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Decentralized Finance:
A Future Where It Could Integrate With Traditional Finance

Executive Summary

Decentralized Finance (DeFi) has successfully reimagined the archetypes that drive financial markets ranging from lending, trading, insurance, and investing tech. The inherent non-custodial, self-governed, and community-driven nature has been a major draw, driving significant growth in total value locked (TVL).

Many enthusiasts and crypto natives believed in and argued for **a future where DeFi could completely replace** centralized finance (CeFi) and traditional financial services. But DeFi's current nascent development could possibly make any conclusive judgment now seem premature.

Most current DeFi protocols are, to a certain extent, still centralized, in that they have centralized development teams (especially at the initial stage of their launch), the voting power of some DAOs is concentrated in certain groups of people, etc. **Decentralization is actually a spectrum rather than being so black and white.**

In the foreseeable future, **instead of being an existential threat,** an increasing integration of DeFi with the conventional financial system could also be beneficial to the traditional financial markets.

DeFi could be a testing ground for distributed ledger technologies, which financial institutions could adopt to improve efficiency and lower transaction costs. **CBDCs (Central Bank Backed Digital Currencies) that are now being tested and experimented with by various countries are a prime example** of how DeFi could positively impact our traditional, centralized financial system.

Discussions and dialogues with key stakeholders, as well as regulators as presented in this report, probe and extrapolate how financial institutions could not only coexist but also leverage the opportunities presented by DeFi.

This opens up a vast universe of opportunities for all market participants. And the report targets to equip them, who might not have much prior knowledge in the space, with a comprehensive understanding so they can capitalize on these opportunities in the future.

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About the Report

This report gives readers a distilled but comprehensive overview of the whole decentralized finance (DeFi) space. It is meant to present an easy to understand report, without jargon, to anyone interested in the space, even if the reader only has a limited understanding of it.

The report is divided into four major parts, each building on top of the preceding part. It started by explaining what DeFi - is its historical development, the building blocks, and the types of tokens. The next part then introduces the eight leading protocols across various key functions in DeFi (lending & borrowing, trading, insurance, and investing).

Building on this, the report highlights how industry experts in both traditional and decentralized finance view the future development of the space and, more importantly, where traditional financial institutions could leverage the technology that has underpinned DeFi's strong growth.

The last part focuses on regulations and highlights the key challenges and concerns regulators currently have in the face of DeFi. It includes three suggested approaches identified from the research to enhance the current regulatory framework.

After reading the report, readers should have a solid understanding of DeFi and be able to engage in meaningful discussions with people in the industry.

Decentralized Finance Overview

Decentralized Finance Defined

Albeit its recent popularity, decentralized finance (DeFi) is still loosely defined without a single agreed definition. It has been commonly referred to as the provision of financial products, services, arrangements, and activities that use distributed ledger technology (DLT) to eliminate the need for some traditional financial intermediaries and centralized institutions.

Simply put, it is a peer-to-peer ecosystem (i.e., without the need for intermediaries) that leverages smart contracts and blockchain technologies to provide financial services and carry out other activities. One may realize that the fundamental idea itself is not new at all. But, thanks to DLT and the growing popularity of cryptocurrencies, the development of DeFi has been significant in recent years.

Although there is no single definition agreed, DeFi's key features include:

- **Non-custodial**
  - One of the main defining characteristics of DeFi
  - No central authority or other intermediaries could gain access to or control over participants' digital assets
  - Participants manage their private keys and their digital assets directly

- **Self-governed and community-driven**
  - Many protocols are open-source so that the community can further review and develop the protocols' codes
  - Governance tokens allow users to vote on decisions that would impact the future development of the protocols

- **Composable**
  - One of the most essential innovations in DeFi
  - Existing components of DeFi networks, such as digital assets, smart contracts, protocols, etc., can be combined to create new applications
  - This is also the fundamental driving force behind the innovation and growth in DeFi in recent years as it allows everyone to look at the codes and use them to create new applications
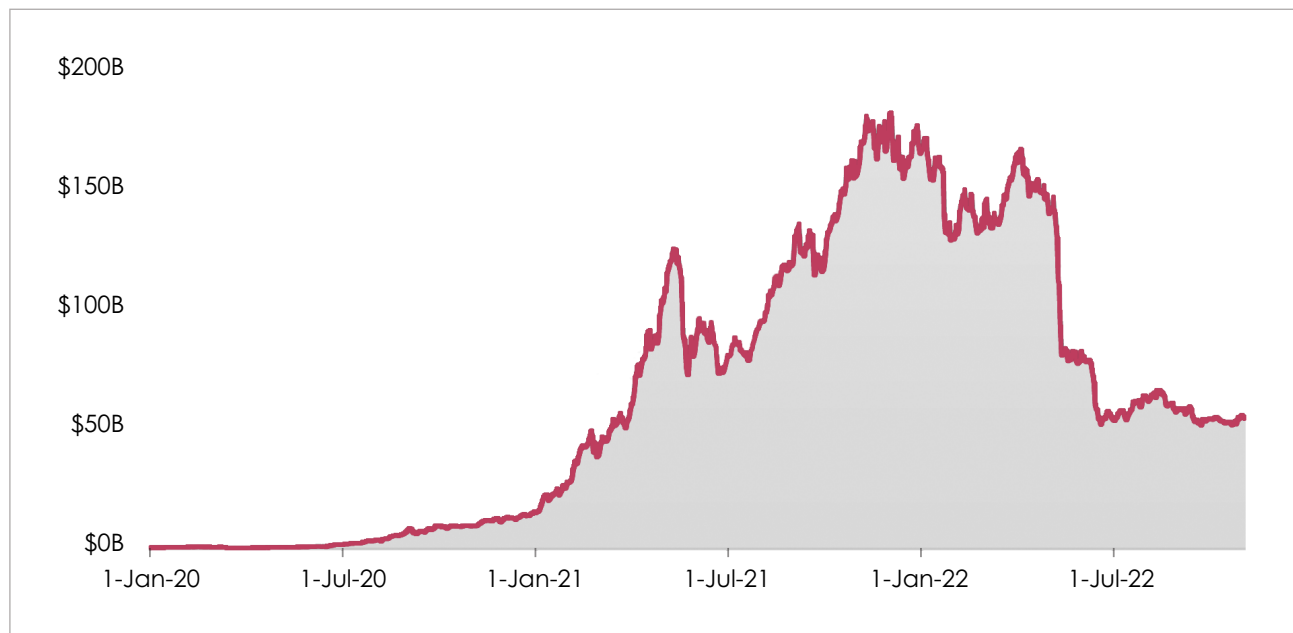
Historical Development of DeFi

