A
PROJECT REPORT

ON

"THE STUDY OF DECENTRALIZED FINANCE (DeFi)"

Submitted in partial fulfillment of requirement of the award of degree

IN

BACHELORS OF BUSINESS ADMINISTRATION (BBA)

By

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CERTIFICATE

This is to certify that **MASI UNNISA** Roll no:**1084-19-684-033** of **GOVERNMENT CITY COLLEGE**, Hyderabad, Telangana, submitted the project work on "**THE STUDY OF DECENTRALIZED FINANCE (DeFi)**" as partial fulfillment of **BBA** for the academic year **2021-2022.**

DECLARATION

I **MASI UNNISA** bearing Roll No: **1084-19-684-033** Studying **BBA** VI Semester at **GOVERNMENT CITY COLLEGE** Hyderabad, during the academic year **2021-2022** hereby declares that the project titled "**THE STUDY OF DECENTRALIZED FINANCE (DeFi)**" has been carried out by me under the extreme guidance and supervision of **DR. R. SRIDHAR**

The information has been collected from genuine & authentic sources. The work has been Submitted in fulfillment of the partial fulfillment of **BBA** and not submitted elsewhere for any other purpose.

Signature of the Supervisor **Signature of the Student**

ACKNOWLEDGEMENT

It is an immense pride for me, that **GOVERNMENT CITY COLLEGE** for providing us the needful education.
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CHAPTER:1

Defining DeFi, the new level of currency

1.0 INTRODUCTION TO DeFi:

Decentralized finance (DeFi) is an emerging financial technology based on secure distributed ledgers similar to those used by cryptocurrencies. The system removes the control banks and institutions have on money, financial products, and financial services. It is an open and global alternative to the restrictive, centralized and centuries-old traditional financial system much of the world knows today. DeFi is a terminology used to define decentralized financial protocols, products, and platforms that allow people to become a part of the financial ecosystem, without depending on traditional financial infrastructure. DeFi offers anyone with a smartphone and an internet connection the opportunity to put their money to work on their terms across services like investing, borrowing, lending, and trading. Rather than have banks act as intermediaries, DeFi puts individuals at the center of a peer-to-peer financial system run on open-source blockchains like Ethereum.

DeFi is a developing area at the intersection of blockchain, digital assets, and financial services. Its protocols seek to disintermediate finance through both familiar and new service arrangements.
It is a general term covering a variety of activities and business relationships.
Since DeFi has no central authority, it enables users to take advantage of financial systems by providing an alternative to traditional financial systems that are currently in place. DeFi ecosystems drive a variety of tasks that are powered by products and services, such as digital assets, smart contracts, protocols, and applications that lie at the core of DeFi and can be accessed through a simple UI.

We identify six major DeFi service categories—stablecoins, exchanges, credit, derivatives, insurance, and asset management—as well as auxiliary services such as wallets and oracles. While traditional finance relies on intermediaries to manage and process financial services, DeFi operates in a decentralized environment—public, permissionless blockchains. Services are generally encoded in open-source software protocols and smart contracts.

Like blockchain technology more generally, DeFi has an enthusiastic base of evangelists, who promote its potential for efficiency, transparency, innovation, and financial inclusion. It also has its critics, risks, and unknowns. At this early stage, it is essential for industry and governments alike to develop a well-informed and nuanced understanding of the opportunities, risks, and challenges.
DeFi is a collective term for financial products and services that are accessible to anyone who can use Ethereum – anyone with an internet connection. With DeFi, the markets are always open and there are no centralized authorities who can block payments or deny you access to anything. Services that were previously slow and at risk of human error are automatic and safer now that they're handled by code that anyone can inspect and scrutinize.

1.1 OBJECTIVE OF THE STUDY:

The objective of this thesis is to take a closer look at DeFi and its underlying protocols that has made it surge in popularity, especially since 2020. To achieve the objective of this thesis, a thorough literature review is conducted, where assessments are presented based on a set of research questions.

The aim of the thesis is to answer the following research questions:
• ***Research question 1****:* What is DeFi and why has it emerged as an alternative form of finance?
• ***Research question 2****:* What is the applicability of DeFi today?
• ***Research question 3****:* What does the future look like for the DeFi movement?

The thesis is structured in a simple manner to ensure a full systematic understanding of DeFi and its main components. Firstly, an introduction is provided which is followed by a literature review that gives valuable information and an understanding on previous research about DeFi as an alternative financial movement. Secondly, the main protocols that make up DeFi is examined and explained. Next, the advantages and disadvantages are put forward. Furthermore, the results of the literature review and analyses are presented and interpreted.
Finally, the results and the corresponding conclusion of the thesis is laid out.

1.2 FUNDAMENTALS OF DeFi:

DeFi is a general term for decentralized applications (Dapps) providing financial services on a blockchain settlement layer, including payments, lending, trading, investments, insurance, and asset management. DeFi services typically operate without centralized intermediaries or institutions, and use open protocols that allow services to be programmatically combined in flexible ways. Historically, intermediaries have played essential roles within financial markets, serving as agents and brokers of trust, liquidity, settlement, and security. The range and value of intermediaries has grown over time to meet the needs of an increasingly complex financial system.

DeFi aims to address some of these challenges—though many still apply to the DeFi ecosystem in its current state. DeFi leverages blockchain technology to facilitate alternatives to traditional service providers and market structures. It offers the potential for innovation and creation of new services for improving efficiency of financial markets—building upon work being done in financial technology (fintech) and blockchain technology more broadly. Whether it achieves this promise remains to be seen. The market experienced explosive growth beginning in 2020. According to tracking service DeFi Pulse, the value of digital assets1 locked into DeFi services grew from less than $1 billion in 2019 to over $15 billion at the end of 2020, and over $80 billion in May 2021.2 Yet DeFi is still early in its maturation.

DeFi has changed the conventional notions regarding finance by bringing the best of cryptocurrency foundations and blockchain technology for the management of financial transactions. Therefore, the attention on DeFi features has increased profoundly in recent times

1.3 CHARACTERISTICS AND FEATURES OF DeFi:

The goal of this report is to demystify DeFi. It describes the basic attributes of DeFi services, the structure of the DeFi ecosystem, and emerging developments. Not every application of blockchain technology—even those involving financial transactions—is a form of DeFi. Nor is every element contributing to the DeFi ecosystem appropriately considered a DeFi service, business or software. It is also possible to get a clear impression of the characteristics of DeFi by reflecting on the benefits they offer. The benefits actually showcase the value proposition offered by DeFi or the features which you can include in your DeFi solutions.
Importantly, these characteristics represent the aspirations for DeFi. Businesses will exhibit each of these characteristics to varying degrees, and this may be fluid over projects' lifetimes.12 Broadly speaking, the goal of DeFi solutions is to provide functions analogous to, and potentially beyond,

those offered by traditional financial service providers, without reliance on central intermediaries or institutions.
Here are the four important layers which make up the DeFi stack and are crucial for the popularity of DeFi.

1. SETTLEMENT LAYER:

The settlement layer is one of the notable DeFi features as it is the basic layer on which other DeFi solutions are developed. It includes a public blockchain along with the native digital currency. The transactions on DeFi apps generally use the native digital currency, which could be or could not be traded in different markets.

2. PROTOCOL LAYER:

Software protocols are basically rules and standards tailored for the governance of specific activities or tasks. The protocol layer features a collection of principles and rules which all the participants in a particular industry must follow. DeFi protocols enable interoperability, thereby opening up the scope for use by multiple entities simultaneously for the development of a service or app. The protocol layer is essential for obtaining the desired liquidity levels in the DeFi ecosystem.

3. APPLICATION LAYER:

The application layer is one of the notable features in DeFi, which answers the question of 'Why is DeFi so popular?' effortlessly. According to the name, one can clearly infer that the application layer houses the consumer-facing applications. The decentralized applications represent the underlying protocols in abstract forms as basic consumer-oriented services. Many applications on the crypto landscape, such as lending services and decentralized exchanges, are found on this layer.

4. AGGREGATION LAYER:

The final layer in the DeFi tech stack is also one of the top features of decentralized finance. The aggregation layer includes aggregators connecting different applications from the previous layer for providing service to investors. For example, aggregators could help with the seamless circulation of money among various financial instruments for improving returns.

1.4 FACTORS OF DeFi:

Over the past one year, DeFi markets have drawn significant attention. This surge in attention can be attributed to the following factors:

- Mandatory requirement by regulators for KYC between lenders and borrowers enabled DeFi to flourish, as there is no such requirement for lending.
- Involvement by major players such as Grayscale and members of Interbank Information Network
- Lower interest rates were offered globally because of the COVID-19 pandemic, whereas DeFi offered higher interest rates.
- FOMO led people to explore DeFi and invest in projects that were initially left out by the explosive growth

CHAPTER:2

The Rise of DeFi

2.0 THE DeFi MOVEMENT:

This chapter outlines the DeFi movement as a continuation of the emergence of blockchain technology. With the advent of blockchain technology, cryptocurrencies and smart contracts, alternative financial systems have steadily gained more attraction. In addition, the most important promises of DeFi are laid forward. These promises are decentralization, borderless transactions, increased transparency, and better interoperability.

2.1 EMERGENCY OF DeFi:

Decentralized finances, at least as a concept, is not a new phenomenon. An early example of decentralized finance emerged in the foreign currency (forex) market approximately 20 years ago. Instead of individual corporations demanding various banks to get the best rate, an electronic system was introduced to match the buyers and sellers directly at an agreed-upon price with little to no spread. The banks could offer this service to its own customers and collect a modest fee (compared to the spread). Excessive costs and unhappy customers have always brought in many fintech innovations that have revolutionized traditional finances, PayPal being a great example. In 2009 the landscape of digital currencies changed forever with the publication of Bitcoin's whitepaper by the creator(s) Satoshi Nakamoto and the subsequent launch of Bitcoin. The paper presents a peer-to-peer system that is decentralized and utilizes the concept of blockchains. Blockchains allow for cryptographic scarcity (Bitcoin has a fixed supply cap of 21 million which in concept is deflationary), censorship resistance and user sovereignty (no entity other than the user can determine how to use funds), and portability (send any quantity anywhere at any time for a relatively low fee). These features combined in a single technology make cryptocurrencies a formidable innovation in the financial world. Compared to traditional currencies such as the United States Dollar (USD), Bitcoins value proposition becomes easier to understand. The USD is no longer backed by gold, it was removed in 1971 [68]. In addition, The Federal Reserve can adjust the supply of USD through monetary policy to achieve certain financial or political goals, and lastly the people do not "own" their own money. Inflation eats away at the value of USD, decreasing its ability to store value over time.

Cryptocurrencies as a whole has risen due to a desire to be free from financial systems dominated by governments and central banks. They present new ideas such as being immutable, borderless, open-source and decentralized.Importantly, all these innovations were built on the back- bone of centralized finance. While there have been some technological advances, the structure of today's banking system has not changed much in the past 150 years. That is, digitization still supported a legacy structure. The high costs associated with this legacy system has spurred further advances known as fintech.

FINTECH

When costs are high, innovation will arise to capitalize on inefficiencies. Sometimes, however, a powerful layer of middle people can slow this process. An early example of decentralized finance emerged in the foreign currency (forex) market 20 years ago. At the time, large corporations used their investment banks to manage their forex needs. For example, a U.S. based corporation might need €50 million at the end of September to make a payment on some goods purchased in Germany. Its bank would quote a rate for the transaction. At the same time, another client of the bank might need to sell €50 million at the end of September.

The bank would quote a different rate. The difference in the rate is known as the spread – the profit the bank makes for being the intermediary. Given the multitrillion-dollar forex market, this was an important part of bank profits.

2.2 DeFi AND ETHEREUM:

Let's start by specifying that presently, most if not pretty much all of the DeFi projects are built on Ethereum. Ethereum is a decentralized blockchain that allows other decentralized blockchain applications (dApps) to be built on smart contracts, and some of these apps can have their exchangeable tokens. The compound is one of the protocols that primarily deal with decentralized financial services that save and lend cryptocurrency.

The main reason for this is the fairly powerful Ethereum smart contract platforms that provide the robustness that allows you to write smart high level contracts containing all the necessary logic for your DeFi application. Additionally, Ethereum has the most advanced ecosystem for all smart contract platforms. Thousands of developers create new applications every day, and the greatest value lies in smart contracts that create additional networking effects. One of the widely adopted programming languages for smart contracts on Ethereum Blockchain is called Solidity. Solidity allows the creation of advanced smart contracts containing all the necessary logic for the DeFi applications. Besides, Ethereum has the most developed system amongst smart contract platforms, with an increasing number of developers building and creating new applications every day and the most value locked in a smart contract, creating an additional network effect. This is perfect because Ethereum's platform for smart contracts gives more room for flexibility, and it instantly performs transactions if specific conditions are met. Ethereum smart contracts programming languages like Solidity are particularly created for developing and deploying such smart contracts. For example, if a user wants to send their money to a friend on a Thursday, only if the temperature skyrockets to 85 degrees Fahrenheit, according to weather.com. Another example would be changing your agricultural land rent prices based on corn futures (i.e., futures security) prices. Rules and clauses like this can be included in a smart contract. Lots of DeFi applications run on Ethereum with smart contracts at the center of them all.

