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Part B

The Future of Money and Finance: Blockchain Transformation

Chapter 4

Decentralized Finance and Digital Finance

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Thie chapter explores the profound shift underway in the world of finance, driven by the advent of blockchain technology. Beginning with the phenomenon of Decentralized Finance (DeFi), the chapter analyses its distinctive features and fundamental components, highlighting its rapid growth, key applications, and intrinsic risks. Subsequently, the chapter focuses on Digital Finance, examining how the traditional financial sector and regulators are addressing the blockchain revolution, both through the internal adoption of distributed ledger technologies and the creation of new regulatory frameworks. Based on these analyses, the chapter concludes by discussing the future prospects and potential convergence of decentralized and traditional finance, which is poised to become the future of money and financial services.

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1. General overview

1.1 The profound shift redefining the financial sector is driven by two distinct yet interconnected phenomena. On one hand, Decentralized Finance (DeFi) represents a radical re-engineering of financial services, aiming to eliminate traditional intermediaries through the use of smart contracts on public blockchains. Its model is founded on disintermediation, permissionless access, and transparency, directly challenging the conventional banking system.

1.2 On the other hand, digital finance is the response and evolution of the same traditional system, leveraging technology to modernize and enhance its services while maintaining centralized structures. In this context, financial institutions are exploring the use of permissioned distributed ledgers to optimize processes like cross-border payments and are exploring institutional forms of digital money like CBDCs, while regulators are working to define new legal frameworks.

1.3 These two worlds, though driven by opposing logics, are destined for convergence, where blockchain technologies will be increasingly integrated into traditional finance and DeFi protocols will find themselves operating within a regulated environment.

2. Decentralized Finance (De-Fi): core features and components

2.1 Decentralized Finance (De-Fi) is an umbrella term for **decentralized financial applications and services built on public blockchains**. It is used to identify the rise of peer-to-peer financial ecosystems that operate without central intermediaries like banks, brokerages, or clearinghouses. The core innovation of DeFi lies in its ability to provide traditional financial services, such as lending, borrowing, and trading, but in a decentralized, transparent, and accessible way, where **the role of financial intermediaries is substituted by algorithms running on blockchain**, that is to say, by (a combination of) smart contracts. The latter are automated, self-executing applications deployed on blockchain that automate transactions and enforce rules, effectively replacing traditional institutional trust with a new kind of trust based on verifiable code. In sum, De-Fi allows for the **disintermediation of financial services**, through which the financial counterparties – like the lender and the borrower – enter a financial relationship directly by interacting with smart contracts and decentralized applications instead of accessing the services provided by a traditional financial intermediary. As such, the phenomenon of Decentralized Finance represents a profound **paradigm shift in the world of finance**.

⇒ OKP, Part B, Chapter 1
⇒ BIS, The Technology of Decentralized Finance (DeFi), 2023
⇒ ECB, Decentralised finance – a new unregulated non-bank system?

2.2 The De-Fi architecture is built on a set of core features that fundamentally distinguish it from the traditional financial system. Firstly, it is **permissionless**, meaning any individual can

access and participate in the network without needing institutional approval, thereby promoting financial inclusion and **worldwide participation in protocols and services**. Secondly, it champions **transparency** through public blockchains, where all transactions and software applications are publicly verifiable, creating a comprehensive and auditable trail that replaces trust with verifiable data. Thirdly, DeFi is built on the principle of **interoperability**, where different protocols can be combined to create new and **complex financial products and services**. Lastly, it embraces **decentralized governance**, often through Decentralized Autonomous Organizations (DAOs), where decisions are made by token holders, shifting control from a central entity to a distributed community.

2.3 The core building blocks of DeFi ecosystems, such as decentralized exchanges and lending protocols, can be divided into three key technological layers. The **Foundation Layer** includes the public blockchains, primarily Ethereum, that serve as the fundamental infrastructure for DeFi where smart contracts and decentralized applications are deployed and all transactions verified and recorded into the core ledger. The cryptocurrencies that run on these blockchains, such as Ether (ETH), are also part of this foundational layer, serving as both the underlying asset and the due fees for network operations.