DeFi's development can be largely broken down into 3 stages/periods.

1. **Setting the Scene (2009 – 2016)**

   ▪ We saw the creation of the two most popular/fundamental cryptocurrencies (BTC & ETH) in this period that set the scene for the future development and innovations of DeFi.

   ▪ **BTC** was created by Satoshi Nakamoto in 2009

   ▪ The **ETH** blockchain was launched in 2015, two years after its whitepaper was first published by Vitalik Buterin

2. **The Birth of DeFi (2017 – 2019)**

   We saw the launch of the first iteration of DeFi protocols in this period which marked the beginning of the whole space.

   ▪ **Maker**, which has been considered one of the very first DeFi projects, was launched in 2017 (refer to the "Introduction of Key Protocols" section for more details)

- **EtherDelta**, one of the first decentralized exchanges (DEX), was also launched in 2017
  - Its founder, Zachary Coburn, was later charged by the SEC for running an unregistered national securities exchange in 2018
  - This ultimately led to the demise of EtherDelta
- Initial Coin Offerings (ICOs) became very popular in 2017
- Although many over-hyped projects ultimately failed, ICOs also gave rise to some very successful and popular protocols nowadays, for example:
  - **Aave**: a leading lending & borrowing protocol (refer to the "Introduction of Key Protocols" section for more details)
  - **Synthetix**: a protocol that enables the issuance of synthetic assets on-chain
- **Compound Finance**, a decentralized lending protocol, was launched in 2018
  - The liquidity mining program of its native tokens (COMP) launched in May 2020 which was seen as the main catalyst for the DeFi summer in 2020
- **Uniswap**, which is currently the most popular DEX, was also first launched in 2018 (refer to the "Introduction of Key Protocols" section for more details)
- **Opyn**, which is currently the most popular DeFi options protocol, was launched in 2018 (refer to the "Introduction of Key Protocols" section for more details)

3. The Rise of DeFi (2020 – 2021)

The market has witnessed a significant growth in DeFi's total value locked (TVL) in this period starting from the summer of 2020 (commonly known as the DeFi summer)

- The growth was largely thanks to the liquidity mining programs of various protocols that offered extremely high APYs
- **Sushiswap**, a fork[1] from Uniswap, was launched in August 2020 that aimed to attract liquidity from Uniswap
- Curve Wars began in 2020 and had been going on for the past two years
  - **Curve Finance** is one of the largest DEXs specializing in stable swaps between pegged assets
  - Curve Wars refer to various protocols competing to acquire Curve's native tokens (CRV) by offering "bribes" (incentives)
- **Ribbon Finance** was launched in 2021 (refer to the "Introduction of Key Protocols" section for more details)

Note: [1]Protocols built based on other existing open-source decentralized protocols

Figure 2: Timeline of DeFi Development
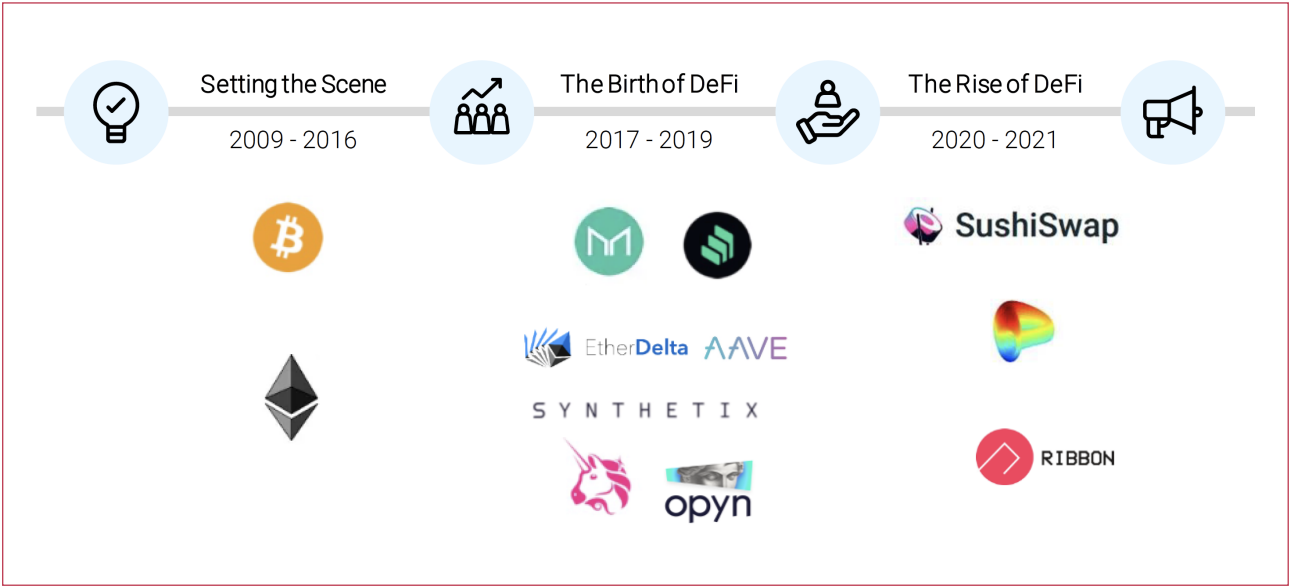
DeFi's Layers & Building Blocks