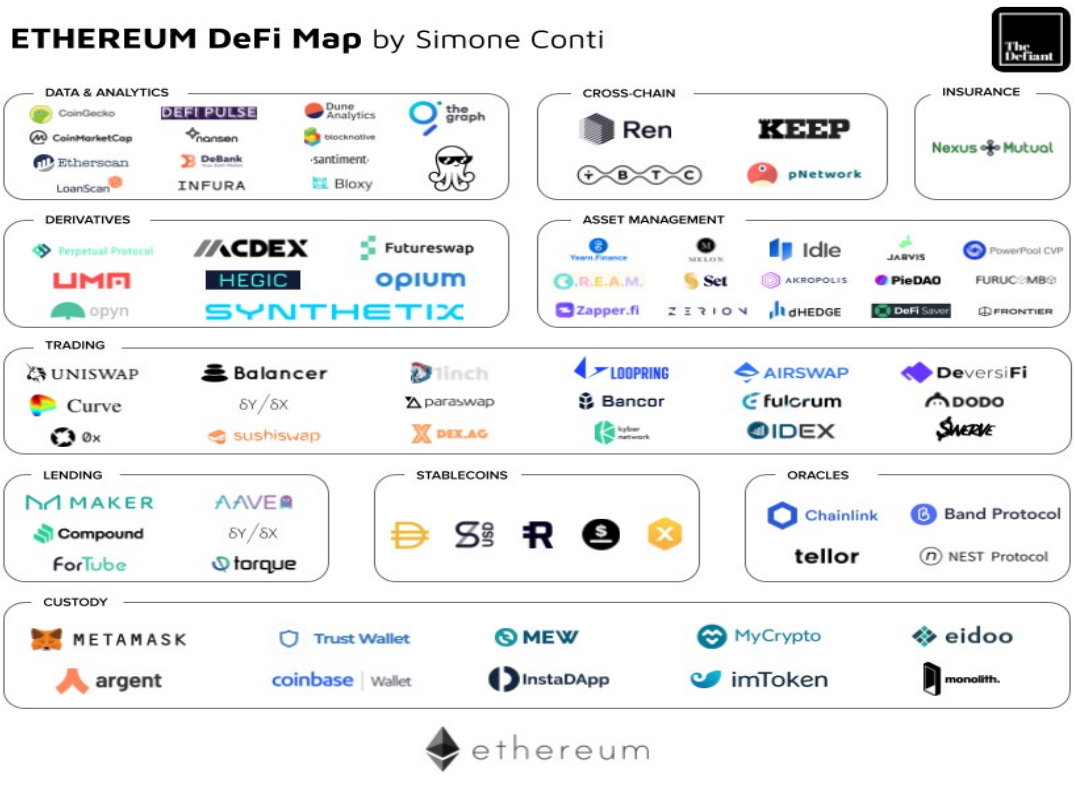


Figure 1: Ethereum DeFi projects map

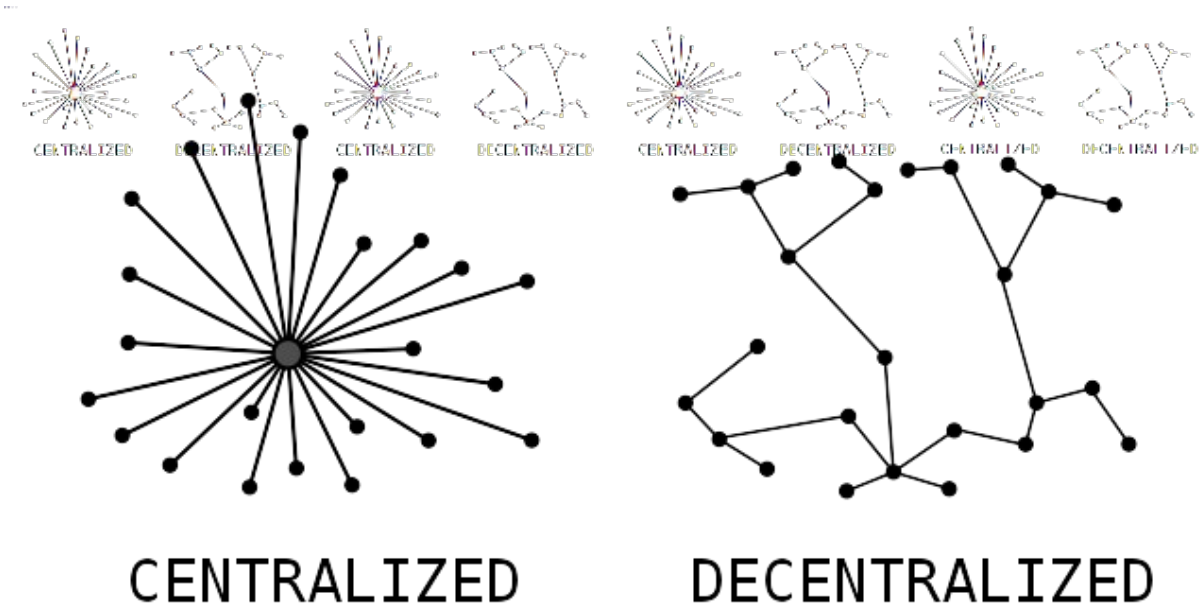
2.3 DeFi PROMISES:

DeFi offers a mix of promises and key properties not readily available today in the context of traditional financial economy. If successful, it may have the potential to create an alternative financial system that is more decentralized, innovative, interoperable, transparent, and borderless. Moreover, this movement highlights the potential of blockchain technology in spawning a new set of business models centered around decentralization.

In the following subchapters we will look at key promises of DeFi.

Decentralization

One of the key promises of DeFi is in the name itself – decentralization. When centralized financial institutions—such as Citibank (or any major bank for that matter) or online payment services like PayPal, or Square rise to dominance, it accumulates disproportionate market power and large profits. In a centralized financial system, financial institutions are the main intermediaries negotiating and controlling financial transactions. In contrast, in a decentralized financial system, financial transactions are facilitated not by centralized institutions but by decentralized peer-to-peer networks across the globe – without the need for governmental or institutional interference [36]. By reducing or completely removing the involvement of centralized institutions, DeFi platforms can reduce transaction costs. As decentralized peer-to-peer networks emerge and rise to power, everybody can participate in the system to carry out financial transactions. And yet, no central figure can monopolize or limit the network and exclude others from participating. Decentralization is in the heart of the DeFi movement, in addition to general blockchain technology and several cryptocurrencies.



Borderless

DeFi and decentralized applications are inherently borderless. In contrast, centralized finances cannot truly be borderless, as it is often tied to specific governmental rules and geographical locations with specific fiat currencies. With the use of cryptocurrencies, a participant in a DeFi system can move capital (or other digital assets) freely across borders, geographical locations, and bypass authoritarian governmental rules. Transferring value across the globe in a decentralized financial system can then be compared to sending an email – with minimum transaction costs.

Transparency:

Centralized financial institutions cannot have full transparency, as they must secure their centralized assets. DeFi, in contrast, secures their public ledgers through distributed consensus and fundamental transparency. It uses public records that can be easily viewed and verified, and it records transactions on public blockchains to limit opportunistic behavior. Transacting parties can then interact and trust each other without pre-existing relationships or an intermediary. This can expand the scale and scope of potential transactions across the world as distributed ledgers generate distributed trust. DeFi platforms are also often built with open-source code. This means external parties can check business logics to expose hidden biases, risks, and threats. In addition, transparent public ledgers and open-source code help keep records of historical transactions

Interoperability:

Institutions within traditional finances tend to work in single, isolated islands – driving up transaction barriers. Different financial institutions must maintain their own records, so one financial service may not be interoperable with another. Moving capital and value across these institutions become cumbersome, time consuming and costly. In contrast, DeFi is built on public blockchains with open principles, increasing the interoperability across different decentralized services. With high interoperability, financial capital and value can flow effortlessly across various services and borders. Although projects developed on the same public blockchain enjoy high-level interoperability, decentralized finance has not reached full interoperability yet, due to the lack of interoperability across blockchains. Currently, many projects—such as Cosmos and Polkadot—are working on intersecting different blockchains to achieve full interoperability in the decentralized financial space. As of early 2021, Ethereum is the dominant platform for DeFi institutions, and all Ethereum- based projects enjoy high interoperability. In total, 87% of all publicly funded projects within DeFi is built on the Ethereum blockchain.

Financial services:

DeFi directly mediates the transfer and exchange of value. Auxiliary services such as oracles, query systems, and decentralized storage may be important enablers of DeFi activity, but they should be distinguished from DeFi services themselves.

Trust-minimized operation and settlement:

DeFi projects generally build on public, permissionless blockchains offering smart contract functionality, such as Ethereum. Transactions are executed and recorded according to the rules of the DeFi protocols. Trust minimization is often extended to the governance structures that establish the conditions for protocol changes.

Non-custodial design:

The assets issued or managed by DeFi services cannot in theory be unilaterally expropriated or modified by third parties, even by those providing intermediation and other services users retain full control. Thus, centralized cryptocurrency exchanges that have custody over digital assets are not DeFi businesses, though many are developing DeFi offerings.

Open, programmable, and composable architecture:

There is broad availability of the underlying source code and a public application programming interface (API). Components can be composed together and programmed to create new financial instruments and services dynamically. For example, a stablecoin may be used as the foundation for a derivative which is used as collateral on a loan and subject to an insurance contract.

Programmability:

Another notable entry among features of decentralized finance is programmability. It is essential to note that majority of the DeFi solutions available now are based on the Ethereum blockchain. Therefore, the opportunity for accessing smart contracts with higher chances of programmability in DeFi could help in automatic execution. At the same time, the programmability in DeFi also opens up new avenues for creating new financial instruments and digital assets. Therefore, DeFi has all the necessary support required for addressing any type of conventional financial service function.

Immutabilty:

The concept of financial inclusion for everyone is one of the promising responses for ‘why is DeFi so popular?’ albeit with concerns regarding immutability. The exchange of information and financial transactions in DeFi requires the assurance of data integrity. So, it is important to have tamper-proof data coordination throughout the decentralized architecture of blockchain.As a result, it can contribute profound improvements in security and scope for audits. Immutability is not only an essential feature but also a credible value advantage of introducing blockchain in the world of finance. With the assurance of safe and secure data transmission without any unauthorized modifications, DeFi could offer the assurance of integrity for all transactions.

CHAPTER:3

Defi eliminating all money exploiter.

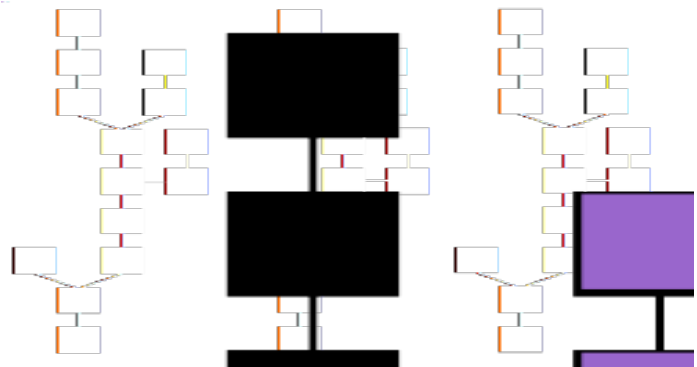
3.0 DeFi INFRASTRUCTURE:

In this chapter, we discuss the innovations that led to DeFiand lay out the terminology.

DeFi's ecosystem has been expanding owing to increased interest among retail investors, which is evident from the total value locked in the DeFi ecosystem. Growth since October 2017 has been over 921K%. Though it is evident that most of the growth occurred during the COVID-19 period, the industry was gearing up for this growth for the past two years. DeFi infrastructure consists of protocols, structures, or technologies that help build DeFi projects or enable to connect different projects, also known as oracles.

DEFI BUILDING BLOCKS:

- **BLOCKCHAIN:** The key to all DeFi is the decentralizing backbone: a block-chain. Fundamentally, blockchains are software protocols that allow multiple parties to operate under shared assumptions and data without trusting each other. These data can be anything, such as location and destination information of items in a supply chain or account balances of a token. Updates are packaged into "blocks" and are "chained" together cryptographically to allow an audit of the prior history – hence the name Blockchains are possible because of consensus protocols sets of rules that determine what kinds of blocks can become part of the chain and thus the "truth."
  These consensus protocols are designed to resist malicious tampering up to a certain security bound. The blockchains we focus on currently use the proof of work (PoW) consensus protocol, which relies on a computationally and energy intensive lottery to determine which block to add. The participants agree that the longest chain of blocks is the truth. If attackers want to make a longer chain that contains malicious transactions, they must out pace all the computational work of the entire rest of the network. In theory, they would need most of the network power ("hash rate") to accomplish this – hence, the famous 51 percent attack being the boundary of PoW security. Luckily, it is extraordinarily difficult for any actor, even an entire country, to amass this much network power on the most widely used blockchains, such as Bitcoin or Ethereum. Even if most of the network power can be temporarily acquired, the amount of block history that can be overwritten is constrained by how long this majority can be maintained. Then, they may be selected to propose a block, which needs to be attested by many of the other validators. Validators profit by both proposing a block and attesting to the validity of others' proposed blocks. PoS is much less computationally intensive and requires vastly less energy.



- **DIGITAL ASSETS:** Tokens representing value that can be traded or transferred within a blockchain network. Bitcoin and other cryptocurrencies were the first blockchain-based digital assets. Others have a range of intended functions beyond payments.
- **CRYPTOCURRENCY:** The most popular application of blockchain technology is cryptocurrency, a token (usually scarce) that is cryptographically secured and transferred. The scarcity is what assures the possibility of value and is itself an innovation of blockchain. Typically, digital objects are easily copied. As Eric Schmidt, the former CEO of Google, said, Bitcoin is a remarkable cryptographic achievement and the ability to create something that is not duplicable in the digital world has enormous value."

  No one can post a false transaction without ownership of the corresponding account due to the asymmetric key cryptography protecting the accounts. You have one "public" key representing an address to receive tokens and a "private" key used to unlock and spend tokens over which you have custody. This same type of cryptography is used to protect your credit card information and data when using the Internet. A single account cannot "double spend" its tokens because the ledger keeps an audit of the balance at any given time and the faulty transaction would not clear. The ability to prevent a double spend without a central authority illustrates the primary advantage of using a blockchain to maintain the underlying ledger.

  The initial cryptocurrency model is the Bitcoin blockchain, which functions almost exclusively as a payment network, with the capabilities of storing and transacting bitcoins

across the globe in real time with no intermediaries or censorship. This is powerful value proposition gives bitcoin its value. Even though its network effects are strong, some competitors in the cryptocurrency space offer enhanced functionality.

- **WALLETS:** Software interfaces for users to manage assets stored on a blockchain. With a non-custodial wallet, the user has exclusive control of funds through their private keys. With custodial wallets, private keys are managed by a service provider.
- **DECENTRALIZED APPLICATIONS (DAPPS):** software applications built out of smart contracts, often integrated with user-facing interfaces using traditional web technology.As DeFi has boomed from 2020 and onwards, a whole ecosystem of DApps have been developed to be used in the space. Below is a list of the top 5 DApps (in terms of use case, innovation, and popularity) in specific categories as of February 2021

  Lending:

- **Aave** – an open source and non-custodial protocol to earn interest on deposits and borrow assets.
- **Akropolis** – a lending protocol aiming at DeFi yield optimization and interest-rate sharing.
- **Atomic Loans** – a lending platform that offers non-custodial Bitcoin-backed loans.
- **bZx** – a decentralized and open finance protocol that facilitates lending and borrowing for margin trading.
- **Centrifuge** – an on-chain risk assessment tool and pooling infrastructure for borrowing against illiquid holdings such as invoices, real estate, and commodities.

