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A review of centralised finance (CeFi) and decentralised finance (DeFi) and its challenges to the lending market.

Abstract

In this work, we systematically analyse the differences and similarities between CeFi (Centralised Finance) and DeFi (Decentralised Finance). Financial technology is rapidly expanding, and large technology firms are advancing in credit markets. The Internet of Value (IOV), with its distributed ledger technology (DLT) as a basis, has developed new types of loan marketplaces. In this paper, we enumerate the prospects & challenges of Centralised Finance (CeFi) lending markets driven by banks and other lending institutes, as well as the benefits of DeFi lending protocols that may support resolving long-standing concerns in the conventional lending landscape. Overall, fintech and big tech credit appear to complement rather than substitute conventional forms of lending. This study provides a comprehensive analysis of the distinctions between CeFi (Centralised Finance) and DeFi (Decentralised Finance) lending. It analyses several aspects including legal considerations, economic factors, security measures, privacy concerns, and market structure. We conclude our study that convergence between centralised finance (CeFi) and decentralised finance (DeFi) can facilitate synergies in the lending market.

Keywords: Blockchain, Decentralized finance, Centralised Finance, Smart contract

JEL classification E5, E51, F30, G23, G32, O33.

1. Introduction

Lending and credit have been a component of human culture for thousands of years. The earliest loans were recorded in Mesopotamia around 5000 years ago (Freas, 2018). Lending markets have grown into several forms, such as consumer lending, student loans, mortgages, corporate debt, and government bonds. Lending is fundamentally closely linked to trust and the promise of payback. Lending money entails receiving repayment, earning interest, and lending again.

The term "credit" first appeared in English in the 1520s, as it derived from Middle French *crédit*, which originated from the Italian word "credito." Credit or Credito stem from the Latin word "creditum," which means "a loan, thing entrusted to another," i.e. a loan generated from trust or belief.

At present, one of the most significant financial activities is lending. It fosters forward-thinking business endeavours and increases economic progress. According to estimates, as of 2019, the amount of the global debt markets exceeded \$255 trillion, or around \$32,500 for every person on the planet, and exceeded three times the global yearly production (Jones, 2019).

CeFi (Centralised Finance) is similar to conventional finance, comprising regulatory compliance, centralised control, and geographic and procedural limits. CeFi relies on established financial institutions such as Banks to facilitate transactions. Trusted intermediaries control the loan procedure, including credit evaluation, cash dispatch, and repayment. Throughout this paper, we refer to conventional Finance as CeFi (Centralised Finance) because conventional Finance relies on a centralised intermediary chain. CeFi, like Bank, uses reputable financial institutions to handle financial transaction mediation.

DeFi platforms aim to decentralise the loan process and oppose CeFi institutions. In accordance with market statistics (DeFi Pulse 2022), DEXes (32%) and asset services (18%) are the next two largest categories on Ethereum, with lending and borrowing protocols holding the largest share of the market at 44% (DeFi Pulse). As of December 2021, the TVL of lending protocols is USD c.42 bn (DeFi Pulse). By means, blockchain technology offers a way to use smart contracts instead of intermediaries. Smart contracts provide transparency and minimise the need for trust in certain organisations by automatically carrying out transactions according to the contract deployer's defined parameters. Regardless of a user's demographics, DeFi platforms offer unrestricted access to financial services; yet, to reduce risk when trust fails, they often require substantial collateralization. These platforms have introduced governance tokens by democratising the decision-making process and enabling community members to suggest and vote on protocol improvements. DAOs (Decentralised Autonomous Organisations) are these groups or communities.

The reliability, effectiveness, and accessibility of financial services are under scrutiny in light of this shift from CeFi to DeFi. Though DeFi protocols bring with them the promise of further democratisation and inclusion, they also raise concerns regarding market stability, security, and regulatory compliance. Above all the technology's influence on the loan market has significantly improved recently, offering solutions to several issues in rather inefficient markets. Alternative credit scoring, collateralization, artificial intelligence and alternative data, for instance, are advancing financial inclusivity.

