A Short Survey on Business Models of Decentralized Finance (DeFi) Protocols

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Abstract. Decentralized Finance (DeFi) services are moving traditional financial operations to the Internet of Value (IOV) by exploiting smart contracts, distributed ledgers, and clever heterogeneous transactions among different protocols. The exponential increase of the Total Value Locked (TVL) in DeFi foreshadows a bright future for automated money transfers in a plethora of services. In this short survey paper, we describe the business model for different DeFi domains - namely, Protocols for Loanable Funds (PLFs), Decentralized Exchanges (DEXs), and Yield Aggregators. We claim that the current state of the literature is still unclear how to value thousands of different competitors (tokens) in DeFi. With this work, we abstract the general business model for different DeFi domains and compare them. Finally, we provide open research challenges that will involve heterogeneous domains such as economics, finance, and computer science.

Keywords: Decentralized Finance · Value Investing · Blockchain

1 Introduction

Decentralized Finance (DeFi) aims to provide financial services on a blockchain-based infrastructure. A plethora of cryptocurrencies form the DeFi ecosystem. These tokens are able to replicate classical financial services, such as lending/borrowing, without any central institution, by exploiting smart contracts and the immutable ledger. In the literature \textsuperscript{11,12}, DeFi’s key features are generally recognized to be open to anyone, transparent, non-custodial, and composable, i.e. financial services can be arbitrarily composed to make new financial products. The Total Value Locked (TVL)\textsuperscript{3} has seen exponential growth with the so-called “DeFi Summer”. The TVL grew from $600m by the end of March 2020 to $11bn by the end of September 2020 \textsuperscript{3}. At the time of writing\textsuperscript{4} DeFi TVL is around $98bn. Similarly, from March 2020 to the time of writing, the top-100 DeFi tokens’ market cap grew by almost hundred times - from $1.8bn to $154bn.

\textsuperscript{3} The sum of all assets deposited in DeFi protocols, and therefore locked in a smart contract.

\textsuperscript{4} 2021-10-31, https://defipulse.com/
We show, in Figure 1, the top Ethereum DeFi tokens’ daily revenue over time, smoothed by a rolling window of 30 days, for each DeFi financial service, i.e. Uniswap (UNI) for DEXs, Yearn Finance (YFI) for Yield Aggregators, and AAVE for PLFs. These recent DeFi milestones foreshadow a bright future for both DeFi’s users and investors.

Fig. 1. The figure shows the top DeFi’s protocols by revenue for each financial service. On the left, Figure 1a shows UNI daily revenue across time, smoothed by a rolling window of 30 days. Uniswap is currently the biggest DeFi protocol by daily revenue. Its treasury has more than $9bn in assets. Similarly, Figure 1b and Figure 1c show, respectively, YFI and AAVE daily revenue, smoothed by a rolling window of 30 days. We can clearly see how these protocols have built a steady and reliable cash flow in less than one year. UNI and AAVE data are retrieved from CryptoFees API, while YFI data is retrieved from YFI stats.

To date, there is a lack of literature that offers any clear abstraction on how DeFi protocols generate their revenue stream, a key component for the sustainability of a project. We claim that it is important for both investors and users to understand how DeFi’s tokens profit. From an investor’s perspective, a clear business model with a steady and constant revenue stream are key features before investing in the underlying project. As an end user, DeFi’s users look for reliable protocols; hence, a protocol with an efficient and observable business model is likely to be a “secure” protocol. Therefore, the central contribution of this short survey paper is to describe and offer a clean comparison of different DeFi services business models. In this work, we will look into the main DeFi financial services namely: Protocols for Loanable Funds (PLFs), Decentralized Exchanges (DEXs), and Yield Aggregators. We won’t analyze the variety of protocols in technical detail, but rather we will direct the reader to other resources. The focus of this work is mainly on the protocols’ business model. The paper is structured as follows. First, we describe the general PLFs business model in Section 2. Subsequently, we explain the dominant cash flows within DEXs and Yield Aggregators in Section 3 and 4. In Section 6, we present a first generalized business model in DeFi. Finally, we provide a literature review and conclude the work with Section 6 and 7.
2 Protocols for Loanable Funds (PLF)