- **GOVERNANCE SYSTEMS:** Software-based mechanisms that manage changes to smart contracts or other blockchain protocols, often based on tokens that allocate voting rights to stakeholders.
- **DECENTRALIZED AUTONOMOUS ORGANIZATIONS (DAOS):** Entities whose rules are defined and enforced in the form of smart contracts.
- **SMARTCONTRACTS:** A crucial ingredient of DeFi is a smart contract platform,which goes beyond a simple payments network such as Bitcoin and enhances the chain's capabilities. Ethereum is the primary example. A smartcontract is code that can create and transform arbitrary data or tokens on top of the blockchain to which it belongs. Powerfully, it allows the user to trustlessly encode rules for any type of transaction and even create scarce assets with specialized functionality. Manyof the clauses of traditional business agreements could be shifted to a smart contract, which not only would enumerate but also algorithmically enforce those clauses. Smart contracts go beyond finance to include gaming, data stewardship, and supply chain.
  Smart Contracts are simply programs that run on the Ethereum blockchain. It is a set of code (functions) and data (states) located at a certain Ethereum blockchain address. Smart contracts are a form of an Ethereum account. What it implies is that it contains a fund balance and can activate transactions across the network. Nonetheless, it cannot be controlled by a network member. Instead, it is programmed and distributed across the network and works as pre-set or pre-coded. User accounts can interact with smart contracts

by sending transactions that perform functions DeFined in the smart contract. Smart contracts specify rules as regular contracts, and these get enforced automatically using code. Smart contracts assist with the exchange of money, property, shares, or anything valuable in a transparent, non-conflict way while forgoing the services of a middleman. Specific output is guaranteed with the correct input. This logic is coded in the vending machine the same way it is coded into a smart contract.

Anyone can sign smart contracts and use them on the web. All that is required of you is to learn to code in smart contract language and have enough ETH to use the contract. Using a smart contrct is technically a transaction, so you have to pay for gas in the same way you pay for a simple ETH transfer. However, the gas cost of using the contract is much higher.

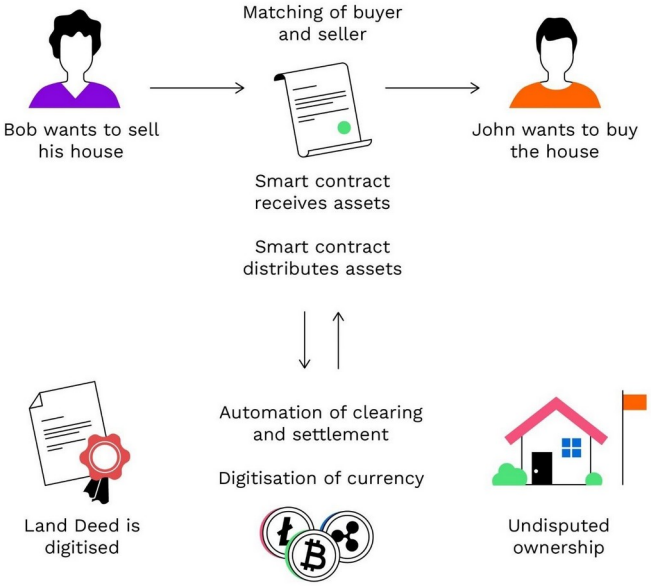


Figure 4: An example of a smart contract implementation.

- **STABLECOINS**: Digital assets whose values are pegged to a fiat currency, a basket of fiat currencies or other stable-value assets.
- **DAOs:** Blockchain enabled Decentralized Autonomous Organizations (DAOs) have emerged as a new form of collective governance, in which communities can organize themselves relying on decentralized infrastructure. One can define a DAO as an internet-native entity with no central management or control, regulated by a set of automatically enforceable rules on a public blockchain. The DAO will take a life of its own and incentive people to achieve a shared goal – in the instance of DeFi, to trade on DEXs. A DAO supports to keep a network safe and optimized without the need for manual input by its members. Participants are not obligated by a legal contract, but rather incentivized by rewards in the form of native asset tokens thathelp them work towards a unified goal [49]. In short, a DAO is a scalable, self-organizing coordination on the blockchain, controlled by smart contracts. The rise of DeFi protocols has led to a rise in the popularity of DAOs. Many yield farming and DEX platforms like Compound (COMP), yearn.finance (YFI) and Uniswap (UNI) are dependent on them for effective governance.
- **ORACLE:** An interesting problem with blockchain protocols is that they are isolated from the world outside of their ledger. That is, the Ethereum blockchain authoritatively knows what is happening only on the Ethereum blockchain and not, for example, the level of the S&P 500 or which team won the Super Bowl. This limitation constrains applications to Ethereum native contracts and tokens, thus reducing the utility of the smart contract platform; it is generally known as the oracle problem. In the context of smart contract platforms, an oracle is any data source for reporting information external to the blockchain. How can we create an oracle that can authoritatively speak about off-chain information in a trust- minimized way? Many applications require an oracle, and the implementations exhibit varying degrees of centralization.
  There are several implementations of oracles in various DeFi applications. A common approach is for an application to host its own oracle or hook into an existing oracle from a well-trusted platform. One Ethereum-based platform known as Chainlink 3 is designed to solve the oracle problem by using an aggregation of data sources. The Chainlink white paper 4 proposes a reputation-based system.

3.1 DeFi SERVICE CATEGORIES:

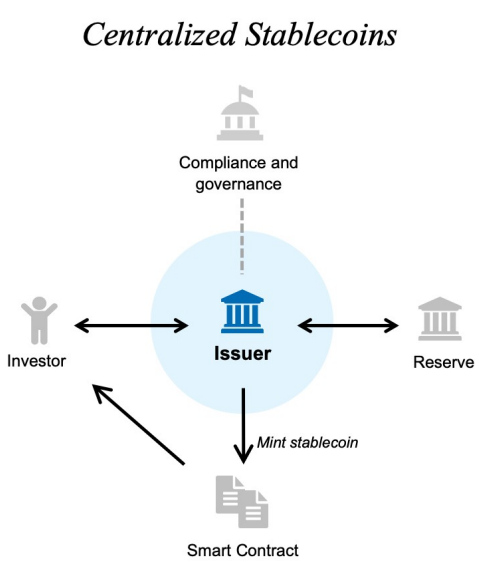
DeFi embodies a variety of activities meeting the criteria of trust-minimized, non-custodial, open, composable, and programmable financial services. We identify six major DeFi categories, in addition to auxiliary services such as oracles and wallets. The lines between them are not always clear. However, this typology generally reflects participant perceptions of the DeFi market.

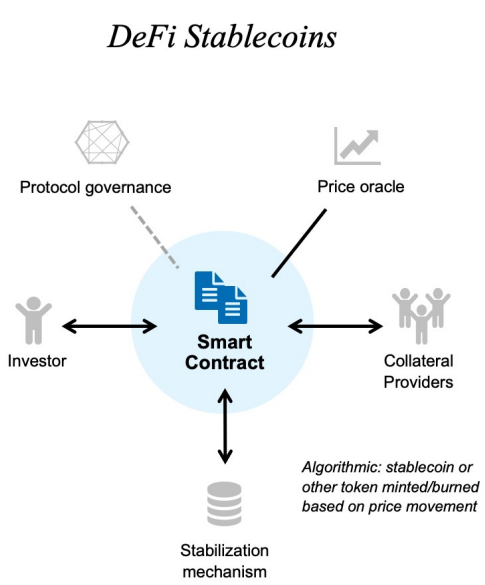
- Stablecoins seek to maintain a constant value of a token relative to some asset, most commonly the U.S. dollar or other major fiat currency. Non-custodial stablecoins function as DeFi services themselves. Custodial stablecoins are centralized but may be incorporated into DeFi services.

- Exchanges allow users to trade one digital asset for another. DeFi exchanges avoid taking custody of user assets, either through a decentralized order book or by matching orders and setting prices algorithmically.
- Credit involves the creation of time-limited interest-bearing instruments, which must be repaid at maturity, and the matching of lenders and borrowers to issue those instruments.
- Derivatives are synthetic financial instruments whose value is based on a function of an underlying asset or group of assets. Common examples are futures and options, which reference the value of an asset at some time in the future.
- Insurance provides protection against risks by trading the payment of a guaranteed small premium for the possibility of collecting a large payout in the event of a covered scenario.
- Asset management seeks to maximize the value of an asset portfolio based on risk preferences, time horizons, diversification, or other conditions.

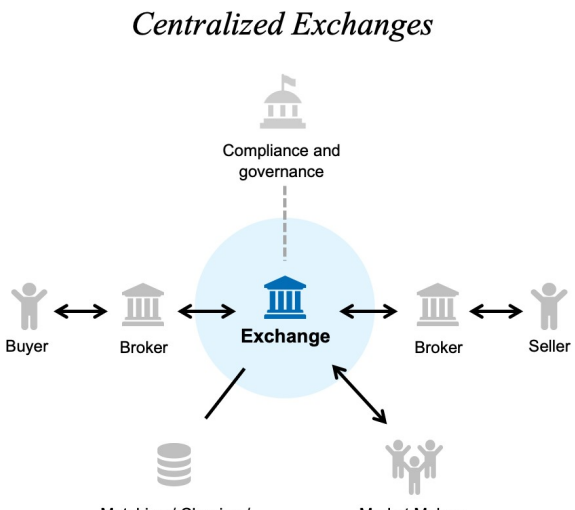
While this report includes examples throughout, it is important to keep in mind that DeFi is developing quickly. These categorizations—and the projects that fit within them—may change over time.
Because DeFi services are programmable and composable, aggregators have emerged that mediate activity across services in these base categories. Yield farming services such as Yearn Finance, which optimize returns from liquidity and collateral provision, are one example. Exchange aggregators such as 1inch and Matcha send trade orders to the exchange offering the best price. Zapper and Zerion provide integrated interfaces for order routing, yield optimization, and other DeFi activities across different protocols, reducing complexity for users. Tally The Wharton School The University of Pennsylvania DeFi Beyond the Hype 9 aggregates DeFi governance token activity to facilitate participation in governance decisions. Because of their potential for better usability, aggregators may originate a significant share of DeFi activity in the future.

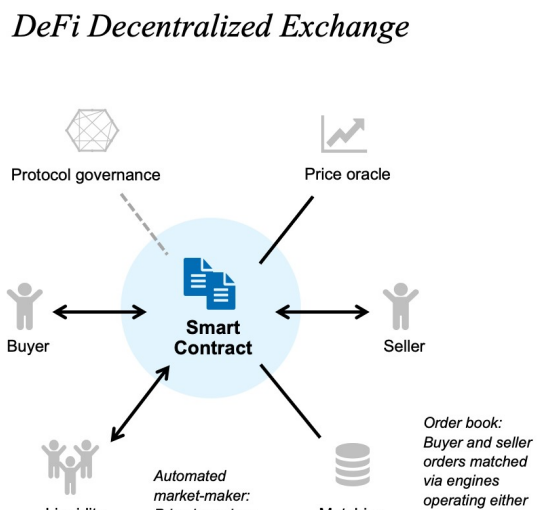
- **STABLECOINS:** A crucial shortcoming of many cryptocurrencies is excessive volatility. This adds friction to users who wish to take advantage of DeFi applications but don’t have the risk-tolerance for a volatile asset like ETH. To solve this, an entire class of cryptocurrencies called stablecoins has emerged. Intended to maintain price parity with some target asset, USD, or gold, for instance, stablecoins provide the necessary consistency that investors seek to participate in many DeFi applications and allow a cryptocurrency native solution to exit positions in more volatile cryptoassets. They can even be used to provide on-chain exposure to the returns of an off-chain asset if the target asset is not native to the under-lying blockchain (e.g., gold, stocks, exchange-traded funds [ETFs]). The mechanism by which the stablecoin maintains its peg varies by implementation. The three primary mechanisms are fiat-collateralized, crypto-collateralized, and non-collateralized stablecoins.Stablecoins are crucial to DeFi, because they separate the risk/return calculus of the DeFi services from the oftenhigh volatility of digital assets. Financial interoperability requires stable prices for value exchange and investors expect a steady unit of account for financial services.





◆_◆ **EXCHANGES:** Exchanges are important to DeFi in two ways:
They allow holders of various digital assets to use DeFi services,and they provide opportunities to profit from appreciation in the value of tokens. Centralized exchanges requiretraders to trust an operator to safeguard user funds, provide accurate price information, match buyers and sellers to process trades, settle transactions, and engage in transaction monitoring. This is true whether the exchange is purely fiat-based (such as NASDAQ), facilitates trading between fiat and digital assets (such as Coinbase), or only processes trades among digital assets (such as Uniswap).While centralized exchanges can trade digitalassets used in DeFi services, they are themselves custodial and neither trust minimized nor programmable.
DeFi exchanges, by contrast, decentralize key functions. They can be accessed programmatically with non- custodial wallets. Transactions are automatically processed by smart contracts on a peer-to-peer basis or against a pool of capital. While exchanges can operate order books either on or off the blockchain, the most prominent form of DeFi exchange, automated market makers (AMMs), does away with the traditional order book entirely. Any holder of digital assets can lock up funds as liquidity for potential trades, earning a yield paid by traders. The price of any trade is determined algorithmically, based on the ratio if available liquidity in the assets being traded. A trader is therefore dealing against liquidity pools supplied by market makers, rather than an order book of potential counterparties subject to a bid/ask spread. Different design choices for DeFi exchanges produce tradeoffs around throughput, latency, security, scalability, and fees, and slippage (the extent to which a larger order alters the price).





- **CREDIT:** Borrowing and lending are central to finance, because they facilitate risk-taking and expand the supply of capital through leverage. The classic form of centralized credit provision is banking. The bank manages the spread between the interest rates it pays to depositors, whose assets are liquid, and the rates it receives from borrowers on longer-term loans. It must assess credit-worthiness of borrowers and set interest rates appropriately to account for defaults.
  By contrast, DeFi credit protocols such as Compound andAave pool together tokens, subject to an interest rate determined by the ratio of supply to borrowing. When lenders commit capital to DeFi credit services, they receive platform-native tokens representing their tokens plus the specified interest rate. Net of transaction fees—which accrue to service providers lenders receive and borrowers pay the same interest rate, which is typically variable (some platforms now purport to offer fixed rates as well). Both sides maintain full custody over their assets and the ability to liquidate at any time. Credit terms can be quite complex, and these instruments can themselves be securitized and traded.