This paper focuses on the ways that blockchain technology and the Internet of Value are facilitating the development of more effective loan markets. Although we focus on lending to consumers, businesses, and more recently, crypto assets, the concepts covered may naturally be extended to the larger unsecured and secured lending sectors (FCA, 2021).

The remainder of this paper is organised as follows: Section 2 An overview of centralised finance (CeFi) and decentralised finance (DeFi); Section 3 Key characteristics of DeFi and CeFi Platform; Section 4 Shift in lending towards the Internet of Value (IOV); Section 5 Lending and borrowing process in DeFi and CeFi; Section 6 Convergence and Coevolution of DeFi and CeFi; Finally, Section 7 concludes with a look at potential future developments and transformations in the lending markets.

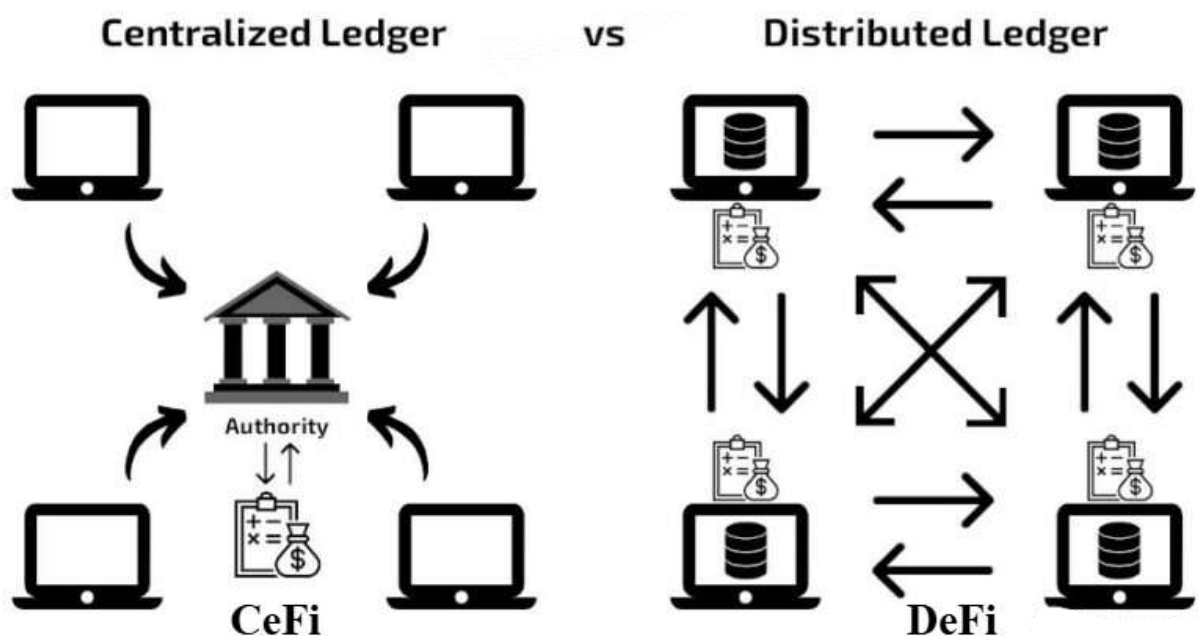
2. An overview of centralised finance (CeFi) and decentralised finance (DeFi).

The term "centralised finance" (CeFi) describes the conventional financial system in which banks, credit unions, and other financial institutions—among other centralised and regulated entities—provide financial services. This system's reliance on intermediaries to carry out services and transactions is what makes it unique. Institutions of government have established the regulatory framework that governs CeFi. CeFi uses intermediaries in its transaction process, which may lead to longer wait times and more expensive costs. Defix (2023) claims that fundamental financial services including checking and savings accounts, credit cards, loans, and investment opportunities are offered by CeFi or conventional financial institutions.

CeFi structures provide a high degree of customer protection, including deposit protection through insurance plans comparable to the FDIC in the US. They also provide a certain level of reliability and trust that has been built up over many years of business. Even though CeFi offers better customer protection and regulatory compliance (FWX, 2023), they are often criticised for their inefficiencies, higher costs, and exclusivity. Furthermore, the 2008 financial crisis shows that CeFi institutions may be prone to financial crises and economic downturns.

