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## INTRODUCTION

**W**e have come full circle. The earliest form of market exchange was peer to peer, also known as barter.<sup>1</sup> Barter was highly inefficient because supply and demand had to be exactly matched between peers. To solve the matching problem, money was introduced as a medium of exchange and store of value. Initial types of money were not centralized. Agents accepted any number of items such as stones or shells in exchange for goods. Eventually, specie money emerged, a form in which the currency had tangible value. Today, we have non-collateralized (fiat) currency controlled by central banks. The form of money has changed over time, but the basic infrastructure of financial institutions has not.

However, the scaffolding is emerging for a historic disruption of our current financial infrastructure. DeFi, or decentralized finance, seeks to build and combine open-source financial building blocks into sophisticated products with minimized friction and maximized value to users utilizing blockchain technology. Given it costs no more to provide services to a customer with \$100 or \$100 million in assets, we believe that DeFi will replace all meaningful centralized financial infrastructure in the future. This is a technology of inclusion whereby anyone can pay the flat fee to use and benefit from the innovations of DeFi.

DeFi is fundamentally a competitive marketplace of decentralized financial applications that function as various financial “primitives” such as exchange, save, lend, and tokenize. These applications benefit from the network effects of combining and recombining DeFi products and attracting increasingly more market share from the traditional financial ecosystem.

Our book details the problems that DeFi solves: **centralized control, limited access, inefficiency, lack of interoperability, and opacity**. We then describe the current and rapidly growing DeFi landscape and present a vision of the future opportunities that DeFi unlocks. Let’s begin with the problems.

## **FIVE KEY PROBLEMS OF CENTRALIZED FINANCIAL SYSTEMS**

For centuries, we have lived in a world of centralized finance. Central banks control the money supply. Financial trading is largely done via intermediaries. Borrowing and lending are

conducted through traditional banking institutions. In the last few years, however, considerable progress has been made on a much different model: decentralized finance. In this framework, peers interact with peers via a common ledger not controlled by any centralized organization. DeFi offers considerable potential for solving the following five key problems associated with centralized finance: centralized control, limited access, inefficiency, lack of inoperability, and opacity.

**1. *Centralized Control.*** Centralization has many layers. Most consumers and businesses deal with a single, localized bank, which controls rates and fees. Switching is possible, but it can be costly. Further, the U.S. banking system is highly concentrated. The four largest banks have a 44 percent share of insured deposits compared with 15 percent in 1984.<sup>2</sup> Interestingly, the U.S. banking system is less concentrated than other countries, such as the United Kingdom and Canada. In a centralized banking system, one consolidated entity attempts to set short-term interest rates and to influence the rate of inflation.

This phenomenon reaches beyond the legacy financial sector to tech players like Amazon, Facebook, and Google, who now dominate industries like retail sales and digital advertising.

**2. *Limited Access.*** Today, 1.7 billion people are unbanked, making it very challenging for them to

obtain loans and to operate in the world of internet commerce. Further, many consumers must resort to payday lending operations to cover liquidity shortfalls. Being banked, however, does not guarantee access. For example, a bank may not want to bother with the small loan that a new business requires. Instead, it may suggest a credit card loan, which carries with it a borrowing rate well above 20 percent per year – a high hurdle rate for finding profitable investment projects.

- 3. *Inefficiency.*** A centralized financial system has many inefficiencies. Perhaps the most egregious example is the credit card interchange rate that causes consumers and small businesses to lose up to 3 percent of a transaction's value with every swipe due to the payment network oligopoly's pricing power. Remittance fees are 5–7 percent. Time is also wasted in the two days it takes to “settle” a stock transaction (officially transfer ownership). In the Internet age, this seems utterly implausible. Other inefficiencies include costly (and slow) transfer of funds, direct and indirect brokerage fees, lack of security, and the inability to conduct microtransactions, many of which are not obvious to users. In the current banking system, deposit interest rates remain very low and loan rates high because banks need to cover their brick-and-mortar costs. The insurance industry provides another example.

4. ***Lack of Interoperability.*** Consumers and businesses deal with financial institutions in an environment that locks interconnectivity. It is well-known that the U.S. financial system is siloed and designed to sustain high switching costs. Moving money from one institution to another can be unduly lengthy and complicated. For example, a wire transfer can take three days to complete. In an attempt to mitigate this issue within the world of centralized finance, in 2019 Visa tried to acquire Plaid,<sup>3</sup> a product that allows any company to plug into an institution's information stack with the user's permission. Though this was a strategic move to help Visa buy some time, it did not address the fundamental problems with the current financial infrastructure.
5. ***Opacity.*** The current financial system is not transparent. Bank customers have very little information on the financial health of their bank and instead must place their faith in the limited government protection of FDIC insurance on their deposits. Further, it is difficult for them to know if the rate they are offered on a loan is competitive. Although the consumer insurance industry has made some progress with fintech services that offer to find the "lowest" price, the loan market is very fragmented – yet competing lenders all suffer from the system's inefficiencies. The result is that the lowest price still reflects legacy brick-and-mortar and bloated back-office costs.

## IMPLICATIONS

The implications of these five problems are twofold. First, many of these costs lead to *lower economic growth*. For example, if loan rates are high because of legacy costs, high-quality investment projects may be foregone, as explained previously. An entrepreneur's high-quality idea may target a 20 percent rate of return – precisely the type of project that accelerates economic growth. If the bank tells the entrepreneur to borrow money on their credit card at 24 percent per year, this seemingly profitable project may never be pursued.

Second, these problems perpetuate or exacerbate *inequality*. Across the political spectrum, most people agree there should be equality of opportunity: a project should be financed based on the quality of the idea and the soundness of the execution plan and not by other factors. Importantly, inequality also limits growth when good ideas are not financed. Though purported to be the land of opportunity, the United States has one of the worst records in migrating income from the bottom quartile to the top quartile.<sup>4</sup> Inequality of opportunity arises, in part, from lack of access to the current banking system, reliance on costly alternative financing such as payday lending, and the inability to buy or sell in the modern world of e-commerce.

These implications are far-reaching, and, by any calculations, this is a long list of serious problems endemic to our current system of centralized finance. Our financial infrastructure has failed to fully adapt to the digital era in which

we are living. Decentralized finance offers new opportunities. The technology is nascent, but the upside is potentially transformational.

Our book has multiple goals. First, we identify the weaknesses in the current system, including discussion of some early initiatives that challenged the business models of centralized finance. Next, we explore the origins of decentralized finance. We then discuss a critical component of DeFi: blockchain technology. Next, we detail the solutions DeFi offers and couple this with a deep dive on some leading ideas in this emerging space. We then analyze the major risk factors and conclude by looking to the future and attempt to identify the winners and losers.