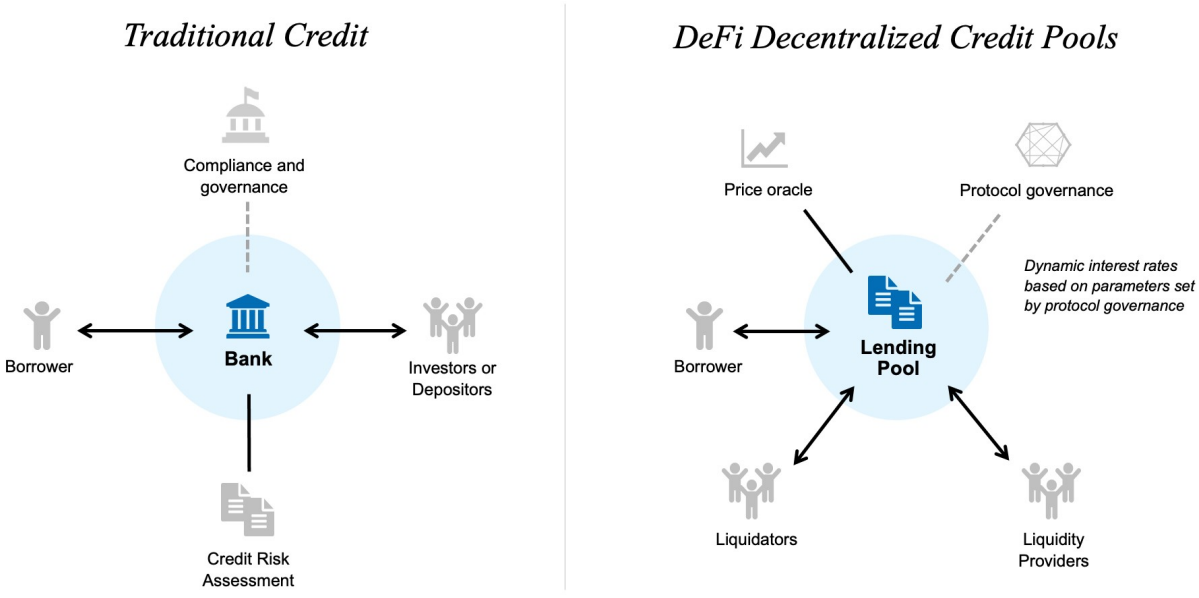


Figure 7: Credit

DeFi loans are generally backed by collateral in the form of digital assets. Because loans are secured with assets held in smart contracts, there is no need for credit checks or other borrower specific evaluation prior to a loan. To buffer against price fluctuations, loans are generally overcollateralized, meaning the borrower must supply collateral greater than the value of the loan amount. As with asset-backed stablecoins, if the collateral value falls

below a specified ratio of the loan value, the position is automatically liquidated to pay back the debt. A percentage of interest paid by borrowers is typically allocated to a reserve pool to repay lenders when a liquidation fails to cover the value of the loan (known as a failed liquidation). This requirement means that loans are generally used for leveraged trading or accessing new assets.

- **DERIVATIVES:** Derivatives increase the sophistication of financial transactions beyond lending, creating both valuable market opportunities and new risks. A derivative could be based on the value of a stock, commodity, digital asset, at the present time of in the future; the cash flow of a business (creating a crowdfunding relationship); or a real-world event, such as the outcome of a sporting event or the weather (creating a prediction market).
  In centralized finance, derivatives traders rely on a futures commission merchant and other intermediaries to accept orders to buy or sell futures or options contracts. They also accept money or other assets from customers to support such orders. Traders submit their orders to their respective clearing member firms, which then conduct the trade on the traders' behalf. The clearinghouse stands in between the two clearing firms and assumes the legal counterparty risk for the trade. It executes all the activities involved in clearing, securing, and settling the transaction.

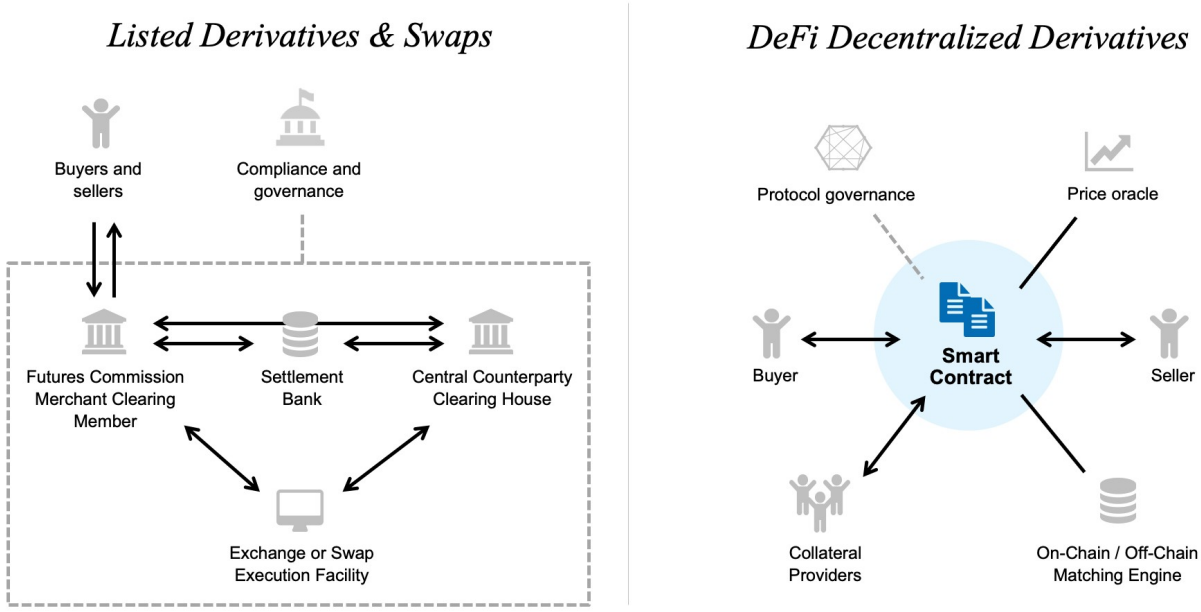
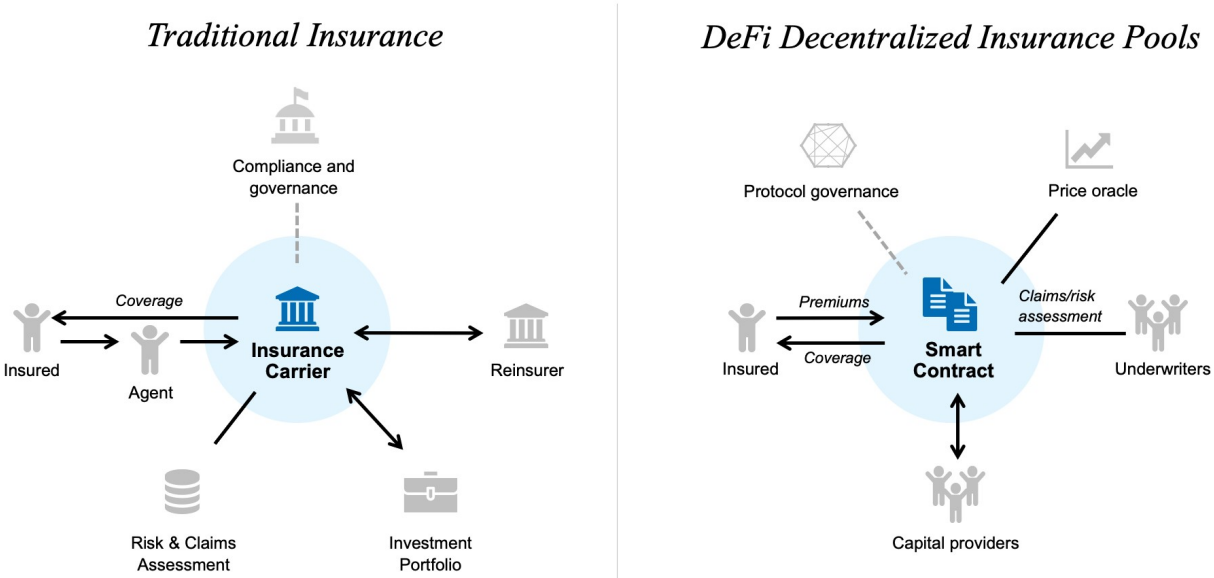


Figure 8: Derivatives

- **INSURANCE:** Risk is essential to finance, and is correlated positively over time with returns. However, investors and others will often prefer to pay a definite but small amount to avoid the possibility of a larger loss. Others will be able to profit by taking on a portion of those risks in return for a payment. A centralized insurance carrier balances premiums received against investments made to maintain sufficient capital reserves for claims, along with associated risk assessment, underwriting, and claims management. While there are opportunities for DeFi derivatives to function as insurance against financial defaults, the primary focus of DeFi insurance services are the DeFi-specific risks posed by smart contract failures, successful hacks of DeFi protocols, game-theoretical risks of incentive systems, and similar failures.



DeFi insurance pools are collateralized with digital assets that providecapital associated with individual protocol, in return for tokens granting a share of premiums. In the event of a hack or other failure, those funds reimburse premium-paying users. Claims assessors vote on whether claims are paid out, while claim payments are typically enforced by token-driven economic incentives. Surplus and investment returns generally accrue to capital providers or governance token holders.

- **ASSET MANAGEMENT:** Investors rely on asset managers to manage and allocate their portfolio. In traditional finance, an investment manager will typically assemble a regulated product such as a mutual fund, ETF, separately managed account, or private equity interest. Wealth managers package these products into asset allocations distributed through financial advisors and brokers to clients. Robo-advisors provide automated financial services with minimal to no human intervention or oversight.
  In DeFi, the underlying investments can be composed of tokens, digital assets capturing traditional exposure, synthetic structured tokens, and interest-bearing accounts. DeFi asset management protocols combine them through smart contracts into “vaults” or “pools”, which function as a diversified portfolio of digital assets. The boundaries between asset classes and package types, as well as typical business models for these services, are still developing.

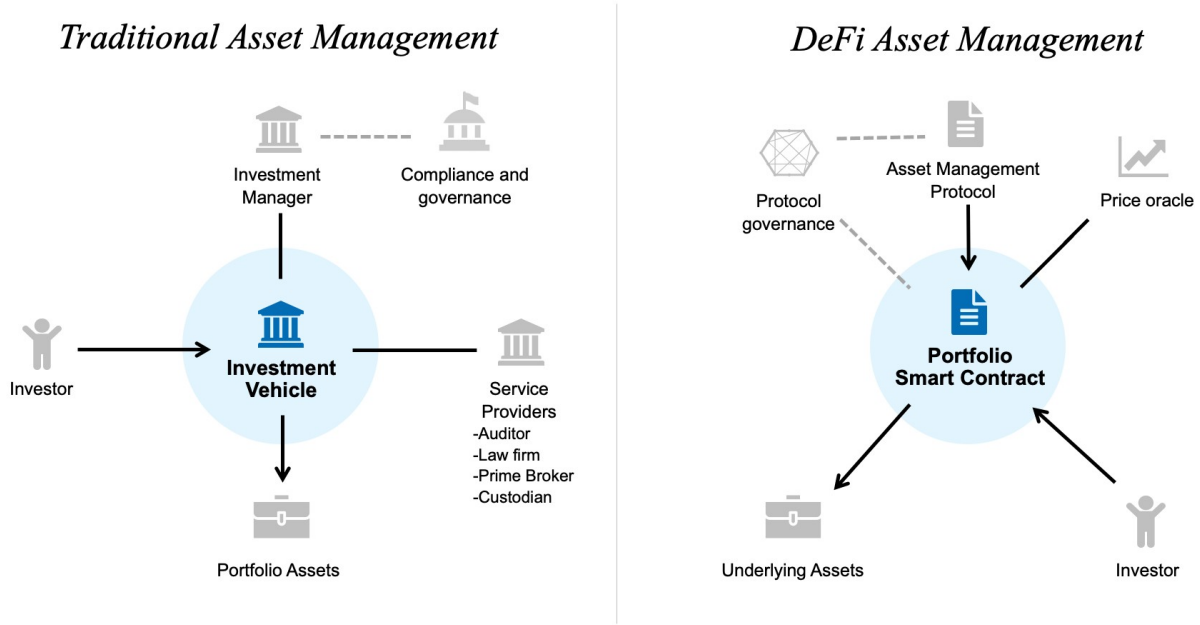


Figure 10: Asset Management

3.2 HOW DeFi WORKS:

DeFi uses cryptocurrencies and smart contracts to provide services that don't need intermediaries. In today's financial world, financial institutions act as guarantors of transactions. This gives these institutions immense power because your money flows through them. Plus billions of people around the world can't even access a bank account.
In DeFi, a smart contract replaces the financial institution in the transaction. A smart contract is a type of Ethereum account that can hold funds and can send/refund them based on certain conditions. No one can alter that smart contract when it's live – it will always run as programmed.
A contract that's designed to hand out an allowance or pocket money could be programmed to send money from Account A to Account B every Friday. And it will only ever do that as long as Account A has the required funds. No one can change the contract and add Account C as a recipient to steal funds.

Contracts are also public for anyone to inspect and audit. This means bad contracts will often come under community scrutiny pretty quickly.
This does mean there's currently a need to trust the more technical members of the Ethereum community who can read code. The open-source based community helps keep developers in check, but this need will diminish over time as smart contracts become easier to read and other ways to prove trustworthiness of code are developed.

Here are the main tenets of DeFi:

- There are no intermediaries, so no banks or institutions overseeing your money
- There's a level of transparency, as the code is available for anyone's review
- There are open networks that transcend geographic borders
- There are many applications for users, primarily based on Ethereum

With DeFi's smart contracts, certain financial transactions are executed after specific conditions are met. The smart contracts allow for borrowing, lending, and more and the terms of the transaction are literally written in the code. While that makes these transactions easy-to-use and more efficient, it can also make them more susceptible to errors that can't be fixed.

3.3 HOW TO USE DEFI?

DeFi has gained significant momentum over the years, mainly because of its ability to earn a substantial amount of interest on DAI (the popular USD pegged stablecoin) and other types of cryptocurrency

Getting started with DeFi:

Below is a step-by-step guide on how to get started with DeFi and learn the basics.

Step 1 – Set up your wallet

Firstly, you will require a cryptocurrency wallet installed on your browser, one that ideally supports Ethereum and can also connect to various DeFi protocols.

MetaMask is the most commonly used wallet, although there are a wide selection of wallets available that will allow you to connect and interact with DeFi.

Step 2 – Purchase relevant coins

You will now need to buy the relevant coin for the DeFi protocol that you plan to use. When it comes to DeFi, Ethereum is leading because of the value it provides through its smart contracts, this means that most DeFi protocols live on Ethereum, so you will likely need to buy ETH in order to use them.

You can acquire Ethereum on a cryptocurrency exchange like Binance or Coinbase. You can additionally buy crypto using fiat in a peer to peer exchange. Ensure that you sign up to legitimate websites as the cryptocurrency industry is rice with scams.

Step 3 – Explore DeFi

Lend out crypto. You could become a “yield farmer”, this involves earning governance tokens that are awarded for lending out your cryptocurrencies. 2. Put your funds in a decentralised exchange, such as Uniswap. With DeFi exchange you can earn fees by becoming a market maker. Find out more about DeFi Exchange later in the article.

Invest in DeFi projects like Aave or Yearn Finance, but please note that these assets are prone to volatility.

Always ensure to keep in mind that the crypto space is full of risks. Fraudsters, and scammers are prevalent, smart contracts have sometimes revealed how projects are not decentralised at all, with the token creators harnessing all the power.

3.4 WHY THE DeFi HYPE?

The 2008 financial crisis was an eye-opener on how fragile our current financial system is and heavily reliant on banks and financial institutions that act as intermediaries in providing any financial service.

Financial infrastructure has structurally not changed since the industrial revolution and it is similar to software in the pre-internet era. High entry barriers, opaque and inefficient processes and high transaction cost as resulted in limited innovation in core finance.
While many fintech startups have emerged in the last decade, they are built on top of existing financial rails. The creation of financial products and services has always been a top-down process dominated by a few large financial institutions such as asset management firms, commercial banks and insurance companies.