Centralised control, regulatory compliance, intermediation, and limited accessibility were among CeFi's distinctive characteristics. Centralised institutions that retain control over operations and user assets oversee financial transactions and services (Deloitte 2022, 6). CeFi firms must adhere to stringent regulations that are intended to protect the interests of customers and maintain the integrity of the system (Qin et al., 2021, 7). Due to their heavy reliance on intermediaries like banks, conventional financial systems are susceptible to higher expenses and transaction delays (BIS 2023, 19). Not everyone may be able to use CeFi services, especially in areas with a lacklustre banking system or for those without a formal banking link (Deloitte 2022, 6).

Figure- 1: DeFi and CeFi structure



However, the concept of "decentralised finance," or "DeFi," refers to an open-source protocol group constructed on public blockchain networks with the main objective of establishing an open, transparent, interconnected, and permissionless financial ecosystem that is accessible to everyone (Buterin,2014).

The DeFi market has grown exponentially, and several DeFi protocols are locked in trillions of dollars (Table- 1). This expansion is attributed to the creative application of

blockchain technology, which provides financial services that are typically quicker, easier to obtain, and more lucrative than those provided by conventional financial systems (Levine 2022). DeFi has considerable potential, however, it also has several challenges to face, such as fraud and smart contract attacks, scalability issues, and regulatory ambiguity. The ecosystem's early nature raises concerns regarding the ecosystem's stability and the absence of protections for customers (Saengchote et al. 2022,

Table 1 depicts the ten largest protocols in terms of TVL as of December 2021 including information about their blockchain and their protocol type (DeFi Pulse 2022).

SI	Protocol	Category	TVL [USD bn]
1	MakerDAO	Lending	16.48
2	Curve Finance	DEX	14.41
3	Convex Finance	Asset Services	11.95
4	Aave	Lending	11.01
5	Uniswap	DEX	8.29
6	Compound	Lending	7.83
7	InstaDApp	Asset Services	6.86
8	yearn. finance	Asset Services	3.84
9	Balancer	DEX	2.19
10	Sushi Swap	DEX	2.17

Unrestricted Access, Smart Contracts, Interoperability, and Transparency are some of DeFi's fundamental characteristics. Anyone with an internet connection can freely access DeFi platforms, regardless of location or status (Schär 2021). Smart contracts, which automate financial operations and take the place of intermediaries, are programmable, self-executing contracts with conditions of agreement explicitly written into code (Buterin 2014). Creating a modular and interconnected financial ecosystem DeFi applications interact and integrate with one another (Werner et al. 2022, 1). DeFi platforms provide transparent and verifiable transactions, which promote confidence in the integrity of the Platform (Werner et al., 2022).

A considerable distinction can be observed in the array of financial services and products that CeFi and DeFi offer. CeFi functions as a framework that centralises authority and depends on well-established rules and regulations, whereas DeFi uses blockchain technology to get rid of intermediaries and democratise the financial system (Schär, 2021). Moreover, DeFi provides cutting-edge solutions like liquidity pools that are unusual in conventional finance (Bartoletti et al. 2021). Xu and Vadgama (2022) state that, CeFi operates under a centralised model in which the organisation mediates financial transactions. On the other hand, DeFi differentiates by utilising blockchain technology to provide peer-to-peer (P2P) financial services regardless of a central authority (Qin et al. 2021). Geographic limitations and credit checks are two common access barriers in conventional financial systems (Qin 2021). On the other hand, DeFi platforms offer more accessible financial services to everyone with an internet connection (Deloitte 2022). Castro-Iragorri et al. (2021) argue that there is a well-established regulatory framework for CeFi, with defined guidelines and supervision procedures that lower risk and ambiguity. Yet the legislative environment around DeFi is still developing, which presents challenges for users and platforms alike with regard to security and compliance. The main sources of risk for DeFi are the volatility of digital assets and the technological flaws in smart contracts (Darlin et al., 2022; Werner et al, 2022).