PLFs let users borrow/lend digital assets in a decentralized fashion. Automated smart contracts behave as middle-men. They lock assets deposited by the lender and allow borrowers to get liquidity in exchange for collateral. These types of smart contracts are also called Lending Pools [8]. These Lending Pools typically lock a pair of tokens, a loanable token, and a collateral token. By providing liquidity, lenders gain interest rates depending on the supply & demand. Because there is no guarantee of paying back, Borrowers must over-collateralize their position. On top of that, when returning the amount borrowed, the borrowers must pay an interest rate that is split pro-rata among the lenders and the governance token. Moreover, when borrowers get liquidated, they will have to pay an additional fee. We show in Figure 2 a typical generalized PLF use case.

![Figure 2](image)

**Fig. 2.** The figure above abstracts and generalizes the lending protocol framework by showing the main actors and interactions. From left to right, Lenders can deposit their crypto-assets, Ethereum in this case, to gain additional profits. They receive a PLFs wrapped token or IOU as proof of their deposit. In the center, the smart contract acts as a middle-man. It takes care of the deposited assets, loans, and liquidations - if any. On the right, a borrower must deposit collateral before getting the loan. Finally, at the end of the loan, the borrower will have to return the borrowed amount plus an interest rate, part of this interest rate will split pro-rata among all lenders, and the rest will generate revenue for the PLF itself.

**Business Model** - PLFs cash flow depends on the interest rate model, the current underlying demand & supply, and the total amount borrowed. The interest rate model can be either a linear model, a non-linear model, or a kinked model [10]. Demand & supply increases the interest rate when demand is high, and supply is low; vice versa, interest decreases. Given the rate of interest, the PLF gets a percentage of it. For example, Compound takes 10% of the interest
Besides traditional over-collateralized loans, PLFs offer flash loans\footnote{Flash Loans are a special type of loan where the borrower must return the borrowed amount plus interest in the same transaction without the need for collateral. An in-depth explanation, analysis, and exploitation can be found in \cite{9}.} that can bring more revenues to the protocol. Flash loans interest rate is usually fixed, e.g. AAVE \cite{12}, or even without fees, e.g. dYdX \cite{13}.

3 Decentralized Exchanges

DEXs take distance from the classical order-book exchanges where traders match market bids and/or asks. Again, smart contracts are the middle-men and, in this case, are called Liquidity Pools. Investors or, in this scenario, Liquidity Providers (LPs) can deposit a pair of equal worth tokens, say ETH/DAI as shown in Figure 3 into these Liquidity Pools. In exchange, they will receive LP tokens as proof for their deposit and earn a percentage of the fee accrued to the Buyer when swapping. A price is assigned for each token given the protocol’s price function - usually determined by the constant rate formula \cite{14}. The Buyer that is willing to exchange - or “swap” - DAI for some ETH will deposit DAI in the Liquidity Pool, plus some interest, and receive ETH. The whole mechanism is called Automatic Market Making (AMM). Further reading on the topic can be found in \cite{15} \cite{16}. We show in Figure 3 a typical generalized DEX use case.

\textbf{Fig. 3.} The figure above abstracts and generalizes DEXs protocols framework by showing the main actors’ interactions and the protocol revenue stream. From left to right, LPs deposit a pair of tokens, in this example DAI/ETH, in the Liquidity Pool. In exchange, they receive LP tokens as proof of their deposit. In the middle, a smart contract takes care of locked assets, new deposits, swaps, and fees. The Buyer, willing to exchange his DAI for some ETH, will have to pay a fee. This fee will be partially distributed pro-rata among all LPs, while the DEX treasury will collect a percentage of it.
**Business Model** - When Buyers swap, they pay a fee. This fee is split pro-rata between the liquidity providers of the pool as a reward for their contribution to the pool. A percentage of the interest rate is sent to the protocol’s treasury. This share of the fee represents the primary income resource for most of AMMs, such as Uniswap or Balancer that have variable swap fees \[17\] \[18\], or Bancor that has a fixed interest rate \[19\]. To date, Uniswap has the biggest treasury in DeFi with $9bn locked in its treasury \[20\].