DeFi is a bottom-up innovation that takes the component of centralised finance and replaces human trust with math-based trust, paperwork with smart contracts, legal enforcement , and third party audit with open source code and public ledger. It is enabling developers to create new financial products such as decentralised banking, decentralised money markets and decentralised asset management firms. DeFi aims to be 10x better, faster and cheaper compared with today's financial services.

Lastly, there has been an increase in people putting their money into DeFi tokens because people refuse to be left behind and denied their exponential growth potential. We see lots of unreasonable exuberance these days because many tokens are worth nothing or nearly nothing when viewed practically. Whether you agree or not, we are headed towards a new financial breakthrough that is more free and decentralized than ever before. The big question is; how do we best steer its development with checks and balances to reduce the risks and circulate the probable advantages as broadly as possible?

This is the challenge that threatens to fruit in the next few years.

3.5 DIFFERENCES BETWEEN DEFI AND CEFI:

Let's compare the key differences between DeFi and CeFi, meaning central or traditional economy:

Table 1: DeFi Vs. CeFi

	DeFi	**CeFi**
Funds Custody	The user has complete authority over funds custody.	Outside of user's custody
Services available	Borrowing, Lending, Payments, Trading	Trading, Borrowing, Fiat-to-crypto, Payments and Lending
Personal Information	Proof of Work	Pluggable Framework
Security	Not accountable for funds	Vulnerable in case of security bridges on the exchange.
Market cap	$16 billion*	$324 billion*

Customer Service	NA	Provided by major changes.
Risk Factor	Security relies on the technology you are using.	Centralized exchanges are responsible for security.
	Permissionless	Permission-based system
	Does not require knowing your customer protocol (KYC)	Requires to Know Your Customer
	Open source - encouraging free collaboration	Closed source -decisions made behind closed doors
	DeFi is generated on the blockchain	CeFi is generated on old foundations
	DeFi is cheaper, mostly network fees	CeFi is more expensive-intermediaries charging hefty fees
	DeFi is resistant censorship	CeFi can be censored

Though you would find many differences between DeFi and CeFi, the question is whether users should trust technology or people.With DeFi, users trust that the technology will perform as proposed to execute on services being offered. On the other hand, with CeFi, users trust a business's people to manage funds and execute the business's services. Both DeFi and CeFi deliver a wide range of cryptocurrency-related financial services. Let's discuss some of the features and functionalities of both the ecosystems that differentiate them from each other.

CHAPTER:4

Deep diving into DeFi

4.0 DEFI OPPORTUNITIES:

DeFi offers several opportunities that were not available in the world of traditional finances or even on regular, simpler blockchains like Bitcoin. In this chapter we will address the concrete solutions that DeFi presents to the flaws of traditional finance: these flaws include,as discussed before; inefficiency, limited access, lack of transparency, centralized control, and lack of interoperability.

Increased Efficiency:

One of the biggest flaws of traditional finances that DeFi fixes is inefficiency. With DeFi the accomplishment of financial transactions with high volumes of assets and low friction can be executed, this would generally be a large organizational burden for traditional finance. DApps designed to execute a specific financial operation is possible with reusable smart contracts.

These DApps are available to anyone who seeks to interact with DeFi projects and platforms. A user can easily interact with the DeFi ecosystem, regardless of geographical location as long as internet service is available. With DeFi, moving funds is simple with no organizational overhead, increasing the efficiency of financial transactions.

Unconstrained Access:

DeFi gives large groups of people such as the global population of the unbanked as well as small businesses that employ substantial portions of the workforce direct access to financial services that can better service their interests. As DeFi platforms continue to improve and scale, user friction falls, enabling a wide range of users, and thus mitigates another flaw of traditional finance: limited access.

More Transparency:

Transparency is clearer in DeFi due to the implementation of smart contracts. All parties are aware of the capitalization of their counterparts and can see how funds are being deployed. At any time, the parties can read the contracts and determine for themselves if the terms are agreeable or not. This removes ambiguity as to what will happen when they interact under the contract terms. In reality, the average consumer does not understand the contract code, but can depend on the open-source nature of the platform and the wisdom of the crowd to feel secure. DeFi mitigates counterparty risk and thus creates a host of advantages that is not present under traditional finance.

Decentralized Control:

In the traditional finance system, there is a strong control exerted by government agencies and large corporations that hold a near monopoly over elements such as the money supply, rate of inflation, and access to the best investment opportunities. DeFi defies this centralized system by relinquishing control to open protocols, where transparency and immutable properties is part of the ecosystem. If a DeFi app contains special privileges for an overseer, all users are aware of the privileges, and any user can quickly create a less-centralized

Better Interoperability:

DeFi platforms integrate and interact with each other through the method of tokenization. In traditional finances, to use assets that are locked up can be relatively difficult. Take for example someone having a percentage ownership stake in a private commercial real estate venture. To use this asset for a loan or as margin to open a levered derivative position would be quite challenging. counterpart. The open-source ethos of DeFi and blockchain technology in addition to the public nature of smart contracts assures flaws and inefficiencies in a DeFi project can at any time be identified and forked by users who want to improve a more flawed project. As a result, the DeFi system is constantly being improved, and is not being held down due to monopolies and concentrated power on top who have their own interests at hand.

4.1 HOW TO GET INVOLVED WITH DEFI:

Evolution is the answer to everything that exists, and finance is no exception. The aim is to democratise finance by replacing centralised institutions such as banks with direct, peer-to-peer relationships. Every financial service we use today -- savings, loans, insurance and much more -- could one day exist on a blockchain, not in a bank. DeFI is making its way into a wide variety of simple and complex financial transactions. It’s powered by decentralized apps called “dapps,” or

other programs called “protocols.” Dapps and protocols handle transactions in the two main cryptocurrencies Bitcoin(BTC) and Ethereum (ETH) While Bitcoin is the more popular cryptocurrency, Ethereum is much more adaptable to a wider variety of uses, meaning much of the dapp and protocol landscape uses Ethereum-based code.

Here are some of the ways dapps and protocols are already being used:

- **Traditional financial transactions.**

Anything from payments, trading securities and insurance, to lending and borrowing are already happening with DeFi.

- **Decentralized exchanges (DEXs).**

Right now, most cryptocurrency investors use centralized exchanges like Coinbase or Gemini. DEXs facilitate peer-to-peer financial transactions and let users retain control over their money

- **E-wallets.**

DeFi developers are creating digital wallets that can operate independently of the largest cryptocurrency exchanges and give investors access to everything from cryptocurrency to blockchain-based games.

- **Stable coins.**

While cryptocurrencies are notoriously volatile, stable coins attempt to stabilize their values by tying them to non-cryptocurrencies, like the U.S. dollar.

- **Yield harvesting.**

Dubbed the “rocket fuel” of crypto, DeFi makes it possible for speculative investors to lend crypto and potentially reap big rewards when the proprietary coins DeFi borrowing platforms pay them for agreeing to the loan appreciate rapidly.

- **Non-fungible tokens (NFTs).**

NFTs create digital assets out of typically non-tradable assets, like videos of slam dunks or the first tweet on Twitter. NFTs commodify the previously uncommodifiable.

- **Flash loans.**

These are cryptocurrency loans that borrow and repay funds in the same transaction. Borrowers have the potential to make money by entering into a contract encoded on the Ethereum blockchain no lawyers needed that borrows funds, executes a transaction and repays the loan instantly. If the transaction can’t be executed, or it’ll be at a loss, the funds automatically go back to the loaner. If you do make a profit, you can pocket it, minus any interest charges or fees. Think of flash loans as decentralized arbitrage.

The table below gives a brief explanation of the main DeFi use cases as of early 2021

Table 2: DeFi Use cases

Application	Description	Use case	Examples
Layer 3 applications	Applications combining core DeFi infrastructure. This provides an abstraction of complexity.	Combining several DeFi platforms allow customers easier interactions, monitoring and general better usability.	InstaDapp Zerion DeFi Saver DeFi Pulse
Borrowing/Lending	Lend crypto assets and	Lender: Provide capital	Compound

	receive interests. Borrow crypto assets and pay interests.	and earn interests Borrower: Create leverage or short an asset Both: Arbitrage	Maker dYdX Exchange bZx
DEXs	Decentralized alternative to centralized exchanges to trade cryptocurrencies	Trading of cryptocurrencies	Uniswap Kyber Swap dYdX Exchange 1inch Exchange
Stablecoins	Crypto coins pegged to a fiat currency	For the trader, the cryptocurrency has minimal volatility. For the ecosystem, it allows easy comparision of value for various cryptocurrencies.	Tether USDC Dai Binance USD
Derivatives	Decentralized alternative to traditional financial derivatives	Risk management, leveraged trading and betting.	Synthetix Nexus Mutual DerivaDEX Augur
Prediction/Betting	Decentralized alternative to prediction and betting markets.	Betting and prediction	Augur Stox Gnosis Polymarket
Insurance	Insurance against price risk, technological risk, network risk, hacking risk etc	Insurance against a variety of risk affecting DeFi and online trading	Nexus Mutual Etherisc Cover Protocol Opium Insurance

4.2 BENEFITS AND ADVANTAGES OF DEFI:

Usually, finance depends on banks acting as a middle man and courts to judge if the need arises. However, DeFi applications do not need arbitrators or intermediaries. This is because the code dictates the solution of every possible dispute that may ensue, and the users make sure to control their funds all the time properly. This method reduces the cost affiliated with giving and making use of the se products and gives way for a more frictionless financial operation.

Bye-Bye to human error and mismanagement:
We have already mentioned that financial crises occurred due to the mismanagement of central banks(CBs) and third party intermediaries (TPIs). But thanks to smart contracts, human error on a day-to-day basis are removed from the process; unless the contracts themselves were poorly written.

Quick and permanent access:
Before DeFi, if you needed to get a loan, you would have to go to bank and a lot of time will be wasted. With DeFi, you can get a loan with just one click, even in the middle of the night. You can access the market from anywhere and anytime as long as you have an internet connection.
A Healthier System:
Covid-19 has shown that traditional financial systems (CeFi) are very vulnerable to global shocks. This is because centralized financial systems are based on direct contact between individuals.

The level of physical contact needed to support decentralized financial systems (DeFi) could drop to zero; and cryptocurrency prices and companies have been going from strength to strength in the current health crisis.

Permissionless Operations:
In the traditional financial system, you have to get permission from an intermediary to carry out almost any financial operation. A wide range of services could be imagined in DeFi space. Undoubtedly, rapid development of DeFi ecosystem proves that application of new technologies offers many advantages to market participants as compared to the use of traditional financial services. On the other hand, there are some associated limitations and risks. Benefits and limitations related to DeFi services are presented in Table.

Table 3: Advantages of DeFi

ADVANTAGES
• The use of digital technologies; • Elimination of control from large financial institutions; • Accessibility of financial services; • Privacy; • Open software code; • Passive income; • Lower transaction costs.

4.3 DEFI LIMITATIONS:

DeFi allows people to enter a whole new world of financial products and services, expanding
the possibilities of financial technology and opportunities. However, just with traditional financial services, there are risks involved with DeFi. This chapter puts forward a list of the main risks associated with using DeFi services.

- **Smart Contract Execution:**
  Since smart contracts are algorithmic and programmable, coding errors may create vulnerabilities that can allow attackers to drain funds or cause a protocol to be unusable. As a user, one must be aware that a protocol is as secure as the underlying smart contract. This is a challenge, since the average user is not able or in most cases, willing to read through a contract code, let alone evaluate if it is compromised or not. Insurance services, code audits and verifications exist, but to some degree, some uncertainty still remains.

- **Security of Operation:**
  With DeFi, protocols and applications need admin keys used typically by the core development team to perform upgrades and if necessary, emergency shutdowns. While the need for these keys is understandable, the existence of these keys can be a potential problem. If the keyholders do not create and/or store their keys in a secure manner, malicious third parties could gain access to the keys and exploit the smart contract. Most projects try to mitigate this risk with multisig (M of N keys needed to execute any of the smart contracts admin functions) and timelocks (time delays that can be used to respond accordingly).

- **Dependencies:**

Since the DeFi ecosystem allows for more interoperability and openness, it can also introduce more dependencies. If there is an issue with one smart contract, this may potentially have wide-reaching consequences for multiple applications across the entire DeFi ecosystem. Many smart contracts can also be reliant on external data. Whenever a smart contract depends on data that is not natively available on-chain, this data must be provided by external data sources. Price oracles introduce dependencies and could, in some cases, lead to heavily centralized contract execution. To mitigate this risk, many projects rely on large oracle networks with M-of-N data provision schemes

- **Governance Risk:**
  DeFi applications rely on more than just autonomous computer codes. For example, MakerDAO, the decentralized credit facility, is reliant on a human-controlled governance process that actively adjusts protocol parameters to keep the system solvent. Many other DeFi protocols use comparable systems and rely on humans to actively manage protocol risk. To participate in the governance process, users and investors must acquire a token that has been explicitly assigned protocol governance rights on a liquid marketplace. Holders use these tokens to vote on protocol changes and guide future direction. Any financially equipped adversary can simply acquire a majority of liquid governance tokens to gain control of the protocol and steal funds. However, this has yet to happen and is more of a theoretical risk.

- **Oracle Risk:**
  Oracles are required by most DeFi protocols in order to function properly. Oracles try to answer a simple question related to blockchain technology; How can off-chain data be accurately reported on-chain? Without oracles, blockchains are completely self-encapsulated and have no knowledge of the outside world other than the transactions added to the native blockchain. Many DeFi protocols need oracles to access secure, reliant asset prices to ensure routine actions such as prediction markets and liquidation resolutions function appropriately. Protocol dependence on these data feeds establishes an oracle risk. Until oracles are blockchain native and proven to be resilient, they represent a large systemic risk to DeFi today.

- **Scaling Difficulties:**
  Blockchains have a fixed block size (similar to how a hard drive has fixed amount of disk space). With the decentralized nature of DeFi, there are no centralized nodes that can handle thousands of transactions in seconds like Visa or Mastercard. For a block to become part of the chain, every Ethereum miner must execute and validate all the included transactions. To expect each miner to process all of the financial transactions for a global financial market is not realistic. If DeFi cannot properly scale, it will be unable to meet the necessary worldwide demand. As of date, several scaling solutions for the Ethereum blockchain are at work, including a proof of stake migration from the more cumbersome proof of work. Many approaches today aim to decrease the scalability risks facing the DeFi ecosystem. One thing is certain, as long as the growth of DeFi is limited by blockchain scaling, applications will be limited in their potential impact on the world.