The technology stack of DeFi consists of four main layers.

At the very bottom is the settlement layer, which is often seen as the foundation of DeFi. The asset layer is built on top of the settlement layer, followed by the smart contract/ protocol layer, with the application layer at the top.

Products and services are offered at each level of the stack. One layer can not exist without the layers beneath it.

Figure 3: DeFi's Technology Stack

Application layer	• Protocol specific interfaces • Protocol agnostic interfaces		
Smart contract/ protocol layer	• Trading • Lending & borrowing	• Derivatives • Insurance	• Bridges
Asset layer	• Tokens • "Bridged" tokens	• Stablecoins	
Settlement layer	• Blockchains	• Layer 2 solutions	

Settlement layer

- The core infrastructure of DeFi that includes blockchains and "layer-2 scaling solutions"

  - Transactions are recorded, shared, and guaranteed in this layer (hence, its reference to ledgers)

- A blockchain is a distributed ledger that is shared among the nodes of a computer network

  - Validating and recording these transactions are handled cooperatively by computers organized in a peer-to-peer network structure rather than a server-client network model

- Throughput (transactions per second) of highly popular decentralized blockchains (e.g., Ethereum) can be very low, leading to high transaction fees

  - As such, various "layer-2 scaling solutions" exist to attempt to scale blockchain usage by enabling faster and cheaper transactions with greater throughput, as an alternative to utilizing the base blockchain layer

- Existing layer-2 scaling solutions include "lightning networks", rollups, side chains, etc.

  - In essence, these "layer-2" solutions allow certain transactional data to be processed off the base blockchain and would eventually be recorded back onto the base blockchain once they are confirmed and finalized

- Examples of base blockchains include Ethereum, Binance Smart Chain, Solana, etc.

Asset layer

- The asset layer refers to the coins and tokens that reside on a blockchain

- Coins and tokens are often used interchangeably, though not exactly the same

  - Coins are digital assets native to a particular blockchain (e.g., ETH for the Ethereum network, BTC for the Bitcoin network, etc.)

  - Tokens are a denomination of a currency or representation of an asset on a blockchain. Instead of having their own blockchains, tokens usually operate on other coins' blockchains (e.g., UNI on the Ethereum network, CAKE on the BNB Chain, etc.)

  - **Hence, all coins are considered tokens but not all tokens could be considered coins**

- Tokens are a strong tool to build network effects and are one of the advantages DeFi protocols have over traditional startups

  - Tokens can help align protocol-user interests, bootstrap initial traction, facilitate fundraise, etc.

  - One protocol's token can often be used in other protocols (e.g., UNI token can be used as collateral to borrow in Aave), which showcases DeFi's composability

- Stablecoins are a subset of crypto assets that are meant to have a stable value

  - Generally linked or pegged to the value of some other assets (could be fiat and other crypto-assets)

- "Bridged"/"Wrapped" tokens are another subset of crypto-assets created on a blockchain as a synthetic for a given token to be used on a different blockchain

  - For example, wrapped Bitcoin (wBTC) is Bitcoin that has been converted for use on the Ethereum ecosystem

- The asset layer has been the layer likely with the most public coverage so far

  - Unfortunately, public coverage of these assets tends to focus primarily on their price action for speculation

  - This layer also covers non-fungible tokens (NFTs)

Smart contract/protocol layer

- Smart contracts are codes deployed to and executed on a blockchain

  - They provide the underlying functionality for DeFi use cases, e.g., exchanges, lending & borrowing, derivatives, etc.

- Transaction fees, known as gas fees, are charged to users to incentivize miners/ stakers to verify and include the transaction in a block

  - Transaction fees are proportional to the complexity of the code (hence, the code quality matters)

- When smart contracts are deployed to the blockchain, the source code is publicly available for checking, testing, or even copying

  - Due to the isolated nature of blockchains, "bridges" have been developed to allow interoperability between different blockchains

Application layer

- Built on top of smart contracts
  - A simplified analogy (to traditional web development) is that the application layer is akin to the front-end interface that users interact with a web application, while smart contracts are similar to the application's back-end structure

- The application layer usually includes graphical user interfaces (GUIs) and other components that enable and shape user interaction with DeFi
  - Graphical images and interaction codes are often hosted on centralized servers, i.e., much of this functionality does not operate on a blockchain but instead on traditional internet infrastructure

- Protocol-specific interfaces: refer to a user interface exclusively built for interacting with the smart contracts of one underlying protocol (e.g., app.uniswap.com to interact with Uniswap's smart contracts)

- Protocol-agnostic interfaces: refer to aggregators typically developed to interact with several protocols' smart contracts (e.g., app.1inch.io to easily interact with the smart contracts of Uniswap, Sushiswap, Balancer, etc.). They provide users with easy access to multiple protocols by being a one-stop interface

Different Types of Tokens

Tokens on the asset layer can be further classified into five main categories: utility tokens, security tokens, governance tokens, payment tokens, and stablecoins.