### 4 Yield Aggregators

Yield Aggregators combine different strategies to maximize investors’ rate of return. Similar to PLFs and DEXs protocols, smart contracts have a central role. Commonly, smart contracts are referred to as “Vaults” in this domain. In this scenario, shown in Figure 4, investors deposit their savings into a Vault. Different Vaults run different strategies. These strategies can be straightforward, such as finding the best lending protocol interest rate, or more complex, as borrowing assets and leveraging some other position by exploiting different protocols (Compound, Uniswap, Aave, to cite some), for example. There are a plethora of solutions. To have a more in-depth technical insight refer to \[21\].

![Fig. 4. This figure shows a typical yield aggregator use case. Starting from the top left, the Investor chooses his Vault of preference to deposit his savings. The Vault, a smart contract, will run its pre-set strategy; simple staking, lending, or providing liquidity are just examples. More complex strategies combine borrowing and/or leveraging involving multiple steps and protocols. The yETH vault is an example of a multiple-step strategy \[22\]. Usually, Vaults apply a fixed performance fee on the strategy yield.](image)

**Business Model** - Yield Aggregators cash flow is based on their Vaults performance. That is, yield aggregators charge a commission fee on the strategy’s
profit. Hence, the investor yield will be equivalent to the Vault’s total profit minus the protocol’s fee. Different tokens apply different interest rates: Yearn Finance v2 applies 20% as performance fee and an additional 2% as management fee \[23\]. Pickle Finance and Idle have 20% and 10% performances fees respectively \[24\] \[25\]. Harvest is the only yield aggregator that applies 30% of fees but uses the whole reward to buy back FARM tokens (Harvest native tokens) from DEXs and re-distribute them to FARM stakers \[26\].

5 DeFi Business Model

We now synthesize the business models reported and give a first general DeFi business model framework. This framework involves different actors and actions with their naming conventions.

![DeFi common mechanism and revenue strategy.](image)

**Fig. 5.** DeFi common mechanism and revenue strategy.

| DeFi Protocol | Smart Contract | Investor | User | Financial Service |
|---------------|----------------|----------|------|-------------------|
| PLFs          | Lending Pool   | Lender   | Borrower | Loan           |
| DEXs          | Liquidity Pool | Liquidity Provider | Buyer/Trader | Exchange |
| Yield Aggregators | Vault | Vault User | - | Asset Management |

**Table 1.** An overview of DeFi’s naming taxonomy.

DeFi Protocol with multiple facets - Lending, AMM, or Yield Aggregator - provides open, non-custodial, permissionless, and composable financial services in exchange for a small fee. The fee is accrued to any asset movement, for example, borrowing assets, swapping assets, or movements that yield profits.
**Investor** this actor is willing to hold the underlying protocol risk, such as protocol misbehavior, impermanent loss, or rug-pulls, in exchange for a passive income. The Investor mainly deposits his assets and provides liquidity to the financial service. Usually, this figure has a passive role: He waits until the return rate satisfies the risk held. The Investor is also known as Lender, Liquidity Provider, or Vault User.

**User** Different from the Investor, the User usually exploits the protocol on the fly, and he never waits for any long-term response. This actor moves asset - borrowing or swapping -, and thus pays interest rates to the protocol. This figure has an active role - he uses the protocol, and he expects an immediate response. The User is also known as Borrower, Buyer, or Trader.

**Financial Service** a smart contract that lets the Investor and the User interact indirectly. This actor is the core of the whole protocol: Locks the Investor assets, satisfies the User requests, and prevents protocol’s misuse. Furthermore, it can behave as a User by leveraging other DeFi Protocols. Finally, it delivers yields and earnings to the Investor and DeFi Protocol. The smart contract in DeFi is usually known as Lending Pool, Liquidity Pool, and Vault. In the latter form, the smart contracts move assets to yield interest, thus paying some interest to the protocol.