- **Regulatory Risks:**
  As the growing influence and size of DeFi increases, it will face several regulatory scrutinies. Governance tokens that are released by certain DeFi projects are also facing increasing inquiry 39as the SEC continues to evaluate if these new assets will be regulated as securities or not. As DeFi continues to flourish and the total number of distributed holdings continues to expand, it is expected to see increasingly specific and nuanced

regulation aimed at DeFi protocols and their users. For example, cryptocurrency taxes are yet to be fully developed from a regulatory standpoint, and as of today, individuals have to manually do their taxes – with little to no guidelines by central governments. The outlook is still hazy, though it is not unrealistic to foresee that in the future, governments will develop easier methods to file in taxes and on-chain assets.

Table 4: Limitations of DeFi

LIMITATIONS
• Information shortage; • Lack of legal framework; • Lack of support; • Hacker attacks; • regulatory risks; • governance risk

4.4 DEFI RISKS AND HAZARDS:

This section provides a risk-mapping framework as a basis for policy considerations. There have already been significant examples of fraud, attacks, governance controversies, and other failures in the DeFi world.

DeFi, as good as it may sound, also faces some challenges that should be discussed with individuals that may be interested. This is to make you aware of what you are getting into properly. Before moving on to this section, it's worth also mentioning the potential dangers of DeFi. One of the biggest risks is errors, bugs, and vulnerabilities in smart contracts and protocol changes that can affect existing contracts. For the same reason, consumers need additional insurance to reduce the risk of potential problems. Also, you should always check how decentralized your DeFi project is and what the shutdown procedure is when something goes wrong. An individual may have an admin key that can disable the protocol, or there may be a contactless management system that makes such decisions. Also, it would help if you always considered the more systematic risks that may arise from, for example, sudden depreciation of the price of an asset. This can lead to cascading liquidations through multiple DeFi protocols. Network and congestion charges can also be an issue. This is especially true if we avoid liquidation and try to provide more security on time. The upcoming Ethereum 2.0 and Tier 2 scaling solutions can help solve this problem. It also has subtle features or changes that apply to one of the protocols, leading users to take less obvious actions that can cascade across multiple protocols. A good example of this is the recent increase in Compound protocols' composition, which forced consumers to engage in seemingly unprofitable loans at high interest rates, profitable due to the additional COMP's compensation. These situations can be very dangerous, but as you have already noticed, they make the entire ecosystem more powerful and less sensitive to similar situations in the future. DeFi is a fascinating and lively space full of opportunities, but it's important to remember that this is still a fairly new and emerging industry. Therefore, it is a game that has high risk and high reward. DeFi, unlike most tech companies, is almost a real mess for the traditional financial industry. DeFi does not rely on old techniques and procedures. It is based on new rails. Currently, most financial products can only be made by banks. DeFi is open source, does not require authentication, and enables Internet-like collaboration. DeFi is primarily based on Ethereum, which uses more interoperability protocols, but we can see that more projects will be built on different chains in the future.

Here are some of them boldly highlighted:

- **Poor performance:**
  Blockchains are naturally slower than their centralized partners, extending to the applications founded on top of them. Therefore, there is a need for the DeFi application developers to take note of these restrictions and improvetheir products accordingly.

- **User errors:**
  The liability is transferred from the intermediaries to the users by DeFi applications. This means that you are in control all by yourself due to the lack of central authority, which can quickly become negative for many users. To design a product with little or minimal risk of user error is a specifically hard challenge to overcome, especially when the products are placed on top of rigid blockchains.

- **Bad user experience:**
  At the moment, making use of DeFi applications needs extra effort on the part of the user. DeFi applications must deliver a substantial advantage that motivates and encourages users to change over from the conventional system ways. This will help them become a central component of the international financial system.

- **Chaotic ecosystem:**
  Finding the perfect and most suitable application for a particular use case can be quite challenging. However, users should find the time and possess the ability to discover the best scenarios at all times. The difficulty does not arise only when building the applications but also when thinking about how they can fit into the wider DeFi ecosystem.

4.5 DeFi SOLVES:

This chapter addresses DeFi's concrete solutions to the five flaws of traditional finance: inefficiency, limited access, opacity, centralized control, and lack of interoperability.

INEFFICIENCY:

The first of the five flaws of traditional finance is inefficiency. DeFi can handle financial transactions with high volumes of assets and low friction that would generally be a large organizational burden for traditional finance. It does this by creating dApps: reusable smart contracts designed to execute a specific financial operation and available to any user who seeks that type of service, for example, to execute a put option, regardless of the size of the transaction. A user can largely self-serve within the parameters of the smart contract and of the blockchain the application lives on. In the case of Ethereum-based DeFi, the contracts can be used by anyone who pays the flat gas fee, currently around $3 for a transfer and $12 for a dApp feature such as leveraging against col- lateral. Once deployed, these contracts continually provide their service with near zero organizational overhead.

LIMITED ACCESS:

As smart contract platforms move to more scalable implementations, user friction falls, enabling a wide range of users and thus mitigating the second flaw of traditional finance: limited access. DeFi gives large, underserved groups like the global unbanked population and small businesses that employ substantial portions of the workforce (e.g., nearly 50 percent in the United States) direct access to financial services. The resulting impact on the entire global economy should be strongly

positive. Even consumers who have access to traditional financial services such as bank accounts, mortgages, and credit cards cannot get products with the most competitive pricing and most favorable terms because they are restricted to large institutions. DeFi allows all users access to the entirety of its financial infrastructure, regardless of their wealth or geographic location.

CENTRALIZED CONTROL:

The fourth flaw of traditional finance is the strong control exerted by governments and large institutions that hold a virtual monopoly over elements such as the money supply, rate of inflation, and access to the best investment opportunities. DeFi upends this centralized control by relinquishing control to open protocols with transparent and immutable properties. The community of stakeholders or even a prede- termined algorithm can control a DeFi DApp's parameter, such as the inflation rate. If a DApp contains special privileges for an administrator, all users are aware of the privileges, and any user can readily create a less centralized competitor. The open-source ethos of blockchain and the public nature of all smart contracts assures that flaws and inefficiencies in a DeFi project can be readily identified and "forked away" by users who copy and improve the flawed project. Consequently, DeFi strives to design protocols that naturally and elegantly incentivize stakeholders and maintain a healthy equilibrium through careful mechanism design. Naturally, there are trade-offs in having and not having a centralized party. Centralized control allows for radically decisive action in a crisis, which may or may not be the appropriate reaction. The path to decentralizing finance will certainly involve growing pains because of the challenges in preplanning for every eventuality and economic nuance. Ultimately, however, the transparency and security a decentralized approach brings will lead to robust protocols that can become trusted financial infrastructure for a global user base.

LACK OF INTEROPERABILITY:

We will now touch on how DeFi solves for the lack of interoperability that exists in traditional finance. Traditional financial products are difficult to integrate, generally requiring at minimum a wire transfer and many cases unable to be recombined. The possibilities for DeFi are substantial, and new innovations continue to grow exponentially, fueled by how easy it is to compose DeFi products. Once a base infrastructure has been established – for example, to create a synthetic asset – any new protocols allowing for borrowing and lending can be applied. A higher layer would allow for attainment of leverage on top of borrowed assets. Such com- posability can continue in an increasing number of direc- tions as new platforms arise. For this reason, DeFi Legos is an analogy often used to describe the act of combining existing protocols into a new protocol. The next section discusses tokenization and networked liquidity, which are advantages to this composability.

4.6 CONCEPTS AND POLICY APPROACHES:

The pace of innovation in the DeFi space can be difficult to keep up with, leaving newcomers unsure on how to get into the main concepts of DeFi. In this chapter the two main concepts f DeFi is put forward. The concepts are related to the day-to-day usage of DeFi and how everyone can participate in the space and increase their portfolio or the value of their assets by participating in the DeFi ecosystem.

Liquidity Mining:

Liquidity mining is related to how market makers are implemented in DeFi. In DeFi, as stated before, AMMs are used to provide relevant prices for trading. A token issuer or a DEX can reward a

pool of miners to provide liquidity for a specified token or asset. Since the primary goal of an exchange is to be liquid, DEXs seek out ways to reward users willing to bring capital (liquidity) to their platform.
While the token swapper pays a small fee to trade on a decentralized exchange, the liquidity provider earns money for providing the liquidity that the first user will need. For example, people who provide liquidity for Ether (the token used in the Ethereum blockchain) get a small interest every time someone trades Ether on a DEX such as Uniswap. To conclude, liquidity mining is a fairly simple concept. New DEXs can only survive with appropriate liquidity that can facilitate trades. DEXs motivate cryptocurrency holders to provide this liquidity, by rewarding them with a fraction of the platform's trading fees

Figure 11: Deception of Uniswap (one of the most popular DEXs) AMM flowchart.

Yield Farming:

Yield farming is a method to generate rewards with cryptocurrency holdings. As discussed from the chapter above, users can provide liquidity in a liquidity pool and earn rewards in the form of fees paid by token swappers. Some liquidity pools pay their rewards in multiple tokens. The rewards can then be deposited to other liquidity pools to earn more rewards, and so on. With large amounts of capital, an investment can thus be folded many times over in order to maximize the amount of interests earned. With yield farming, the aim is to maximize a rate of return on investments by leveraging different DeFi protocols. An investor will possibly use a DeFi platform like Compound, accumulate crypto assets, and lend them to potential borrowers. The borrowers will then pay back interest on the loan to the investor. Interest can be either flat or flexible with the rates decided by the individual platform. Compound rewards users with its native token "Comp", along with the interest payment.

CHAPTER:5

DeFi- The Future of Finance

5.1 DeFi AND COVID-19:

The COVID-19 pandemic is leading to major disruptions to consumer behavior and business operations. These disruptions will introduce enduring changes in manufacturing and service sectors and financial services serving this economy.
DeFi seems to have re-emerged from three quarters in 2020 with a higher Total Value Locked (TVL) and more participants, as indicated by addresses participating in DeFi projects. However, these are still early days for creating a sustainable and inclusive financial services sector. Over the first three quarters, we saw DeFi rapidly growing, then shrinking, and then expanding again in quick succession. As larger liquidity pools and Autonomous Market Making (AMM) led to improved price discovery, yield farming brought more participation and automation to token asset management.

To an extent, structured products and secondary markets mirror the evolution of ‘fiat’ financial products. This maturing has been accelerated by the near-zero or, in some cases, even negative

interest rate regimes (a result of monetary policies introduced even before the pandemic broke out). However, it got amplified in 2020.

As early innovators conversant with ETH and BTC hunt for better returns on deposits and, in turn, generate interest among early adopters, it is important to check if the inherent risk reward curve has fundamentally shifted. Early signs show that the curve has not shifted. The correlation between real assets and tokens may have been increased by flight-to-liquidity by common participants in these markets, but it was shown to be not uncorrelated.

Early indications in Q1 2020 implied that the DeFi sector could remain isolated and decoupled from the real economy. However, interlinkages are slowly building up. If anything, flights-to-safety and flights-toreturns are becoming faster. Owing to easier on-ramp and off-ramp mechanics and the increasing prevalence of stablecoins, these flights are becoming more interconnected. Teething issues in March 2020, which were related to Maker auctions and lender liquidation, are not only gradually driving better self-governance in DeFi but also making calls for strident regulations. Innovations in insurance, which were triggered by events in Q1 and came to the foreground, have now become a part of DeFi building blocks.

Another trend in Q2 2020 seems to be a large number of technology, product, and business experts from traditional financial services firms joining DeFi firms. Though this trend increases credibility and creates more interconnectedness in centralized finance, purists will balk at it. With DeFi building blocks coming together to create a larger ecosystem, different components are rewarding native token holders for step-change improvements in their function and performance. These relative returns might shift in the future based on relative values and risk-reward profiles of these components.

Ethereum 2.0 improves scalability and transactional friction is serving as an incentive. Gas prices may encourage people to find ways like dynamic save/spend and bundling of transactions to save money. It is to be noted that in countries with progressive policy regimes, such as Singapore, tokens are increasingly becoming a part of the mainstream, e.g., getting covered under the Payments

Services Act (PSA). As these tokens bear interests, they may also lead to tax coverage decisions.

As per a recent McKinsey survey, global economic recovery is expected to remain muted and slow. Given the larger than average negative impact on lending and banking sectors and the longer period over which inflationary monetary policies will play out, it is foreseen that the healthier yield from DeFi and the increasing spread of more passive staking projects will drive both retail shift and interest from traditional financial institutions (FIs). This might start as a few M&A transactions for owning rights on uncertain upsides but may lead to DeFi sideproducts from FIs as a small defensive play.

Overall, central bankers have been forced to think harder in 2020 about the programmability of money and utilizing tools of monetary policies using Central Bank Digital Currency (CBDC). This acceptance of the programmability of money will have a halo effect on DeFi to an extent.

DeFi seems to have adapted and improved after these first stress tests in 2020. The real indicator of progress and maturity, however, should not only be TVL but also the number of participants accepting DeFi as a part of their portfolio. Even though tools to participate in DeFi are getting

relatively simpler and easier for the shift from early innovators to early adopters, they remain clunky and somewhat crude for large-scale adoption

5.2 TOP DEFI PROJECTS:

The best DeFi tokens have been surging in popularity since the beginning of 2021. Within the blockchain industry, the term market capitalization (or market cap) refers to a metric that measures the relative size of a cryptocurrency. It is calculated by multiplying the current market price of a particular coin or token with the total number of coins in circulation.

Market Cap = Current Price x Circulating Supply

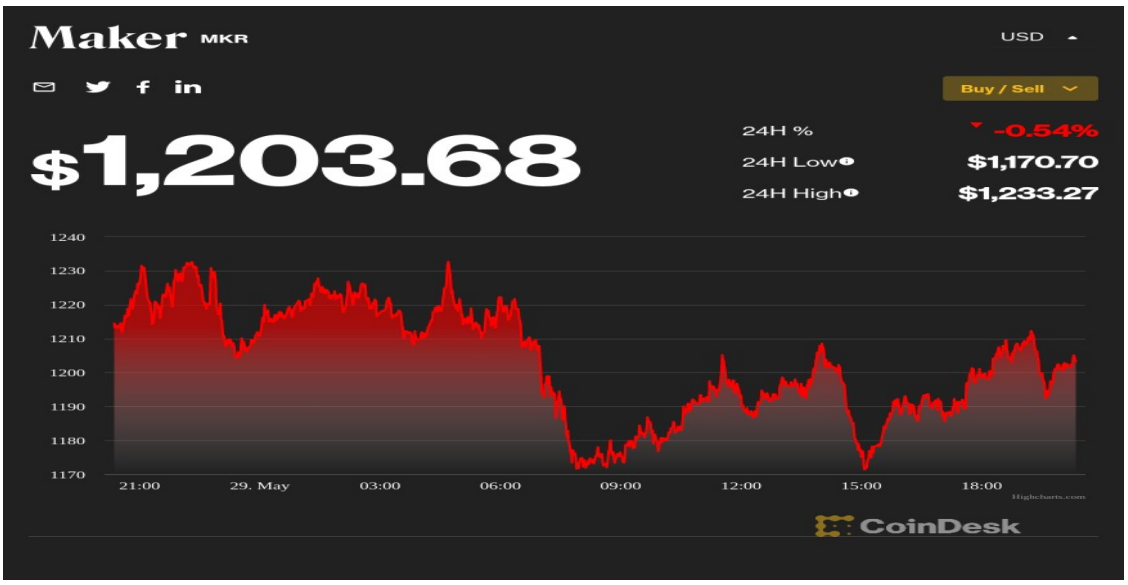
While the market cap may offer some insights about the size and performance of a company or cryptocurrency project, it is important to note that it is not the same as money inflow. So, it does not represent how much money is in the market. This is a common misconception because the calculation of market cap is directly dependent on price, but in fact, a relatively small variation in price may affect the market cap significantly.