However, it is usually not as clear cut since many tokens could be hybrid in nature and span across multiple categories (e.g., utility and governance).

This further increases the challenges and complexities for regulators around the world as they seek to determine whether a token is a security or not.

Figure 4: Categories of Tokens

Type	Features	Key Examples
Utility tokens	▪ Designed to be used to exchange for services/products on a platform ▪ They are usually not considered as securities/ investments - Typically subject to less regulations	▪ **Basic Attention Token (BAT)** - The utility token in the Brave browser - Users can opt-in to view ads and earn BAT - BAT is also used to tip content creators ▪ **BinanceCoin (BNB)** - BNB is the token issued by Binance - BNB holders can pay trading fees in BNB and enjoy a 25% trading fee discount on Binance

Type	Features	Key Examples
Security tokens	▪ Securitized cryptocurrencies that can represent interests in other financial assets - For example, stocks, bonds, real estate, etc ▪ They could offer average investors investment opportunities that are not commonly available in the traditional financial market , e.g., early funding rounds - Regulated by the securities laws	▪ **tZero** - tZero gives companies the opportunity to issue tokenized assets to the public via its blockchain - The platform is fully regulated ▪ **INX** - INX offers users the chance to purchase digital securities from an assortment of businesses - The first US registered security on a blockchain
Governance tokens	▪ Used to support voting systems in DAOs (Decentralized Autonomous Organizations - Holders can participate in a protocol's on chain governance	▪ **Maker (MKR)** - is the governance token of MakerDAO, the protocol/ platform behind the DAI stablecoin - MKR holders can vote oncommunity proposals, e.g., which assets to be whitelisted as collateral ▪ **Curve (CRV)** - Similarly, CRV is the governance token of CurveDAO , a protocol that specializes in stable swaps between pegged assets (esp. stablecoins) - CRV token holders have the right to determine how the CRV emissions should be distributed between various liquidity pools
Payment tokens	▪ Designed to facilitate P2P transactions ▪ Compared to utility and security tokens: - They do not represent ownership and are not used for particular products/services	▪ **BTC** - BTC has been considered as the classic payment token example ▪ **Monero (XMR)** - Although BTC is pseudonymous, payments are still traceable - XMR allows users to send money with even more privacy by using ring signatures to obfuscate the identity of a crypto payment's senders and recipients

Type	Features	Key Examples

Stablecoins	▪ A special type of payment tokens pegged to fiat currencies (e.g., USD)	▪ **USDT USDC**
		  - Fiat/commodity backed stablecoins
		  - Managed by 3 rd party companies (i.e., centralized) with off chain assets as collateral
		
		▪ **DAI**
		  - Crypto assets as collateral
		  - Decentralized , i.e., managed by a protocol on blockchains

Type	Features	Key Examples

Key Decentralized Finance Protocols

DeFi vs. TradFi

As DeFi aims to provide financial services without centralized entities/intermediaries, it replicates many of the key features in the traditional financial (TradFi) system by using blockchain/DLT technologies.

The table below showcases how various DeFi protocols have been developed to serve different key functions in TradFi.

Figure 5: DeFi vs. TradFi

Function	Service	DeFi protocols	TradFi
Lending	▪ Unsecured lending ▪ Secured lending	▪ Aave ▪ MakerDAO	▪ Commercial banks and non bank lenders ▪ Broker dealers in repo and securities lending
Trading	▪ Asset trading ▪ Derivatives trading ▪ Options	▪ Uniswap ▪ dYdX ▪ Opyn	▪ Exchanges, OTC brokers, and market makers
Insurance	▪ Risk protection	▪ Nexus Mutual	▪ Property & Casualty and Life & Health insurance companies
Investing	▪ Investment vehicles	▪ Yearn ▪ Ribbon	▪ Investment funds

Lending & Borrowing

- One of the most common/primary protocols in DeFi

- Lending/borrowing in DeFi is usually over-collateralized
    - This is due to the inherent lack of trust because of DeFi's pseudonymous nature (no credit checks) and the high volatility commonly witnessed in crypto-assets as collateral

- DeFi lending platforms also offer a unique financial instrument called flash loans (akin to unsecured borrowing)
    - Participants can borrow a large amount of crypto-assets without collateral as long as they could pay back the debt in the same transaction
    - The instrument/mechanism allows arbitrageurs to act without their own capital by taking out a loan for the entire arbitrage trade and then repaying the loan

Trading

- Another key product and service in DeFi that has fueled its growth in recent years

- Decentralized exchanges (DEXs), e.g., Uniswap, facilitate the exchange of crypto-assets via smart contracts rather than centralized trading platforms in TradFi
    - Two types of prominent DEXs: order-book exchanges and automated market makers (AMMs)

- DeFi protocols that specialize in derivative trading have also been gaining popularity in recent years
    - dYdX is a popular protocol for perpetual futures trading, while Opyn is a leading protocol for options

Insurance

- Insurance protocols that currently exist in DeFi mostly focus on smart contract risks
  - For example, protocol failures, hacks, stablecoin de-pegs, etc.

