1 | Prologue

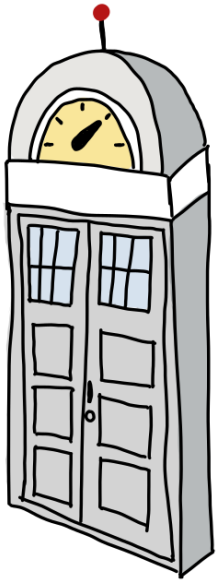
"Vague, but exciting" - these are the words that Mark Sendall wrote on Tim Berners-Lee's 1989 proposal for a client-server architecture with links, which we now known as the world-wide web. The decades after saw an incredibly fast-paced evolution from the advent of early web browser such as Mosaic in 1993 to the development of e-commerce platforms like Amazon and Alibaba and the first types of social media in 1997. Had you been asked to invest in any of these technologies, would you have done it? If only we had a time-machine indeed! But we are in luck, there is a reasonable chance that blockchain (the "internet-of-value") may present us with a similar opportunity. We are already beyond the vague, but exciting phase, and well into web-browser territory.

One of the most exciting stories of the past years has undoubtedly been the vindication of blockchain. Infamous for its alleged pyramid-like features and multiple scams and hacks, it has somehow managed to turn all of this around and attract the attention of controversial entrepreneurs like Elon Musk as well as more traditional investors who expose themselves through funds like Grayscale's bitcoin trust (a crypto ETF). Almost every respectable consultancy company in the world has a blockchain divisions, and most incumbents' innovation labs of have at least experimented with the technology by now. Governments across the world are feeling the heat with many experimenting with digital fiat money which they hope will satiate the demand for more transparent, faster, and cheaper currencies [1].

What is causing such a diverse population to leave behind traditional currencies and become blockchain-zealots? To understand this phenomenon better, we must first let go of the notion of crypto-currencies as just alternative stores of value ("digital gold") or just the latest speculative growth asset. Instead, blockchain should be seen as fundamentally a fully integrated technology which can be programmed to do so much more. Indeed, during the past years, entrepreneurs and developers have worked hand-in-hand to create complete and fully functional financial platforms with backing of billions of USD in venture capital. The end-result of this hard labor is the central theme of this book. DeFi (Decentralized Finance) is an ecosystem which offers all financial services that are found within traditional financial institutions - minus many of its barriers. This book is therefore not about valuing Bitcoin or Ethereum, or the latest coin that is in fashion. Instead, the purpose of this book is to expose you to the beauty of blockchain technology with applications to finance. Let's look at an example.

Alice lives in Venezuela and does not have access to many financial services. With a few clicks of a button, it is now possible for her to buy USD pegged stable-coins using crypto-currency from a decentralized exchange (DEX), then deposit them into a lending protocol or use futures to earn double-digit interest via interest-bearing tokens which she owns and manages herself. She can supply these interest-bearing instruments to an invest-

[1] Include example of eurobond?



ment pool to optimize return for the assets. If she is weary of capital loss due to recent FUD (bad press) for a product that she is using, she can insure her investments on-chain. Twenty clicks later, she has obtained a fully insured portfolio that rivals that of advanced investors in fully developed financial-service economies - all of which, while staying within the blockchain ecosystem.

Don't worry if you didn't get all of that, by the end of this book you will! The point of the above story is to show how far along decentralized finance has come. It is an impressive feat that blockchain technology has caught up to decades of innovation in finance already, and its partly why at the time of writing it has attracted more than USD 40 billion dollars of investments by end-users already. But to claim that DeFi is equivalent to traditional finance would be dishonest. In fact, we are seeing the glimpses of it expanding its capabilities into the realm of financial fantasy. Imagine a world where machines coordinate transactions with each other without any human interaction, where financial contracts are settled automatically based on prespecified conditions. A place where transactions no longer need to go through the slow process of clearance using an order-book, but instead are instantly settled by automated market makers (AMM). Even more mind-boggling, imagine being able to loan 10 million dollars without putting up any collateral, use that to gain a 12% arbitrage return on some asset and then pay the loan back, all within less than 15 seconds of time from start to finish and no KYC. These are just a handful of avant-garde financial innovations that are operational on blockchain today. It is likely that even these will seem rudimentary compared to what will be developed tomorrow, if the speed of innovation keeps up with its current track-record.

This book was written over the course of 2020 and 2021 when we were experiencing a major bull run due to DeFi. Whether that bull-run will have lasted by the time you read these pages, is uncertain. What is certain, is that blockchain is here to stay, for the long run. You have been given a time-machine and its up to you to use it as you desire. Just like in 1993, the road to mass-adoption is perilous, full of volatility and booms and busts. Even so, I have not been more excited about a technology than blockchain in a long time, and I hope that you will be too after learning more about it. Whether or not you are prepared to invest your hard-earned savings

in this technology, it would be a mistake to ignore it. And if you do decide to invest, simple blanket investments in crypto-currencies or off-chain trusts which track them is not going to cut it if you truly want to capture the value of this emergent technology. Indeed, this is the time for any self-respecting investor to start learning, and you have taken your first step by obtaining this book. Alternatively, you could wait for another time machine to appear, but as we know those are few and far between.

1.1 WHY THIS BOOK

DeFi is a complicated subject to learn with a steep learning curve and an incredibly fast pace of innovation. At the same time, it is much more risky than traditional finance as there are both financial risks, legal risks, as well as blockchain-specific risks to take into account. When you read the documentation of DeFi projects (you should!), you will usually encounter a disclaimer somewhere in the beginning saying that users "*should do their own research (DYOR) and be aware of the risks*" . While true, it glosses over another truth: it is difficult to find high-quality information which describes coherently what those risks are exactly.

This book will give you a framework that will guide you through your own DeFi journey, along with formula's to calculate your own risks and returns. By reading it, you are doing your own research and will be knowledgeable enough to know what the major risk/reward trade-offs are for projects that are described within it. With that said, I did not intend to write this book as financial advice and numbers contained within it are mostly for illustration purposes. It is also not an introduction to blockchain, we will assume that you are already with the basics such as what consensus algorithms and wallets are. We will only cover these briefly to ensure that this book can be understood from the grounds-up. Even so, I encourage you to read-up on these topics beyond what is written here if you haven't already.

1.2 A COMMUNITY EFFORT

This book was originally intended as an introductory text for upper undergraduate business majors. Halfway its development, we decided to follow the somewhat unusual development design of Bayesian Methods for Hackers. All content is open-source: everyone is free to read, but also to contribute to the book using github.

1.3 HOW YOU SHOULD READ THIS BOOK

This book does not need to be read in a linear fashion. I encourage readers who are not familiar with blockchain technology to first read Part 1 of the book which introduces the basic concepts. Part 2 is more like a menu that you can select from when you use certain products. They are presented in a manner that is sequentially consistent as some later chapters may require knowledge from earlier ones.

Let's begin!