The **Protocol Layer** is where the actual DeFi applications are built. These are **collections of smart contracts that define the rules and logic for specific financial services**. Protocols are open-source and permissionless, meaning anyone can use or build upon them. The most common types include:

- **Lending Protocols**: Services like Aave and Compound allow users to lend out their stablecoins and crypto assets to earn interest or borrow by providing collateral;
- **Decentralized Exchanges** (DEXs): Platforms like Uniswap and Curve enable users to swap cryptocurrencies directly with each other, eliminating the need for a centralized exchange;
- **Asset Management Protocols**: These protocols allow users to manage and invest their crypto assets through automated strategies.

The **Application Layer** is the user-facing layer where people interact with the protocols. It includes various applications and services that are built on top of the protocols to provide a user-friendly experience. These can range from simple crypto wallets that connect to protocols to more complex interfaces that aggregate data and provide analytical tools.

2.4 **The phenomenon of DeFi has grown exponentially in the last five years**. This growth can be measured not only by the sheer volume of capital flowing into the sector but also by the proliferation of innovative protocols and applications. A primary metric used to gauge this expansion is the Total Value Locked (TVL), which represents the aggregate value of assets deposited within DeFi smart contracts. In just a few years, the TVL has surged from virtually zero to a staggering tens of billions of dollars. This expansion extends beyond just monetary value, manifesting in a diverse and interconnected network of services that are constantly evolving and building upon one another.

2.5 Most significant examples of De-Fi applications include:

- **Uniswap**: a leading decentralized exchange (DEX) that utilizes an Automated Market Maker (AMM) model, allowing for trustless peer-to-peer token swaps without a traditional order book;
- **Aave** and **Compound**: two prominent lending and borrowing protocols that enable users to lend their crypto assets to earn interest and borrow by providing collateral;
- **MakerDAO**: a decentralized autonomous organization (DAO) that manages the DAI stablecoin, a crypto-backed stablecoin whose value is pegged to the U.S. dollar, showcasing decentralized governance in action;
- **Curve Finance**: a DEX optimized for stablecoin swaps, minimizing slippage and fees for users exchanging stable assets; Lido, a liquid staking protocol that allows users to stake their Ethereum and other cryptocurrencies while still retaining liquidity, enabling them to use their staked assets in other DeFi protocols;
- **Synthetix**: a decentralized synthetic asset protocol that allows users to create and trade synthetic assets that mimic the value of real-world assets like gold or stocks;
- **dYdX**: a leading decentralized exchange for perpetual futures and derivatives trading, that offers an order book-based trading experience similar to centralized exchanges but operates on a decentralized infrastructure;
- **Yearn Finance**: an automated yield aggregator that uses smart contracts to automatically allocate user funds to the highest-yielding lending and trading protocols.

⇒ Uniswap – Website
⇒ Aave – Website
⇒ Compound – Website
⇒ MakerDao – Website
⇒ Curve Finance – Website
⇒ Syntethix – Website
⇒ dYdX – Website
⇒ Yearn Finance – Website

2.6 While the permissionless and transparent nature of DeFi offers **significant advantages** in terms of financial inclusion, innovation and efficiency, it also introduces **substantial risks**, particularly from a legal perspective. On the one hand, the automation provided by smart contracts reduces the need for costly intermediaries and can create a more equitable financial system. On the other hand, the absence of a central authority means there is no single entity to hold accountable in the event of a smart contract bug, a platform hack, or an economic exploit, leaving users with no formal legal recourse. This **lack of traditional consumer protection** is one of the most pressing challenges facing the ecosystem. Furthermore, the decentralized, borderless, and often pseudonymous nature of DeFi poses a formidable challenge for regulators, who struggle to apply existing legal frameworks related **to Anti-Money Laundering (AML) and Know-Your-Customer (KYC) rules**, creating a complex and uncertain legal environment.

⇒ World Bank, Blockchain in Financial Services in Emerging Markets, 2018
⇒ US Federal Reserve, Decentralized Finance (DeFi): Transformative Potential & Associated Risks, 2022
⇒ Esma, Decentralised Finance in the EU: Developments and risks, 2023
⇒ Iosco, Final Report with Policy Recommendations for Decentralized Finance (DeFi), 2023

3. Digital Finance: addressing the blockchain-based revolution

3.1 Digital Finance is a very broad concept used to underline the use of technology to provide financial services within the traditional, centralized banking and financial system. Unlike DeFi, which seeks to eliminate intermediaries, Digital Finance still relies on centralized institutions such as banks, brokers, and credit companies: hence, while De-Fi implies a radical re-engineering of the financial system, Digital Finance represents the **digital evolution of finance**, operating within existing regulatory frameworks and infrastructure. The term is often used more specifically to capture the innovative application of blockchain and distributed ledger technology to traditional financial services.