3. Key characteristics of DeFi and CeFi Platform

Public Accessibility and Verifiability: Non-custodial DeFi requires publicly verifiable execution and bytecode on a blockchain, regardless of open-source application code. Unlike CeFi, DeFi allows users to inspect and verify state transitions to ensure proper execution. Such transparency provides unparalleled confidence in the evolving DeFi system.

Possession: DeFi, as opposed to CeFi, gives consumers instant access to their assets at any time of day—no need to wait for the bank to open. Yet immense power also carries a great deal of

responsibility. Unless such insurance is underwritten, users bear the majority of the technical risks (Schmidt,2021; Nexus,2020). Centralised exchanges are essentially equivalent to conventional custodians—which are very popular for storing crypto assets (Daniele & Alexander .2019).

Anonymity: DeFi has only been seen on blockchains that support smart contracts without privacy preservation. These blockchains therefore provide pseudo anonymity but not true anonymity (Fergal & Martin,2013; Corina & Irni,2017).. Blockchain addresses can be categorised and transaction data can be tracked, as demonstrated by a wealth of literature corpus (Martin & Christoph,2016; Martin et al, 2018; Sarah et al 2013; John,2015; Till & Hannes,2017; Fergal & Martin,2013; Friedhelm, 2020). The capacity to reveal address ownership to law enforcement is a feature of centralised exchanges with KYC/AML procedures, as they are often the only viable approach to shift assets between fiat money and cryptocurrency.

Automated process: Sequential activities that incorporate several financial procedures are supported by blockchain transactions. Such a combination can be made to run atomically, which implies that it either fails as a whole or executes fully with all of its operations. Although CeFi at present does not have this programmable atomicity attribute, atomicity might be enforced in CeFi through (possibly expensive and sluggish) legal agreements.

Order Execution: On permissionless blockchains, users usually disclose publicly the transactions they wish to be carried out over a P2P network. Peers can hold transaction fee bidding competitions to influence the order in which transactions are executed because there is not a persistent centralised institution in charge of doing so. It has been demonstrated that this order malleability leads to a variety of market manipulation strategies, many of which have been used on blockchains (Philip et al 2019; Kaihua et el, 2021a; Liyi et al, 2020; Liyi et al, 2021; Kaihua et al, 2021b). Stringent rules are imposed by regulatory organisations in CeFi

on financial services and institutions, such as the need to uphold transaction ordering (FIMNA,2019). This is made possible in CeFi by the financial intermediaries' centralised structure.

Transaction cost: In DeFi and blockchains generally, transaction fees are crucial to preventing spam. However, with CeFi, financial institutions have the opportunity to rely on their clients' KYC/AML verifications, which allows them to choose to offer transaction services at no cost (or are required by governments to give some services free of cost (EU,2021)).

Trading hours: CeFi marketplaces hardly ever run without interruptions. For instance, the two main American trading venues, the New York Stock Exchange and the Nasdaq Stock Exchange, are open Monday through Friday from 9:30 a.m. to 4 p.m. Eastern Time. Since blockchains are always running, the majority of DeFi marketplaces are open around the clock. Because of this, DeFi does not offer pre- or post-market trading, in contrast to CeFi, where a variety of items usually have minimal liquidity at these times.

Anonymity: A number of DeFi projects—like Pancakeswap on Binance Smart Chain and Harvest Finance on Ethereum—are created and managed by anonymous teams; the creator of Bitcoin is still unknown to this day. The DeFi smart contracts are implicitly operated by the miners once they are implemented. Without a front-end, anonymous DeFi applications may operate by having users communicate directly with the smart contract. As an alternative, a distributed storage system like IPFS may be used to serve the front-end website.

Volatility and stability: The volatility of digital assets in the DeFi platform has been noticeably higher than that of assets in the CeFi framework. For Instance, from 2018 to 2021, the average fluctuation of Ether, a significant cryptocurrency in the DeFi market, was c.73%, but the average fluctuation of the S&P 500 was just c.13%. Whereas DeFi does not have this responsibility, central banks are in charge of establishing monetary policies that guarantee price stability. As their direct or indirect exposure to cryptocurrency assets increases potential threats

to financial stability, CeFi balance sheets are becoming more and more susceptible to contagion concerns.

