

IdP	Identity Provider
IOSCO	International Organization of Securities Commissions
KYC	Know-Your-Customer
MAS	Monetary Authority of Singapore
MiCA	Markets in Cryptoassets Regulation
NAS	Novel Activities Supervision Programme
OBIE	Open Banking Implementation Entity
PBoC	People's Bank of China
PISP	Payment Initiation Service Provider
PKI	Public Key Infrastructure
PoC	Proof of Concept
POS	Point of Sale
PSD2	Revised Payment Services Directive
PvP	Payment-versus-Payment
QR	Quick Response
RMB	Renmenbi (Chinese currency)
RP	Relying Party
RTGS	Real-Time Gross Settlement
SAR	Special Administrative Region
SME	Small- and Medium-sized Enterprise
SWIFT	Society for Worldwide Interbank Financial Telecommunications
UPI	Unified Payments Interface
USD	US Dollar
USDC	US Dollar Circle
USDT	US Dollar Tether
VRP	Variable Recurring Payment

About the Author

At the time of writing, **Thammarak Moenjakk** was the Chief Representative, Bank of Thailand London Representative Office, and a Senior Advisor to the Bank of Thailand's Digital Currency Unit. Currently, Thammarak is a Senior Director, International Department at the Bank of Thailand, where he also continues with his deep involvements in the Bank of Thailand's central bank digital currency (CBDC) initiatives.

Prior to his London posting, Thammarak worked in the planning of virtual banking licence and managing digitalization projects done with FinTech firms and commercial banks to help improve SME financing at the Bank of Thailand. Thammarak's involvement in CBDC initiatives at the Bank of Thailand started since the planning of its wholesale CBDC project (Project Inthanon) in 2017. A career central banker, Thammarak has also worked in the areas of monetary policy, reserves management, corporate strategy and financial institutions policy.

Thammarak's previous book, *Central Banking: Theory and Practice in Sustaining Monetary and Financial Stability* (John Wiley and Sons, 2014), has also been translated and released in Mandarin.

Thammarak has a PhD in Economics from the University of Melbourne, Australia, Master in Public Management from Lee Kuan Yew School of Public Policy, National University of Singapore, Singapore, and BSc (Econ) from the London School of Economics and Political Science, UK. He was also a Lee Kuan Yew Fellow at Harvard Kennedy School, Harvard University, USA, in 2013, and the Assistant Chief Representative, Bank of Thailand New York Representative Office in 2008–2009, during the height of the Great Financial Crisis.

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Foreword

Technology is not only changing the way we do finance but also the way we regulate it. As a central bank, we have a dual responsibility: to protect consumers and the financial system and to foster innovation and competition in the financial sector. This is a delicate balance that requires careful judgement and constant adaptation. We are living in an exciting time, where technology is reshaping the finance industry. Technology is also transforming the role and functions of central banks, creating new opportunities and challenges for us.

To take advantage of the opportunities that technology has to offer while mitigating the accompanying risks will require the central banks to navigate terrain that is new to many of us. Like most central banks, the Bank of Thailand is now trying to navigate this exciting new frontier of technology and finance. I believe that our journey is not unique but rather reflects the common issues and trends that are affecting many central banks around the world.

One of the most noticeable changes is the emergence of non-bank players, such as FinTech and BigTech, that offer innovative and convenient financial services, especially to the underserved segments. These new players are disrupting the traditional dominance of banks in most markets and pose new questions for regulators and policymakers. How can we ensure a level playing field for different types of players? What are the necessary digital infrastructures and how should we design the rules for them to access and utilize such infrastructures? How might these players respond to financial stability measures and affect the transmission of monetary policy?

Another challenge is to balance the potential benefits and risks of new technologies such as artificial intelligence (AI). At the Bank of Thailand, our approach is to encourage greater AI adoption in the financial sector rather than imposing stringent regulations on it. At the present junction, the arrival of generative AI has produced a step change, but its impact in the financial sector is yet to be realized, whether in terms of benefits or risks, as the technology itself is fast evolving. Given uncertainty regarding the risk-reward trade-off, we need to carefully calibrate our response to ensure that we can harness the potential of AI such as improved efficiency, accuracy and customer experience while addressing potential risks properly. Although we think that many of the risks associated with AI, such as IT and cyber risk and data security and privacy, are currently adequately addressed by existing regulatory frameworks, the remaining primary concern that we have is the issue of transparency and the potential misuse of AI by malicious actors for fraudulent activities.

Finally, technology also presents opportunities for central banks to innovate and enhance their core functions, such as issuing and managing money. Central bank digital currencies (CBDCs) are at the forefront of this innovation, as they aim to provide a digital form of central bank money that can meet the needs of the modern economy. The Bank of Thailand, in partnership with BIS Innovation Hub Hong Kong Centre, the People's Bank of China, Hong Kong Monetary Authority and the Central Bank of the United Arab Emirates, has developed a platform for wholesale cross-border connectivity – mBridge – designed to support real-time, cross-border payments using CBDCs. The platform shows clear potential benefits, such as faster transfer time (from 3–5 days to several seconds) and significantly lower funding, foreign exchange and compliance costs.

While different jurisdictions might have challenges that are unique to their own contexts, the author's comprehensive take on the issues surrounding the emerging challenges of financial disruptions, available policy tools and relevant policy trade-offs will be useful for those who are dealing with the challenges that digital disruption is bringing to the financial sector globally. This timely book provides a big picture view together with the necessary practical details that will put policymakers, practitioners, academics and students right at the exciting new frontier of central banking.

Sethaput Suthiwartnarueput
Governor
Bank of Thailand

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The book has also greatly benefited from the expertise of Dr Bill Roberts and Keith Bear, who are both Fellows, Cambridge Centre for Alternative Finance, Judge Business School, University of Cambridge. A former Head of Open Banking at the Competition and Markets Authority, the UK, Dr Roberts has kindly shared the thinking and practice behind global open banking initiatives and provided insightful suggestions and comments on the manuscript. Keith Bear, who is a well-known global expert in central bank digital currency, distributed ledger technology, AI, and FinTech circles has also kindly given many insightful and valuable suggestions to the manuscript.

From Consult Hyperion, a premier global technical consulting firm on the future of payments, identity and transit fare collection based in the United Kingdom, Steve Pannifer, Managing Director, and Digital Identity Subject Matter Expert, was kind enough to help review and provide valuable inputs and suggestions on digital ID. Tim Richards, Principal Consultant, and Digital Payments Subject Matter Expert also took his time to kindly review and provide valuable comments on digital payments. Tim Allen, Sales Director, EMEA has kindly taken the time to help coordinate with the author and reach out to the experts.

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