- Participants typically fund the risk pools, which will pay out the claims, by depositing crypto-assets in return for fees (insurance premium)

- DeFi insurance that aims at providing the same or similar protection against risks in traditional insurance is still limited and is only beginning to develop

Investing/asset management

- DeFi investing/asset management protocols can take many forms
  - In many cases, protocols set up asset pools to put together users' deposits/assets and transfer these assets to another protocol that pays a return

- As DeFi investing/asset management protocols are based on blockchains, investors have full transparency and can trace /analyze all their trading activities and investment decisions
  - That said, analyzing blockchain data requires a level of technical expertise that many do not have

Introduction of Key DeFi Protocols

This section will introduce the eight leading DeFi protocols highlighted in the previous table.

They are among the most popular protocols (in terms of TVL) in their own protocol category since many of them are pioneers. As DeFi is relatively nascent, these pioneer protocols still have significant first-mover advantages.

Aave (Lending)

- Aave allows crypto-asset holders to earn a fixed or variable return on those assets they own by depositing them into a lending pool
  - It simultaneously allows other participants to borrow these assets in the lending pool (by depositing collateral)

- Factors that could impact a lending pool's interest rate include the relationship between the crypto-assets in the lending pool, the amount that has been borrowed (the utilization ratio), and the optimal utilization ratio

- Typically, the interest rate on the outstanding loans rises and falls with changes in the utilization ratio
  - The interest rate is programmed to rise when the utilization ratio increases to attract more deposits and discourage borrowing, while it decreases in response to a decreasing utilization ratio to encourage more borrowing

- Borrowers can also borrow at a stable (but higher) interest rate (the difference/ spread can be seen as the premium paid to guarantee that stability)

MakerDAO (CDP)

- MakerDAO does not rely on a lending pool to match borrowers and lenders
  - Instead, it allows users to mint (generate) MakerDAO's native stablecoin, DAI, upon posting an over-collateralized position (collateralized debt position; CDP)
  - Users are basically taking out a loan in DAI by depositing collateral (e.g., ETH)

- The value of the collateralized ETH has to be greater than the value of the DAI loan to account for ETH's volatility
  - If the value of the collateral falls under the value of the DAI loan, the position will be liquidated

Uniswap (DEX)

- The very first decentralized exchange that does not use order book but automatic market maker (AMM) to facilitate the exchange/swap of tokens
  - Uniswap generally uses a version of AMM called constant pricing algorithm, where the product of the number of two tokens in a liquidity pool is always the same constant

- Liquidity providers (LPs) who provide liquidity to a pool are entitled to earning the trading fees of the pool (i.e., liquidity mining)
  - LPs would also receive LP tokens for providing liquidity; LP tokens can be further staked to earn additional returns, besides the trading fees

dYdX (Derivatives)

- The leading decentralized exchange for trading perpetual futures (perps) in DeFi
  - Perps are a type of derivatives that do not expire and allow traders to gain long/ short exposure to a certain crypto-asset similar to futures

- dYdX is a hybrid exchange that utilizes off-chain order books with on-chain settlements
  - It provides users with functions and liquidity usually offered by centralized exchanges, but without compromising their privacy and autonomy

Opyn (Options)

- A leading options protocol that mints tokens (oToken) to facilitate the buying and selling of options
  - It is also the base protocol which DeFi Options Vaults (e.g., Theta Vaults) can be built on

- It launched the innovative perpetual option instrument, SQUEETH, that allows traders/users to gain exposure to the price of ETH squared
  - SQUEETH further enables users to trade option volatility in a decentralized manner much more easily
  - SQUEETH is another major reason why Opyn is the leading DeFi options protocol

Nexus Mutual (Insurance)

- It holds users'/members' funds in a risk-sharing pool and uses those funds to pay out claims
  - Its key product, Smart Contract Cover, provides protection against smart contract bugs and hacks

- Besides providing protection against smart contract risk, it is also working to offer protection against traditional risk events, e.g., earthquake cover
  - It claims to build an alternative risk sharing platform, using blockchain, to replace the traditional insurance model
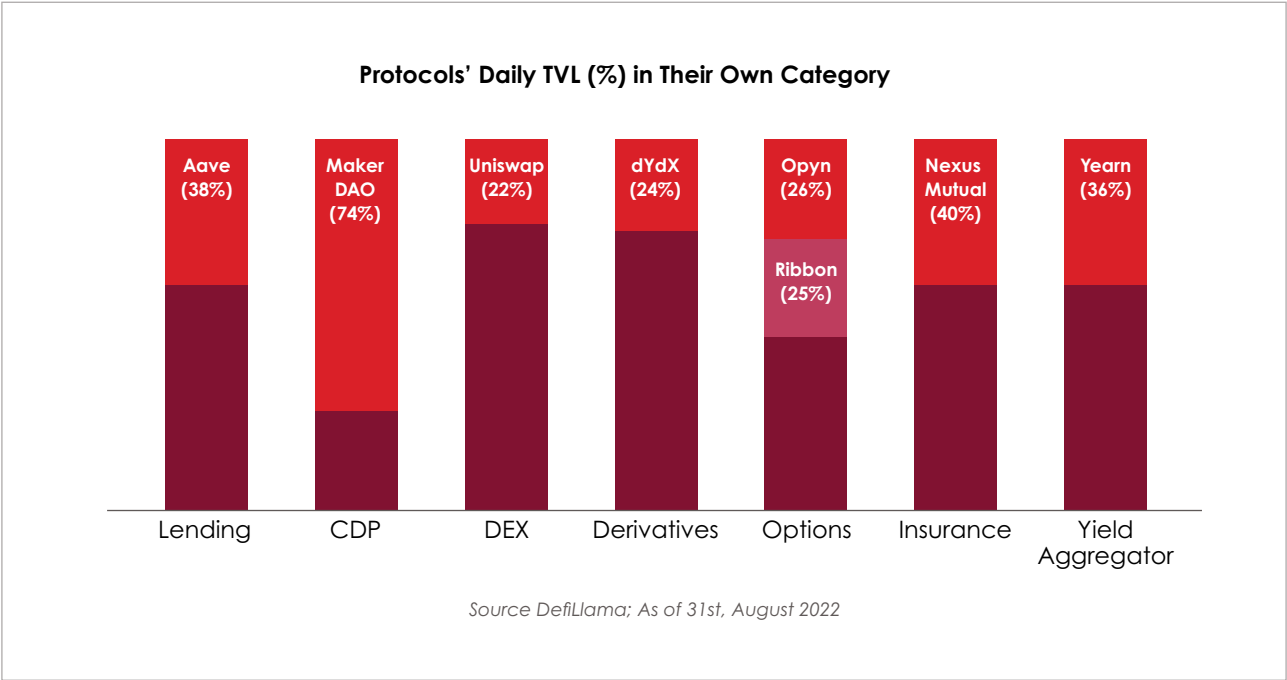
Yearn (Yield Aggregator)