Smart contracts attacks: Users have reported a loss of at least 128 million USD due to smart contract vulnerabilities in DeFi (Coindex-1; Hakernoon.com; Medium.com., n.d.; Coindex-2; Rekt.com). Common vulnerabilities include integer overflows, reentrancy, and timestamp dependencies (Nicola et al., 2017). In April 2020, the lending site "Lendf. Me" had a re-entry attack, resulting in a loss of a fund of USD 25 million (Hakernoon.com). In April 2021, an adversarial profit of 57 million USD was made on the "Uranium Finance" platform due to a major smart contract coding flaw (Rekt.com).

Institutional and legal constraint: CeFi is vulnerable to financial institution incidents, while DeFi depends solely on smart contracts and eliminates the need for intermediaries. DeFi nevertheless depends significantly on centralised intermediaries like wallet providers (MetaMask, Coinbase), blockchain API providers (Infura), mining pools (SparkPool, Ethermine), and oracles. In addition to the hazards of downtime and coding vulnerabilities, it's vital to consider that these intermediaries are sometimes managed by actual firms that may be forced to close in compliance with local laws and regulations (Barbaschow, 2021).

Regulation: There is a great deal of legal ambiguity in the DeFi market as there are still many unsolved legal and regulatory issues. It was briefly indicated above that DeFi regulatory measures cannot be immediately applied to CeFi. The intricate regulatory structures governing the CeFi framework have developed over time, with the main goals being the protection of creditors and investors as well as the lowering of systemic and liquidity risks.

Customer protection: The DeFi platform has a risk of fraud and hacks, which emphasises the necessity of consumer protection. In the DeFi platform, regulation compliance is now attained only technically; there is no central oversight body. Scams like the Enron and Wirecard

scandals have happened, however, in the CeFi, national and international bodies carry out regulatory duties and step in to guarantee security for customers when appropriate.

Inclusivity: DeFi's fundamental tenet is that its financial services and products are freely accessible to everybody with an internet connection. On the other hand, banks and other financial organisations manage who has access to their financial goods and services in CeFi. People who have limited or no access are referred to as underbanked and excluded from financial services.

4. DeFi and CeFi platform

4.1 DeFi Platform

4.1.1 MakerDAI

The Maker framework is powered by DAI, a stablecoin whose value is soft-pegged to the USD. Users must first secure their collateral with the Maker collateral vault smart contract to borrow DAI. The collateral may include one or more assets, such as ETH (Ethereum's native coin) or ERC20 tokens (digital assets). The collateral value generated by the smart contract is based on quantity and market value derived from an external data feed source (oracle). Using the Maker landing platform, the borrower might use the smart contract to seek a smaller DAI than a preset fraction of the collateral value. The liquidation procedure in MarkerDAO is as follows: (i) The threshold fraction decides whether collateral is liquidated. (ii) To avoid having their collateral liquidated due to a little price decline, borrowers should aim for a DAI issuance amount slightly below than the threshold. (iii) MarkerDAO does not use a margin call mechanism unlike standard margin trading platforms. (iv) In the event of a major price fall, borrowers must either provide more collateral or refund their DAI loan. (v) If a borrower's debt-to-value ratio reaches the liquidation level, other network members can bid on their collateral by returning a portion of the loan, so liquidating their position. To redeem collateral from the vault, the borrower must refund their DAI loan and interest, often known as the

stability charge. The stability charge increases over time, and its value changes dynamically. When the stability fee is high, the borrower is incentivized to refund some DAI, which is later burnt by the smart contract. The stability charge directs DAI's circulation supply, keeping the currency from drifting too far from its peg. DAI loans have no defined tenure and can be returned in part or in full at any time.