3.2 The **traditional financial sector** are actively engaging with blockchain technology, not as a replacement for their existing infrastructure, but as a means to enhance it. Major banks and financial firms are exploring and implementing **permissioned distributed ledger technology**, which are closed networks where only authorized participants can access and validate transactions. This approach allows them to harness the benefits of a distributed ledger, such as increased efficiency and transparency **in areas like cross-border payments, trade finance, and post-trade settlement**, while maintaining the necessary control and privacy required by their existing business models and regulatory obligations. A prime example of this institutional adoption is the global exploration of Central Bank Digital Currencies (CBDCs), which would leverage DLT to issue a new, digital form of sovereign currency, representing a top-down, institutional response to the rise of decentralized money. Financial institutions are also exploring **permissionless blockchains and smart contracts**, especially in the context of **asset tokenization**. This involves creating a digital representation of a real-world asset (like real estate or commodities) or a financial instrument (like bonds or equities) that can be traded on a blockchain. This process fundamentally changes how assets are owned and traded within the traditional finance landscape by making them more liquid, fractional, and globally accessible. This practice is a core pillar of the broader **token economy**, which refers to any economic system where the creation, exchange, and value of goods and services are facilitated by digital tokens. This represents a key intersection between traditional finance and blockchain innovation, as institutions seek to leverage the efficiency and programmability of these new digital assets while operating within a regulated environment.

3.3 On the other hand, **regulators** are proactively addressing the blockchain-based revolution by developing new frameworks and adapting existing rules. The decentralized, borderless, and often pseudonymous nature of blockchain and smart contracts has created a significant challenge for traditional legal frameworks, which were designed for a centralized system with identifiable intermediaries. The core regulatory approach is **to balance the need for innovation with the imperatives of financial stability, consumer protection, and the prevention of illicit activities**.
To achieve this, regulators are adopting several key strategies:

- **adapting existing regulations:** rather than creating entirely new laws, many authorities are taking a technology-neutral approach. They are applying existing financial regulations to blockchain-based activities. For instance, a loan executed via a smart contract is subject to the same lending laws as a traditional bank loan. This "same activity, same risk, same regulation" principle provides a foundation for oversight;
- **issuing new regulatory frameworks:** given the unique risks posed by decentralized systems, many jurisdictions are creating dedicated legal frameworks. The EU's **Markets in Crypto-Assets (MiCA)** regulation is a leading example. It provides a comprehensive rulebook for crypto-assets, defining categories of tokens and setting out clear obligations for service providers. This approach aims to provide legal certainty and mitigate risks that cannot be addressed by existing laws;
- **promoting global collaboration:** the borderless nature of blockchain demands a coordinated global response to prevent regulatory arbitrage, where firms move to jurisdictions with more permissive rules. Organizations like the Financial Stability Board (FSB) and the International Organization of Securities Commissions (IOSCO) are working to establish international standards to ensure a consistent regulatory approach worldwide.

4. Core innovations and future prospects

4.1 The core innovations driving both digital finance and De-Fi are set to coexist, shaping a future where the two models influence each other. Digital finance's primary innovation lies in its ability to modernize the traditional financial system, making it more efficient and accessible through the digitization of existing processes. This approach, while maintaining centralized structures and regulations, is building the foundation for a more agile global financial infrastructure, as evidenced by the rising global interest in stablecoins and Central Bank Digital Currencies (CBDCs). Instead, Decentralized Finance (De-Fi), as its revolutionary counterpart, aims to bypass traditional intermediaries entirely through the use of self-executing smart contracts on public blockchains. This gives rise to a truly permissionless and transparent financial ecosystem, where services like lending, borrowing, and trading are directly accessible to anyone with an internet connection. As a result, the rise of De-Fi represents a profound disintermediation of financial services, which challenges the very foundations of the traditional financial system.

4.2 The future will likely see a convergence of these two models. Traditional finance will increasingly adopt blockchain's core technologies, such as tokens and smart contracts, while De-Fi will become more integrated into the broader financial system thanks to clearer regulatory frameworks. The intersection of these two worlds promises to create a more interoperable, efficient, and innovative financial landscape for everyone, blending the control and stability of traditional institutions with the transparency and efficiency of decentralized technology.