- Yearn allows investors to deposit their capital/assets into its vault (Yearn vault), which then runs an automated trading/investing strategy to earn returns for these investors

- It automatically moves users' funds between various DeFi protocols to maximize the yields they could earn for investors
  - Hence, it is also called a yield aggregator

Ribbon (Options Vaults)

- One of the most popular DeFi Options Vaults (built on Opyn)

- Similar to Yearn, users deposit their assets into Ribbon's vaults (called Theta Vaults) which then run option selling strategies
  - These vaults generate yields for users by earning the premium of the options they sell

- Option selling is run automatically; Ribbon's algorithm determines all the options parameters (e.g., the strike price, expiry date, etc.) for the users
  - Common retail investors are not familiar with option selling strategies and might not have the expertise to do so
  - It claims to "democratize" trading strategies used by institutional investors that retail investors might not have access to in TradFi

Figure 6: Dominance of the Eight Protocols Highlighted

Protocols' Daily TVL (%) in Their Own Category

Aave (38%) — Lending
Maker DAO (74%) — CDP
Uniswap (22%) — DEX
dYdX (24%) — Derivatives
Opyn (26%) / Ribbon (25%) — Options
Nexus Mutual (40%) — Insurance
Yearn (36%) — Yield Aggregator

Source DefiLlama; As of 31st, August 2022

Potential Opportunities for Financial Institutions

Many enthusiasts and crypto natives believed in and argued for a future where DeFi could completely replace centralized finance (CeFi) and traditional financial services. But DeFi's current nascent development could possibly make any conclusive judgment now seem premature. This is especially the case since being decentralized or not is not as binary as it might seem on the surface.

Most current DeFi protocols are, to a certain extent, still centralized, e.g., they have centralized development teams (especially at the initial stage of their launch), voting power of some DAOs is concentrated in the hands of founders, development teams, and early investors, etc. Decentralization is actually a spectrum rather than being so black and white.

Besides, DeFi also needs centralization to develop and grow. For example, most DeFi protocols need centralized servers to host their graphical images and interaction codes so users can interact with the application/smart contracts instead of directly with the blockchain.

In the foreseeable future, instead of being an existential threat, an increasing integration of DeFi with the conventional financial system could also be beneficial to the traditional financial markets.

DeFi could be a testing ground for DLT, which financial institutions could adopt to improve efficiency and lower transaction costs. CBDCs (Central Bank Backed Digital Currencies) that are now being tested and experimented with by various countries is a prime example of how DeFi could positively impact our traditional, centralized financial system.

Discussions and dialogues with various industry contacts and stakeholders (refer to the "Methodology & Sources" section for more details) **were further conducted** in order to probe and extrapolate how financial institutions could leverage the opportunities presented by DeFi.

The following are the four key areas in which many of the industry experts see great potential based on the conversations.

Settlements

- Current settlement mechanisms in TradFi are inefficient due to the presence of multiple intermediaries and central counterparties to guarantee the transactions

- DLT and DeFi's tech stack have matured over the years since its inception in 2017

- Financial institutions could adopt DLT (permissioned instead of permissionless in this case) to help reduce the number of central counterparties and intermediaries

- It could automate the process and settle the transaction instantaneously with ßsmart contracts

- Such adoption could be especially beneficial for cross-broader transactions where central banks around the world are now actively exploring (together with their own CBDCs)

> "…Our current financial system has trust issues, so we need all these intermediaries and clearing houses to guarantee settlements, making it extremely inefficient and expensive… Imagine how much faster and cheaper it would be if financial institutions around the world would use smart contracts to automate the transactions and settlements…
>
> **Parter, Global Fintech VC Firm**

Real World Assets

- Real World Assets (RWAs) protocols help bring yields from off-chain assets in the physical world (e.g., real estate, invoices, trade receivables, etc.) on-chain

- RWAs are gaining popularity as they could offer more sustainable yields and help bring stability to DeFi

- Traditional financial institutions could tap into this space by helping protocols bring borrowers on chain (screening, approving, and whitelisting them)
  - Similar to what rating agencies do for companies that are planning to issue bonds/debt

- Currently, certain RWAs protocols (e.g., Goldfinch) rely on participants to audit and approve borrowers by rewarding them with tokens
  - Partnership with financial institutions to onboard approved borrowers could be much more efficient and trustworthy given the trust and the brand name of these financial institutions