4.1.2 Compound

The Compound protocol enables users to produce and borrow Ethereum and ERC-20 tokens. Individuals that deposit crypto assets into the protocol's smart contract will get an equivalent cToken (e.g., aETH, cDAI) that may be traded for the deposited asset and future interest. Leshner and Hayes (2019) define a cToken as an interest-bearing token with a rising exchange rate against the deposited asset. To borrow from the protocol, users must deposit funds as collateral. In this case, the borrower must first and foremost be a depositor. The Compound protocol dynamically adjusts borrowing and lending interest rates for each asset based on deposits, locks, and borrowing amounts (Perez et al., 2021). As a consequence, the borrowed money earns interest at varying rates throughout time. The user can borrow a maximum amount of money using their collateral. The protocol's price oracle determines the market value of assets. Borrowers' collateralization percentage fluctuates due to price changes and interest accruals on borrowed and collateralized assets. Borrowers should overcollateralize their loan position to keep other network members from liquidating the collateral, even if the loan term is not mentioned.

4.1.3 Aave

The Aave protocol (formerly known as "ETHLend") allows liquidity providers to deposit funds in a smart contract and get an aToken (e.g., aETH, aDAI) as a deposit certificate. The aToken is an interest-bearing token that has a fixed value determined by the deposited asset. For example, a user who invests 12 ETH will receive 12 aETH as proof of deposit. According to Aave (www.aave.com, 2020), the balance of aETH increases over time as interest

is paid on the deposit. Token holders can redeem the underlying asset at a 1:1 exchange rate by submitting their token to the smart contract and receiving an equivalent quantity of the asset back. Aave users' borrow positions, such as Compound, require collateral and are exposed to liquidation risk if not adequately collateralized. Aave enables borrowers to use deposited assets as security while switching between variable and fixed interest rates at any time. Aave also allows "flash loans". According to Wolff (2018), flash loans enable customers to borrow and return monies in a single transaction without requiring security. Flash loans are frequently used for arbitrage opportunities and to liquidate under-collateralized borrow positions on lending platforms.

4.2 CeFi Platform

4.2.1 Nexo

Nexo is Credissimo's subsidiary, established in 2007. The Nexo platform launched in 2018. Nexo has paid over \$500 million in interest, has over 6 million users in over 200 countries, and supports more than 60 cryptocurrencies. Nexo provides loans and borrowing, as well as a cryptocurrency credit card. Nexo also has its own native token, NEXO. Starting with loan, Nexo offers some of the highest rates for practically all tokens, outperforming the majority of the competitors in terms of ROI. However, let us not forget what happened to prior platforms that provided unsustainable high returns. In the event that choose a set period and get paid in Nexo tokens, anyone may earn up to 8% on your Bitcoin and Ether investments. Other interest rates are rather high, with DOT reaching up to 15%, and assets such as AVAX and MATIC offering holders limited-time enhanced rates of 17% and 20%, respectively. The rates for stablecoins may reach 16%, but Nexo stands out since it also allows you to lend fiat money. Currently, you may lend USD, EUR, and GBP at the same rates as stablecoins. What distinguishes the Nexo CeFi platform is that interest is paid daily, whilst other platforms pay weekly.

Nexo has emerged as the most popular and commonly utilised loan platform on the market, and with good reason. After competitors Celsius and BlockFi had liquidity concerns, Nexo shown itself to be the more secure, stable, and sustainable platform, while still offering some of the greatest prices and features in the business.

4.2.2 Crypto.com

Crypto.com has become a go-to portal for individuals with a variety of cryptocurrency demands. This powerful platform covers nearly everything crypto-related, including trading, an NFT marketplace, a self-custodial DeFi wallet, their own blockchain network, one of the most popular crypto cards, an appealing Earn programme, and, of course, crypto loans. Users on Crypto.com may earn up to 12.5% APY on their cryptocurrency holdings through the Earn programme, as well as take out crypto-collateralized loans of up to 50% LTV. Interest rates will be strongly influenced by how many of the platform's CRO tokens a user bets and the TVL chosen. Crypto.com users may repay their loans on their own schedule and deposit 20+ crypto assets as collateral, borrowing PAX, TUSD, USDC, or USDT with no credit checks, statement deadlines, or late penalties. In terms of the Earn programme, Crypto.com users may earn passive income on 37+ crypto assets, making it one of the greatest earn programmes accessible, with up to 6.5% per year on USDC stablecoin and some of the highest yields on several altcoins depending on how much CRO the user bets.