- ***Maker (Lending):***

Founding year: 2015 Founder: Rune Christens en Total years of Experience of the founder: 11 Total Value Locked as of May 29 2022: $ 9.370Billion MAKER Blockchain: Ethereum	Growth in Total Value Locked: 483% Market Cap Growth: 20.2% Volume Growth (1 year): 518% Reddit Growth: 77% (17,278) Twitter Growth: 114% (70,134)	Development Activity (makerdao/dai.js) Stars: 2,008 Forks: 15,201 Watchers: 29

- Maker is a governing token of MakerDAO and Maker Protocol and is the lending platform responsible for the creation of Dai, the first decentralized stablecoin built on Ethereum.
- MKR token acts as a voting share to manage Dai and gives voting rights to holders in the development of Maker Protocol.
- Maker is a platform that enables users to autonomously take out loans (Dai denomination) by taking digital assets such as ETH as collateral

Maker's Performance:

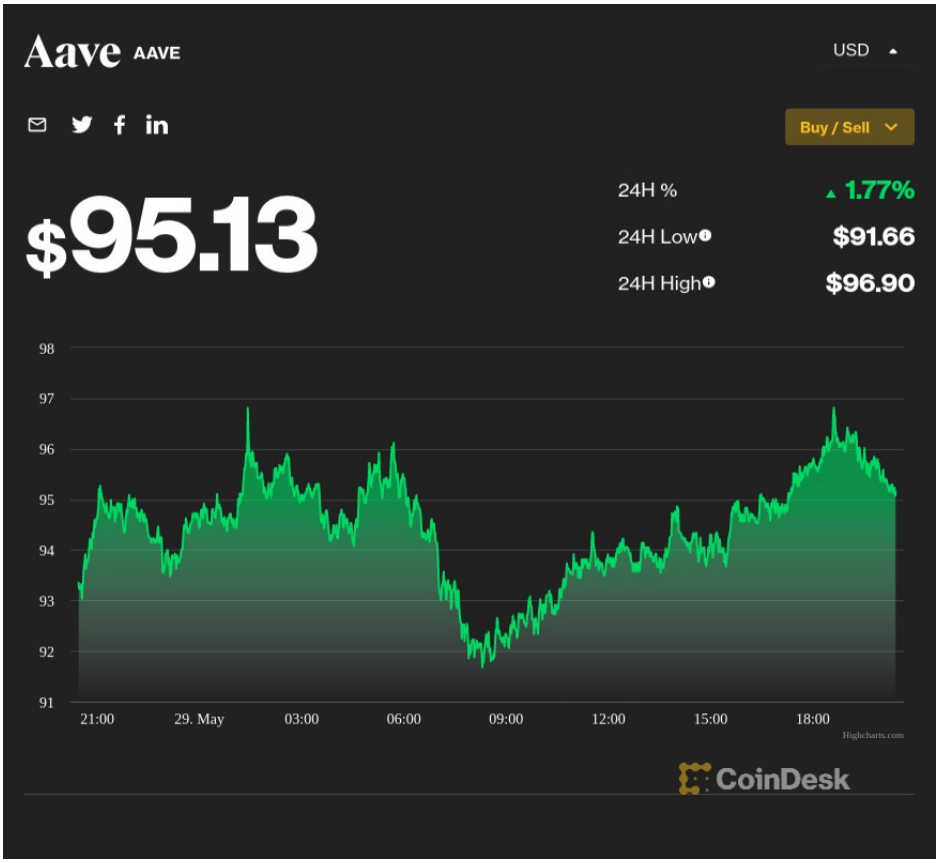


- ***Aave (Lending):***

Founding year: 2017 Founder: Stani Kulechov Total years of Experience of the founder: 6 Total Value Locked as of May 29 2022: $8,482,398,513 Blockchain: Ethereum	Growth in Total Value Locked :17% Market Cap Growth: 2.09% Volume Growth (1 year): 31.25% Reddit Growth: 15.9k members Twitter Growth: 467,502 followers	Development Activity (Aave/Aave Protocol) Stars: 310 Forks: 144 Watchers: 41 AAVE

- Aave is a DeFi project that helps in the creation of money markets. Users can earn interest on deposits and borrow assets.
- Through Aave, lenders earn an interest by depositing their tokens into liquidity pools.
- Borrowers receive instant loans by using their crypto tokens as collateral. The project launched server features such as rate-switching, aTokens, and Flash Loans.
- With the help of Flash Loans, a user with technical knowledge of solidity can take a loan from a reserve pool instantly, without placing any collateral. The user can pay the loan in one block.

Aave's Performance



➢ ***Uniswap (DEX):***

Founding year: 2018 Founder: Hayden Adams Total years of Experience of the founder: 6 Total Value Locked as of May 29 2022: $5,625,351,208 Blockchain: Ethereum	Growth in Total Value Locked :23.94% Market Cap Growth: $3,536,489,257 Volume Growth (1 year): 24.04% Reddit Growth: 62.4k members Twitter Growth: 888.2k followers	Development Activity (Uniswap/uniswap-v2-core) Stars: 508 Forks: 390 Watchers: 65 UNISWAP

• Uniswap is a decentralized exchange that is executed via an automatic smart contract. The decentralized exchange allows users to trade ERC-20 tokens on Ethereum blockchain.
• Uniswap has removed the idea of a limit order book and has moved away from the concept of a traditional limit.
• Uniswap is created to handle any size of orders and uses an asymptotic curve to increase the price of the coin as more users start buying it. However, it is different from a large decentralized exchange, as it swaps tokens with the liquidity pool created. The project was active in September 2020.

Uniswap's Performance:

➢ ***Chainlink (Infrastructure):***

Founding year: 2017 Founder: Sergey Nazarov and Steve Ellis Total years of Experience of the founder: 20 Total Value Locked as of Feb: $203 billion Blockchain: Ethereum	Growth in Total Value Locked : 313% Market Cap Growth: $3,363,618,947 Volume Growth : 24.18% Reddit Growth: 77.9k members Twitter Growth: 823.8k followers	Development Activity (smartcontractkit/chainlink) Stars: 1,303 Forks: 342 Watchers: 193 Chainlink

• Chainlink is a decentralized oracle network that passes information in and out of various blockchains in a secure, trustworthy, and decentralized manner.
• Chainlink acts as a medium between purchasers and data providers. Purchasers request data, and providers return data safely. Purchasers select the data they want, and providers bid to provide that data. By staking LINK tokens, providers ensure that the correct data is provided to purchasers.
• Chainlink uses an oracle reputation system to aggregate and weigh the data provided. If everything goes smoothly, providers get paid and everyone benefits.

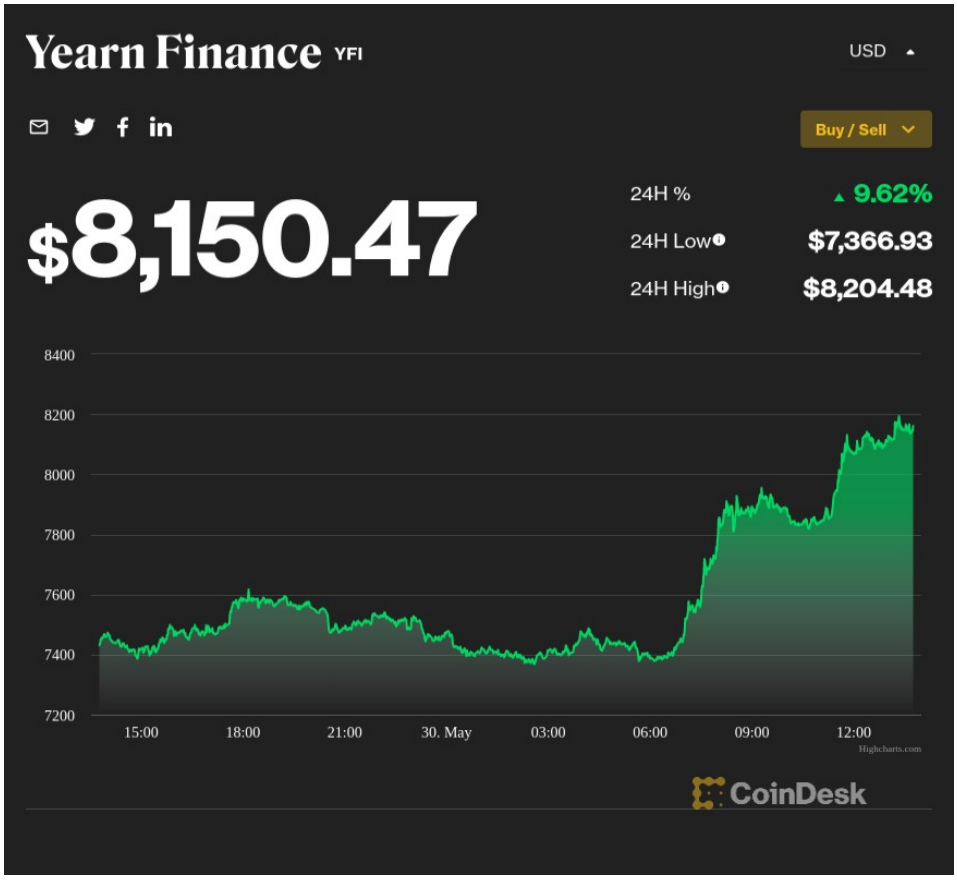
Chainlinks's Performance:

- ***Yearn Finance (Asset Management):***

Founding year: 2020 Founder: Andre Cronje Total years of Experience of the founder: 11 Total Value Locked as of Feb: $1,151,566,409 Blockchain: Ethereum	Growth in Total Value Locked : $11,460.23 Market Cap Growth: 9.65% Volume Growth : 29.19% Reddit Growth: 8.7k members Twitter Growth: 193.7k followers	Development Activity (iearn-finance/ygov-finance) Stars: 35 Forks: 75 Watchers: 14 yearn.finance

• Yearn Finance is a suite of products in DeFi. At its core, it provides lending aggregation, yield generation, and insurance on the Ethereum blockchain. The protocol is maintained and developed by various independent contributors within the cryptocurrency space. The management of the protocol is governed by YFI holders.
• Core products are Vault (capital pools that automatically generate yield based on market opportunities), Earn (lending aggregators), Zap (a tool to switch between liquidity fools), and Cover (insurance for protection against financial loss for various smart contracts on the Ethereum Blockchain)

Yearn finance's performance:



5.3 THE FUTURE OF DeFi:

Within and beyond the categories described here, DeFi is evolving rapidly. Developers are experimenting with new services, business models, and combinations of DeFi protocols. Technologies are maturing. Services are moving to decentralized management and governance of protocols. Tools are emerging to simplify the user experience on and across DeFi services. A significant aspect of ongoing DeFi development will involve composition of Dapps and financial primitives as "Money Legos." Already, aggregator services are emerging. DeFi composability might create new financial instruments and services, as well as new risks due to unanticipated interaction effects.

The investor population will also change as both less-sophisticated participants with more-limited cryptocurrency experience and more-sophisticated institutional traders enter in greater numbers. Speculative demand bubbles that produced spectacular returns over short periods will not be sustainable. Regulators will engage more actively in the DeFi area, especially as financial institutions and centralized finance providers look to become involved. While we cannot offer a crystal ball to predict the future of DeFi, we highlight some significant recent developments. Programmable blockchain networks are the global building blocks that can help create different financial products across all the different FinTech segments, including DeFi. FinTechs have pushed incumbents to move to digital and become tech-savvy. DeFi would move the financial ecosystem one step further, where new financial products would be easily produced through a simple user interface. These products will have a global audience with the help of a new infrastructure, i.e., blockchains.

In conclusion, we would like to highlight three important areas regarding DeFi.

1. LENDING INNOVATIONS:

Lending activity in traditional finance is often not secured by collateral, because identity data and credit-scoring are used to assess creditworthiness and limit defaults. Despite the absence today of analogous mechanisms, unsecured DeFi lending solutions such as flash loans are gradually emerging.

- Fixed Rate Products offer a stable interest rate despite fluctuations in the value of underlying assets. Yield Protocol creates tokens that may be redeemed one-for-one for a target asset after a predetermined maturity date, similar to zero-coupon bonds. The implicit yield curve is beginning to serve as the foundation for additional products.

- Credit Delegation allows users to deposit collateral assets into a DeFi lending service such as Aave, and then authorize trusted users to draw loans against that collateral. The two parties specify details of the loan through an arrangement called a Ricardian contract, in which a legal agreement is cryptographically linked to an associated smart contract on the blockchain. This system allows a depositor with unused borrowing power to delegate a credit line to someone whom they trust to earn additional interest. Borrowers can also refinance existing loans at much more favorable terms.

- Institutional Corporate Credit services such as Maple Finance allow institutions to borrow from liquidity pools managed by experienced investors. These Pool Delegates are responsible for assessing borrowers and negotiating loan terms before lending from their managed pool.

2. RISK MANAGEMENT INNOVATIONS:

There is growing demand for better tools to repackage and redistribute risk associated with DeFi activities, allowing more efficient capital allocation and more complex derivatives.

- Options form the basis for a wide range of hedging strategies in finance. Opyn is a DeFi service for creating tokenized options, which can be used to hedge against risks or take speculative positions. It also supports flash mints, analogous to flash loans: options without collateral that are burned before the end of the transaction. Ribbon Finance further supports Structured Products that combine options with other instruments for even more complex strategies.

- Tranched Lending , under development by DeFi service BarnBridge, separates debt pools into tranches of assets with different risk/reward characteristics, which investors cn access separately.

- Credit Default Swaps allow investors to purchase insurance against default risk of credit arrangements. Saffron Finance is working on enabling this mechanism in DeFi, where users are able to trade swaps on the underlying lending platform.

- Reinsurance is traditionally how insurance companies themselves diversify risks. NexusMutual and other DeFi insurance players have begun extending smart contract insurance to each other, mimicking these arrangements.