> " The hype about DeFi was its high yields, mostly as a result of yield circulation. This isn't going to be sustainable, and it would kill the whole sector if the yields just come crashing down… it needs real, sustainable yields from real worlds assets to further develop and grow…
>
> **Head of BD, Web 3.0 Advisory Firm**

Insurance

- Currently, most insurance protection/coverage offered by DeFi protocols is to protect users against the risk of being hacked and losing their digital assets

- It is a natural development and an extension for DeFi protocols to offer insurance coverage which would include risks in the physical world, given the thesis of DeFi's further integration

- This could present a massive opportunity for insurers to leverage DLT in their underwriting
    - Insurance companies could also partner with DeFi protocols to co-develop products by leveraging their expertise in pricing "real-world risks"
    - They could even provide reinsurance coverage (on-chain) for these products

> "
> There were a lot of talks about using blockchain to do underwriting back in 2016-2017 during the hype of ICOs, which created many unsuccessful projects. Some insurers got burnt and completely dismissed the whole space. I think insurers should take another deep look at DeFi now since the tech as matured a lot over the years...
>
> **Head of Partnership,
> International Direct Insurance Company**

Institutional Custody

- DeFi's non-custodial nature could present serious challenges for institutional investors and prevent them from actively participating in this space
    - Institutional investors need centralized and secure custody services

- Some boutique banks and centralized crypto exchanges have been proactively pitching their institutional custody services
    - BlackRock just announced to partner with Coinbase at the beginning of August to offer crypto trading and custody to its clients
    - But, most large financial institutions are still lagging in this regard

- One of the major investment themes by banks and other financial institutions has been custody solutions

Key Takeaway

DeFi and TradFi could complement and benefit from each other. Although many of the areas highlighted above are still high-level and might need to undergo more detailed feasibility studies, given the speed of development and innovations, we believe major breakthroughs could come in the next 5–7 years.

The following few years are of utmost importance for financial institutions that seek to capitalize on DeFI's innovations.

Regulations

Key Challenges in Regulating DeFi

Regulators have mostly been trying to regulate DeFi based on existing regulatory frameworks, which are designed for a system with financial intermediaries at its core. As a result, such regulatory approach might be incompatible with some of the (novel) characteristics of DeFi.

The fact that DeFi has no single regulatory and supervisory access points makes it even more challenging to be regulated. It is difficult for regulators to identify decision-making entities/actors that can be held accountable, due to DeFi's decentralized nature and its community-driven governance.

DeFi networks and operations are global, with no defined jurisdiction and geographical location for their operations. This further increases jurisdictional uncertainty and enforcement challenges for regulators since DeFi service providers can easily change their locations.

> "…It's like playing whac-a-mole…I just think we might need a more holistic approach targeting the whole space instead of piecing it into different elements to fit into our existing regulatory framework…
>
> **Manager, Financial Regulator**

Regulators' Key Concerns in DeFi

The following are the key concerns regulators could have in the face of DeFi:

1. **Potential risks of spillovers from DeFi to major financial markets and the real economy**

   - Although DeFi's market size is still small given the nascent development, its growth has been significant with increasing interest from both retail and institutional investors

2. **Regulators and supervisors may be exposed to reputational risks if consumers lose money on DeFi and (wrongly) assume they have protection**

   - DeFi token prices have been highly volatile
     - This begs the question of whether it is a suitable investment, especially for retail investors
   - Although many argue that DeFi protocols are safe given their usually high collateralization ratio required, the collateralization ratio will likely drop in the future as the protocols become more capital efficient which could lead to potentially high leverage

3. **Pseudonymity and the lack of AML/CFT requirements for some DeFi protocols could give rise to the risks of money laundering, terrorism financing, and other misconduct**

   - Participation in DeFi platforms only requires connection to a wallet; many of which do not have KYC or other AML/CFT controls in place

4. **Potential regulatory arbitrage between jurisdictions**

   - Lack of a global regulatory and supervisory body to coordinate and regulate a sector/market as global as DeFi
   - One example is the International Organization of Securities Commissions (IOSCO) which is an international body with securities regulators from >130 jurisdictions as its members
     - It targets to promote and set global, consistent standards for the oversight of the securities markets
   - IOSCO just set up a Fintech Task Force at the beginning of the year to look into crypto and digital assets policy recommendations (to be announced in Q4 2023)

Current Regulations in Key Countries

Most countries regulate the broader cryptocurrencies and virtual assets service providers (VASP) without specifically targeting the DeFi space. As such, regulations vary by country (with different approaches) and are difficult to keep track of for both investors and participants.

Below, we have summarized the current regulations in the US, EU, and Singapore to showcase this complexity.

US[1]

- No consistent crypto regulations at the state level

- Crypto exchanges are regulated by the Bank Secrecy Act (BSA). They need to register with FinCEN (Financial Crimes Enforcement Network) and implement AML/CFT programs

- FinCEN suggested imposing data collection requirements on crypto exchanges and wallets in 2020
  - It requires exchanges to submit suspicious activity reports for transactions over $10,000 and require wallet owners' identification when sending over $3,000 in a single transaction
  - It also made clear that AML obligations would extend to DeFi protocols

- Howey Test is used to determine if certain tokens are securities
  - The SEC has made clear that cryptocurrencies which are considered securities should be offered and sold in compliance with the securities laws
  - The SEC stated that BTC and ETH are not securities under the Howey Test, but their status could also change over time depending on the unique circumstances

- As part of its enforcement mechanism, the SEC has targeted founders and project teams behind certain DeFi protocols
  - The SEC accused EtherDelta's founder of running an unregistered exchange in 2018
  - Last year, it also started an investigation targeting Uniswap Labs