4.2.3 YouHolder

YouHodler was launched in 2018 and distinguishes itself by accepting a variety of currencies and offering unique features. Users of YouHodler appreciate that the platform is controlled in the European Union and Switzerland. As with the others, let us begin with loans. YouHodler provides attractive interest rates of up to 15% on most stablecoins and 4.5% on Bitcoin and Ethereum. Furthermore, they provide rates for currencies like as YFI (4.5%) and Sushi (7%). YouHodler now supports over 50 different cryptocurrencies. The interest is paid

weekly in the same currency as the deposit; nothing new here. The borrowing side is similarly quite similar to the others, with one key exception. On other services, you may borrow roughly 50% of your collateral, however YouHodler permits up to 90% and accepts all of the top 20 currencies as collateral. While some may think this is fantastic, I find it quite terrifying. That's because cryptocurrencies are incredibly volatile, and your collateral's value might rapidly collapse, leaving you with a large amount of debt in comparison to what you still have. YouHodler also has the option to submit NFTs as collateral, however this must be applied for separately.

5. Shift in lending towards the Internet of Value (IOV)

Emerging technological innovations are enhancing the lending markets. Blockchain technologies support the Internet of Value by adding a new economic layer for value exchange on top of the Internet. The Internet of Value is transforming lending through decentralised finance, or DeFi (Werner et al., 2022), which addresses long-standing difficulties with conventional loan markets. These novel solutions manifest as protocols (Gudgeon et al., 2020), which are sets of rules that dictate the functioning of a Lending market. By January 2021, the DeFi industry has reached to be worth \$44 billion based on Total Value Locked (Defiplus.com), following a surge in 2020. Decentralised lending platforms, exchanges, derivatives, payments, and assets are all examples of DeFi projects. These Internet of Value Several DeFi lending protocols have two common features: (i) they use codified collateral evaluation instead of subjective credit rating, and (ii) smart contracts to manage crypto assets (Bartoletti et al., 2021).

A smart contract is a programme on a distributed ledger, such as the Ethereum blockchain, that may automate accounting, computations, digital asset storage, and transaction execution based on specified events.

Value locked originates from what the user deposits in a protocol's smart contract(s). The locked value serves as a reserve for redeeming depositors and as collateral. Lending protocols offer *IOU tokens* to users in exchange for their deposits. IOU tokens are transferable and tradeable on exchanges and can only be used to repay deposits later. *Governance tokens* are distributed by DeFi lending platforms, allowing users to propose and vote on protocol improvements like interest rate models. Governance tokens are commonly utilised as incentives for both borrowing and lending in a platform.

MakerDao, AAVE, and Compound are the three major defi platforms. The MakerDao system focuses on DAI, a stablecoin whose value is soft pegged to the US dollar. To borrow DAI, users must first lock their collateral in the Maker collateral vault, a smart contract. Collateral might be ETH (Ethereum's native coin) or ERC20 tokens (digital assets). The collateral might consist of one or more assets. The smart contract generates collateral value depending on quantity and market price, which is obtained from an external data feed source (oracle). The borrower might seek a DAI amount less than a predefined proportion of the collateral value using the smart contract.

The Aave protocol (previously "ETHLend") allows liquidity suppliers to deposit funds in a smart contract and get an aToken (e.g., aETH, aDAI) as a deposit certificate. The aToken is an interest-bearing token with a fixed value based on the deposited asset. For example, a user who deposits 12 ETH will obtain 12 aETH as evidence of deposit. In accordance with wow@aave.com (2020), the balance of aETH rises over time as interest is paid on the deposit. Token holders can redeem the underlying asset at a 1:1 exchange rate by submitting their token to the smart contract and getting an equal quantity of the asset from the smart contract. The Compound protocol allows users to supply and borrow ETH and ERC-20 tokens. The users that deposit crypto assets into the protocol's smart contract will get an equal cToken (e.g., aETH, cDAI) that can be exchanged for the deposited asset and future interest. Leshner and Hayes

(2019) describe a cToken as an interest-bearing token with an increasing exchange rate against the deposited asset over time. While borrowing from the protocol, users must deposit funds as collateral. This means that borrowers must be depositors first and foremost. The Compound protocol automatically computes borrowing and lending interest rates for each asset based on deposit, locked, and borrowed amounts (Perez et al., 2021).