3. SCALING INNOVATIONS:

Ethereum in its current form is slow and suffers from high transaction fees, known as gas prices. Other blockchains such as Algorand, Avalanche, Binance Smart Chain, Cosmos, EOS, NEAR, Polkadot, and Solana are trying to attract DeFi-focused developers and users with promises of higher throughput and lower fees. However, better scalability at the base layer may come at a cost in the degree of decentralization or other attributes. The Ethereum Foundation promises significant scalability improvements in the upcoming Eth2, while Ethereum developers have been building a variety of Layer 2 solutions, such as sharding or “rollups,” that offload computation execution, but keep some transaction data on-chain. Eth2 is also scheduled to replace proof-of-work mining, which has been criticized for intensive energy usage, with a proof-of-stake system

- ➔ In the future, we expect that crypto wallets will be the portal to all your digital asset activity, just like an internet browser today is your portal to the world’s news and information. Imagine a dashboard that shows you not just what assets you own, but how much you have locked up in different open finance protocols–loans, pools, and insurance contracts.Many questions must be answered and advancements made before DeFi becomes safe to use. Financial institutions are not going to let go of one of their primary means of making money if DeFi succeeds, it's more than likely that banks and corporations will find ways to get into the system; if not to control how you access your money, then at least to make money from the system.

FUTURE OUTLOOK:

DeFi Replacing CeFi:

Centralized finance makes a financial ecosystem trustworthy this trust has been built over decades based on the security provided by CeFi.With DeFi, there is a new alternative to financial products,

which was earlier possible to get through the centralized finance ecosystem. However, liquidity in the DeFi ecosystem is way lower than liquidity in a centralized finance ecosystem. DeFi, however, brings improved UI/UX, speed, and user privacy. DeFi replacing CeFi would not be possible because each ecosystem has its strong suit. In the future, both the ecosystems will evolve gradually, where they will adopt the strong areas of each other to offer better products to their respective users. In short, we see DeFi and CeFi co-existing.

Regulations for DeFi Markets:

The current banking and securities regulations maintain trust among investors in the market. These regulations do not apply to DeFi.Yfdexf.Finance was a project that pulled out $20 million from investors' money in an exit scam giving a reason to investors to be suspicious of DeFi projects. With a lot of research and understanding about tokenomics, codes, and other intricacies, one might judge if a project is good or not. Many investors, however, do not make that judgment. This is where light-touch regulation might be good for the industry, at least when it is related to consumer protection and compliance. DeFi projects create liquidity from crowdsourced funds and believe in the mission of a project. Since the core USP of DeFi is to remain a trustless ecosystem, we do not know how many of the current regulations would be applicable to the ecosystem or if the current regulations would be updated for applicability.

Ethereum and Its Issue with Gas Prices:

Another important point that will determine the future of DeFi is Ethereum, which is the blockchain on which most of the current DeFi ecosystem is built. Ethereum uses gas (a unit of activity on Ethereum and the transactional cost for using computational resources to run decentralized apps or smart contracts). Gas prices have already reached an all-time high due to DeFi. If numerous projects are run on Ethereum, prices might surge, making it an unviable option for a user.

5.4 WAY FORWARD:

The literature review and consequential information in this paper gives several key insights into the DeFi ecosystem today and where it is headed. Crucial findings are listed down below as an overall summary of the most vital findings in this report.

- DeFi continues to grow in popularity as of 2021. Since 2020, and especially early 2021, the DeFi movement has exploded in popularity with several DApps, DEXs, lending/borrowing platforms in play and billions of USD in locked value.

- DeFi is still in its infancy with more room to expand. DeFi as an alternative finance is still in its early years. If the DeFi movement lasts, it will take years if not decades to realize its full potential DeFi has several opportunities over traditional finances.

- The opportunities DeFi offers over traditional finances are better interest rates, unconstrained access, more transparency, better interoperability, and total control over invested funds. However, there is a discussion to be had here if the average person wants more control over their finances in this way. There are several stories out there of individuals losing their private keys to their wallets, forgetting passwords, or getting tricked by scammers to give up personal information. With DeFi, there is no customer support line. Each individual is fully responsible for their own funds.

- DeFi provides countless opportunities for previously bankless people. People who today have no way to partake in the traditional financial system can partake in DeFi with internet access and a laptop or smartphone. The opportunities DeFi can offer these people is immeasurable. Merely allowing a simple farmer in India to invest their money and earn interests without the need for any credit card, government issued ID or social security number cannot be understated.

- DeFi can transform how we use money and assets in our day-to-day life through tokenization. By turning virtually any asset into a token, trading becomes much simpler for the common individual. For example, selling ownership of a house through tokenization could remove cumbersome paperwork

- DeFi can help marginalized people get out of difficult situations. People who live in authoritarian places, without any or limited access to traditional finance can use DeFi to keep their earnings safe and possibly escape

- With the growth of DeFi, the role of middlemen and other centralized gatekeepers may become unnecessary and obsolete. The role of judges, middlemen, contract negotiators, finance lawyers, agents, and brokers can be threatened by the DeFi movement and its implementation of smart contracts. Smart contracts and their algorithmic execution can remove a lot of unmercenary middlemen and paperwork.

However, one can argue that a new class of middlemen might arrive, for example smart contract advisors. Smart contracts are codes, written by people, and they still need to be verified by people to ensure they are bug-free and can be implemented in a reliable way.

The results show DeFi (as well as blockchain technology) growin with real-world use cases and implications and risks that need to be addressed and solved.

CONCLUSION:

In this paper, the possibilities, and benefits of the DeFi ecosystem is presented, along with the risks. The latest research is summarized and an in-depth look at the mechanisms of DeFi is revealed. In addition, the difference and pitfalls of traditional financial instruments is laid forward.

As such, this thesis answers the following questions:

➔ ***Question 1:*** What is DeFi and why has it emerged as an alternative form of finance?

The emergence of DeFi can be explained through the lens of traditional finances. Generally, central authorities such as governments have issued the currencies that bolster the financial system. Central banks and institutions were expected to carefully oversee and regulate the supply of currency in circulation. As the size and complexity of our economy continues to increase, these central authorities have gained more power. This in turn results in a system where we often have little say in how banks handle our investments, , or even how our governments manage the greater economy. The emergence of DeFi comes from a place of building a system that is better than the current one. The DeFi movement aims to create a financial system that is accessible to everyone and minimizes the need to trust and rely on central agencies. Technologies like the internet, cryptography, and blockchain gives individuals the means to cooperatively create and control a financial system without the need for centralized figures or unnecessary intermediaries. DeFi provides compelling advantages over traditional finance such as decentralization, increased access to data, efficiency, interoperability, and transparency. Decentralization allows financial assets to be owned collectively by the community without centralized control. Access to these new services for all individuals could dramatically decrease the wealth gap between social groups. As such, DeFi offers exciting opportunities and has the potential to create a truly accessible, transparent, and immutable financial infrastructure. DeFi may lead to a paradigm shift in the financial industry and potentially contribute towards a more robust and transparent economic infrastructure.

➔ ***Question 2:*** What is the applicability of DeFi today?

➔ As a whole, decentralized marketplaces provide many advantages to the market participants. This includes increased trust, better privacy, lower transaction costs, and robust transaction integrity. DeFi can even directly distribute value to users to incentivize its growth, as demonstrated by Compound (via the COMP token) and Uniswap (via the UNI token). Yield farming is the practice of seeking rewards by depositing into platforms that incentivize liquidity provisioning. Token distributions and yield farming have attracted large amounts of capital to DeFi over incredibly short time windows. Platforms can engineer their token economics to both reward their innovation and foster a long-term sustainable protocol and community that continues to provide value. To summarize, individuals can borrow and lend cryptocurrencies and earn high interest rates using platforms such as Compound or Aave. Use prediction markets such as Augur for betting. Create and swap derivatives of off-chain assets such as different real-world currencies or precious metals such as silver and gold on the Synthetix platform. Buy cryptocurrencies known as stablecoins, which are pegged to the value of a particular currency or commodity to keep the value of their investments stable over long periods of time. Trade hundreds of different crypto assets and NFTs. Partake in voting and building a community through DAOs, and lastly use DEXs without the need for any KYC practice.

➔ ***Question 3:*** What does the future look like for the DeFi movement?

> Leveraging blockchain technology, DeFi builds on distributed trust and open platforms to create an alternative financial system that can be more innovative, decentralized, interoperable, transparent, and borderless. DeFi has the potential to reshape the structure of modern finance and create a new landscape for entrepreneurship and innovation. Decentralization will likely see more diverse and competitive financial service ecosystems and reduce the importance of larger centralized financial hubs. As DeFi grows, markets and marketplaces created or maintained by decentralized autonomous organizations will not easily allow for government intervention. Regulations that try to avoid market manipulation, price cutting, or other anticompetitive practices, as well as regulations banning marketplaces from selling a good or a product, will become much harder to enforce in the DeFi space. Thus, if the need to preserve the opportunities provided by emerging blockchain technologies is important in terms of individual freedoms and emancipation, more democratic institutions, and creative individual expression while avoiding or reducing the possible drawbacks that they might introduce in society, then law agencies need to think about a new paradigm of regulations. A paradigm that could balance the power of blockchain technology, DeFi and evolving autonomous systems in ways that encourage economic growth, free speech, democratic institutions, and the safety of individual liberties.

DeFi is a new, fast-growing area. Yet it remains immature, with a variety of unresolved economic, technical, operational, and public policy issues that will be important to address. Although some protocols have attracted significant capital and the associated network effects in a short period of time, the DeFi sector remains volatile. DeFi has the potential to transform global finance, but activity to date has concentrated on speculation, leverage, and yield generation among the existing community of digital asset holders. In addition, the very flexibility, programmability, and composability that make DeFi services so novel also expose new risks, from hacks to unexpected feedback loops among protocols. Retail investors, professional traders, institutional actors, regulators, and policy-makers will need to temper enthusiasm for the innovative potential of DeFi with a clear understanding of its challenges. Developers are actively working to address vulnerabilities and introduce new mechanisms to manage risks efficiently, but the process is ongoing. DeFi will ultimately succeed or fail based on whether it can fulfill its promise of financial services that are open, trust-minimized, and non-custodial, yet still trustworthy.

This paper thus answerers the research questions from above. To punctuate further, DeFi could revolutionize the underlying technology of the payment and credit information systems in banks, thus upgrading and transforming them. Blockchain applications also promote the formation of multi-center, non-intermediary settings, which could enhance the efficiency of the financial industry. In the advent of smart contracts, blockchain technology, DeFi and other distributed ledgers, new legal paradigms and regulatory strategies ought to be explored to discourage illicit and improper use of the technology, while reaping the benefits of the technology as a promoter of economic growth, decentralization, and competition. If done correctly, dynamic policies could enable the DeFi space to flourish, like the internet, and encourage DeFi to evolve as a free-market solution that will optimize financial inclusion for everyone in the long term.

5.4 MULTIPLE CHOICE QUESTIONS:

01. What does DeFi stand for?
    a) Decentralized Finance
    b) Decentralized Field
    c) Detoxicated Firewalls
    d) Data entry Filename Inquiry
    (a)

02. What does decentralized finance involve?
    a) Lending and borrowing assets to and from other users
    b) Decentralized exchanges
    c) Executing smart contracts
    d) Interacting with decentralized exchanges
    e) All of the above
    (d)

03. The most popular use of Decentralized applications (Dapps) is...
    a) Decentralized Exchanges
    b) Sending NFTs
    c) Submitting applications to job and rental engines
    d) None of the above
    (a)

04. The main advantage of Decentralized exchange is...
    a) Users own their private keys
    b) Increased privacy due to the lack of know your customer (KYC) controls
    c) Large range of low cap alt coins
    d) All of the above
    (d)

05. What is the main purpose of DeFi?
    a) Technological playground for developers
    b) Providing financial solutions on blockchain
    c) No dedicated purpose
    d) Foster and encourage money laundering
    (b)

06. What the not the most well-known DeFi services?
    a) Decentralized Exchanges (DEX)
    b) Stable coin initiatives
    c) Lending and borrowing platforms
    d) Automated Market makers
    e) Client On-boarding solutions
    (d)

07. What are not the most well-known protocols of DeFi?
    a) Uniswap
    b) MakerDao
    c) Compound Finance
    d) Tradelens
    (d)

08. To interact with DeFi it is essential...
    a) Register in the corresponding exchange
    b) Have a wallet to store your assets
    c) Use a hard wallet connected to the metamask
    (b)

09. Smart contracts are like regular contracts except they...
    a) Do not require a third party to verify the agreemnt
    b) Are self-executing
    c) Cannot be changed after they've been created and entered onto the blockchain
    d) All of the above
    (d)

10. Which statement best describes a cryptocurrency?
    a) Money that can be stored physically or electronically
    b) A digital or virtual currency secured by cryptography
    c) Paper money that can be used for physical transactions
    (b)

11. What is a decentralization?
    a) Decision making authority provided to customers
    b) Less delays in decision making
    c) Decision making authority shared with other member of the firm
    d) Decision making power only to senior executives and BOD
    (a)

12. Which of the properties listed below is not a DeFi feature?
    a) Public verifiability - While the DeFi application code may not be open source, the execution trace and bytecode must be publicly verifiable on the blockchain. DeFi users can inspect the DeFi state transitions and verify their orderly execution.
    b) Custody - DeFi allows its users to control their assets directly and at any time of the day.
    c) Privacy - State-of-the-art DeFi offers real anonymity. Blockchain addresses cannot be clustered and traced.
    d) Atomicity - A blockchain transaction can combine multiple financial operations. Either the transaction executes in its entirety with all its actions, or fails collectively.
    (c)

13. Which of the following DeFi applications is most likely to require external data:
    a) Token management contracts, such as ERC20
    b) Decentralised and trustless betting on real world events
    c) Uniswap, Curve, and other AMM DEXes
    d) On-chain games that do not require randomness
    (d)

14. Which of the following is not correct?
    a) A DeFi attacker can target any of the system layers
    b) An attacker can create several high-frequency spy nodes that connects to as many peers as possible, to detect all network layer traffic
    c) Attacker can only front-run, but its hard to back-run victim transactions
    d) Eclipse attack can lead to double spending.
    (c)

15. What are the Pros of DApps among the following?
    a) Enhances the user privaccy
    b) Resists censorship
    c) Flexible platform enales dApp development
    d) All of the above
    (d)

16. What are the cons of the DApps among the following?
    a) May lack effective scalability
    b) Difficult to develop user-friendly interface
    c) Code modifications is tough
    d) All of the above
    (d)

17. Which Defi project was founded first?
    a) Maker DAO
    b) Ave
    c) Syntetix
    d) Compound
    (a)

18. Which type of smart contracts get their value, risk, and basic term structure from underlying assets?
    a) Cross chain
    b) Derivatives
    c) Indexes
    d) Oracle
    (b)

19. What cannot be done using DeFi?
    a) Storing value on blockchain
    b) Yield farming and liquidity mining
    c) Customized transactions
    d) Traditional banking
    (d)

20. What is the important blockchains for DeFi?
    a) Tron and avalanche
    b) Ethereum and binance smart chain
    c) Corda
    d) Bitcoin
    (b)