DeFi's services don’t come for free. As we have seen, DeFi multiplies how investors can yield passive income. However, this additional interest is somehow "taxed" by the DeFi protocol. On the other side, the users are willing to use the platform in exchange for a small fee. Hence, the DeFi protocol has a small income from both sides. In classical finance, this market and business model is known as the "Two-Sided Markets," first formalized by Jean-Charles Rochet and Jean Tirole in [27]. Undeniably, the service couldn’t exist without both parties. On one side, the investor provides liquidity to the financial service that peer users can use. On the other side, by paying fees, the user provides income to both protocols and investors.

## 6 Literature Review

Our work is strongly related to the canonical empirical asset pricing problem. Evaluating and pricing an asset is perhaps the most renowned problem in classical finance literature. There exist two cardinal analyses to value and price an asset. On the one hand, technical analysis deduces future underlying value from its history of trading, which can involve price change, trading volume, price moving average, and other historical characteristics [28]. [29] shows how 90% of chief foreign exchange dealers based in London in November 1988 exploited technical analysis for their trades. We observe here a duality between firm shares and cryptocurrencies trading. On the other hand, fundamental analysis is based on a firm’s book value (assets and liabilities), stream of dividends, current earnings, future investment opportunities, etc. [30] studies the role of dividends policies in a firm’s share evaluation. The paper shows how firm’s value can be explained
by its current earnings, the growth rate of earnings, the internal rate of return, and the market rate of return. Remarkable findings in the series of work \cite{31}, \cite{32}, and \cite{33} show how firm book value and market equity size are important to explain future company’s return. Our work focused more on fundamental analysis. Value investing \cite{34} dominated financial decisions for years. Do high-valuable tokens perform better than low-valuable cryptocurrencies? Finally, we would like to stress the parallelism among firms’ share ownership and DAO tokens. Both of them give shareholders voting power on the underlying future moves. We will address and expand on these open research challenges in the next Section 7.

7 Conclusion

In this short survey paper, we have synthesized DeFi’s main business models. We claim that it is important for DeFi’s investors and users to understand which protocol has a reliable cash flow. Moreover, the literature is missing a clear overview of the protocols’ business model to date. The main contributions of this short survey paper of our work are as follows. First, we have provided a clear understanding and explanation of the most important DeFi’s services business model. Furthermore, we have generalized and synthesized a novel general framework business model adopted by DeFi’s protocol. On top of that, the scientific community can address multiple open research challenges:

**Value Investing** In classical finance, a firm has a high value when it has a high book-to-market ratio. In the literature, it is shown that, by smartly investing in value stocks, the strategy could increase the mean return of the portfolio \cite{34}. Conducting a parallel study on crypto-assets is a straightforward application of Value Investing.

**Voting Power** How similar DAO tokens providing the same financial service with the same business model are priced differently. These tokens grant the holder voting power on the underlying protocol improvement/change. However, DAO tokens don’t have an initial value, but they acquire it by exchanging and trading. For example, how is Aave and Compound’s DAO tokens value perceived?

**Regulatory Issues** recently, the crypto-currencies ecosystem has seen big turbulence. While, China has completely banned all crypto transaction \cite{35}, India is working on plans to enforce similar regulations \cite{36}. Finally, the US is willing to regulate the market \cite{37}. We claim that the literature lacks a deep analysis that evaluates DeFi’s business models suitability with the current regulations.

DeFi’s financial services have seen massive growth since the “DeFi Summer”. While some tokens achieved a stable cash flow (shown in Figure 1), many others have been subject to cyber-security breaches. In 2021 only, the whole DeFi world has suffered almost $1bn loss due to hacks \cite{38}. The most recent hack is dated Dec. 1st, 2021. BadgerDAO, a service that allows Bitcoin to be used as collateral over different DeFis protocols, suffered a $120m loss \cite{39}. Therefore, albeit the exponential growth in DeFi’s users and revenue stream, DeFi is yet a risky
infrastructure that has to mature over time. Whether DeFi will replace or co-exist with the classical financial services and infrastructure is unclear yet, leaving us with open research challenges to unveil.

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