Note: [1]As of the end of August 2022

EU[1]

- Crypto exchanges in the EU are under the scrutiny of the European Banking Authority (EBA), European Commission (EC), European Central Bank (ECB), European Insurance & Pension (EIOPA), and European Supervisory Authority for Securities (ESMA)

- A provisional agreement on the MiCA (Markets in Crypto Assets) proposal was reached in June this year which gives rise to a specific regulatory framework on crypto assets at the EU level
  - The proposal covers all crypto-asset service providers, from the issuers of stablecoins to trading venues and wallets where crypto assets are held
  - Crypto-asset service providers will need authorization to operate within the EU and will become liable in case they lose investors' crypto-assets
  - Stablecoin issuers will need to build up a sufficiently liquid reserve, with a 1/1 ratio and partly in the form of deposits
  - Stablecoins will be supervised by the European Banking Authority (EBA), with the presence of the issuer in the EU being a precondition for any issuance

Singapore[1]

- Tends to apply existing laws and frameworks to cryptocurrencies

- Payment Services Act (PSA) determined that the exchanges and other related cryptocurrency businesses will be regulated by the MAS starting from 2020
  - All cryptocurrency businesses in Singapore need to obtain operating licenses from the MAS

- The MAS has, over the years, warned that cryptocurrencies are not suitable investments for the retail public
  - It further issued guidelines this year restricting the marketing and advertising of crypto services in public areas

- The MAS has clearly stated recently that while it supports the development and innovations of the digital assets industry, it strongly discourages the speculation of cryptocurrencies (especially for retail investors)

Note: [1]As of the end of August 2022

> "...cryptocurrencies serve a useful function within a blockchain network...But outside a blockchain network, cryptocurrencies service no useful function except as a vehicle for speculation..."
>
> **Ravi Menon, Managing Director, MAS**

Suggested Approaches Identified from Our Research

Applying existing financial services regulations to DeFi might not be sufficient, given the evolving characteristics of DeFi. It requires a rethink on how to adapt the current regulatory framework to a decentralized environment. For example, **more emphasis needs to be put on activity-based regulations** as opposed to entity-based ones.

The following three approaches have often been suggested to enhance the current regulatory framework:

1. **Gatekeeper approach: regulating the entry and exit points to DeFi**

   - Currently, centralized exchanges (with their on/off-ramps) are the most easily identified gatekeepers to DeFi, and have been suggested as the checkpoints for regulating and supervising DeFi

   - The drawback of this approach is that it might ignore the activities that are taking place within DeFi

2. **Targeting the project team behind the specific DeFi applications and protocols**

   - Smart contracts in DeFi are basically replacing regulated intermediaries in TradFi

   - Smart contracts are just software developed by people. Hence, regulating the people/teams that develop the software is another approach

   - The SEC has targeted DeFi protocols' founders and development teams before, but more as one-off enforcement efforts without making it upfront and crystal clear that people behind these protocols are subject to regulatory scrutiny

3. Embedded supervision using DLT

- A technological solution that could enable supervisors to automatically monitor compliance with the regulatory framework by reading blockchain transaction data

- This, therefore, reduces the need for market participants to actively collect, verify, and deliver data to supervisory authorities

- The feasibility of this approach is still being studied as it requires more technological know-how and development

Key Takeaway

Many countries are regulating DeFi by using existing regulatory frameworks, which are based on a system with financial intermediaries at its core. It requires a rethink on how the framework could be more activity-based as opposed to entity-based.

Although the current regulatory framework could be enhanced/updated, the goal is never to suppress innovations but to provide guidance, prevent bad actors from exploiting the new system, and ensure user and consumer protection while participating in this new space.

Conclusion

Decentralized finance is much more than just trading tokens or speculating on their price actions, which should never be the primary focus.

Instead, the technologies that have underpinned the strong growth in DeFi and their potential applications to our current financial system should warrant a lot more attention as their integration could bring significant benefits to our daily lives.

Through our dialogue with various industry experts, four major areas of opportunities that financial institutions could focus and capitalize on were highlighted. Some of the ideas might still be preliminary and require more vigorous feasibility studies. But, given the speed of development and innovations witnessed, major breakthroughs could come in the next 5–7 years or even earlier.

Decentralized finance is here to stay, whether one likes it or not. Instead of simply dismissing it as another "Tulip Mania" in the making, financial institutions should proactively seek to leverage potential opportunities arising from DeFi and cooperate with the industry to see how their technologies could be applied to enhance the current system.

Regulating the space using the existing regulatory framework is challenging, given DeFi's novel features. An enhanced framework is needed to supervise this space. But, the goal of the oversight is not to suppress innovations but to provide guidance and ensure consumer protection for users participating in this new space.

Methodology & Sources

We conducted a combination of primary and secondary research for this report.

For the primary research, we have spoken to the following industry contacts (not including the ones we already quoted in the report):

- Ethan Tong (Co-founder, Aspen Digital)

- Feiko Lai (Co-founder, Rebase Ventures)

- Fern Wang (Director, Financial Services, S&P Global Ratings)

- Gary Wong (Co-founder, Rebase Ventures)

- Jacob Cheng (Senior Investment Analyst, Macquarie Group)

- Lichen Song (Head of Quant, Akuna Capital)

For the secondary research, we relied on the following research papers, websites, forums, etc.:

- DefiLlama

- Finematics

- European Financial Stability and Integration Review 2022 (European Commission)

- Why Decentralised Finance (DeFi) Matters and the Policy Implications (OECD)

- MAS Greenshoots Seminar

- Point Zero Forum

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