Table 2 displays the largest decentralised lending protocols by funds locked.

Protocol	Value locked (Billion USD)	IOU Token	Governance Token	Market cap (Billion USD)
Maker	9.37	DAI	MKR	3.46
Compound	11.05	cTokens	COMP	5.77
Aave	6.41	aTokens	AAVE	7.27

Table 2: Overview of the main DeFi lending mechanisms on Ethereum. Value locked is the entire sum of ETH and ERC-20 tokens held in loan pool contracts, as received from <https://defipulse.com/>. Market cap refers to the fully diluted market capitalization of the governance token and is obtained from <https://etherscan.io/>. Data are last updated on April 17, 2021.

6. Lending and borrowing process in DeFi and CeFi

In CeFi, borrowing and lending are similar to conventional financial institutions. One of the most popular types of lending is credit, which is given by a lender to a borrower (Dhir, 2023). Essentially, credit allows a borrower to buy products or services now and pay for them later. Following a loan is approved, interest is charged to the borrower at the predetermined borrowing rate that was agreed upon by both sides. The borrower must return the loan plus any accumulated interest when it's due. The risk that a borrower won't make loan repayments on schedule—that is, won't default on the debt—rests with the lender. In order to minimise this risk, a lender—such as a bank—usually bases its decision on whether to approve a loan to a borrower on the borrower's creditworthiness. Alternatively, a lender may reduce this risk by

requiring collateral, such as stocks, assets, or other types of recourse to real property. A borrower's capacity to repay debt is measured or estimated by their creditworthiness (Dhir, 2023b). In the event it's a personal loan, it's often determined using factors like income and payback history. Lenders and borrowers in CeFi can include private or governmental organisations, individuals, or financial institutions.

Conversely, in DeFi, most lending and borrowing protocols (e.g., Aave, n.d.), and Compound (MakerDAO) require over-collateralization due to the lack of a creditworthiness system and enforcement mechanisms on defaults. Whenever a borrower is compelled to furnish collateral that exceeds the outstanding loans' value, this is referred to as over-collateralization. These activities, especially popular in CeFi, are referred to as repo lending or margin lending (Peter & Hans-Joachim, 2016). In DeFi, lending and borrowing take place primarily in what are known as lending pools. In DeFi, lending and borrowing take place primarily in what are known as lending pools. A lending pool is essentially a smart contract that coordinates the assets of lenders, borrowers, and other key players (such as pricing oracles and liquidators). Usually, a lender deposits cryptocurrency into a lending pool so that it may be borrowed. Thus, a borrower contributes collateral to the lending pool and takes out a loan from it. When the lending pool lends out the collateral from borrowers, take note that borrowers also instantly become lenders. Conventional bank deposit protection (BDP) needs, which safeguard a financial institution's customer deposit account up to a specific fiat currency amount, that does not apply to assets placed by users in lending pools.

The underwriting phase is the first stage of the loan origination process. The terms and conditions (e.g., duration, interest rate, repayment, and, if necessary, collateral) of the loan agreement are often defined by the lender based on an evaluation of the borrower's risk, which often includes comprehensive KYC/AML verification. As the borrower in the DeFi platform is usually anonymous, the lender is unable to assess the amount of risk. Rather, the lender defines

the main terms of the loan arrangement and passes those terms along to the smart contract as parameters. In the DeFi framework, over-collateralization usually compensates for the absence of risk assessment. For instance, the current Aave and Compound lending protocols require a minimum collateral ratio of 120%, meaning that a borrower of USD 100 must deposit USD 120 or more in assets. Moreover, the excessive collateralization reduces the extreme volatility of cryptocurrency assets.

The distribution phase, in which the lender disburses the loan money to the borrower, is the second stage of the lending process. The distribution process in the CeFi configuration usually takes one to two business days. On the other hand, with the DeFi platform, the transfer occurs almost instantly and is solely constrained by network usage. When determining the best time for a transaction, it is often necessary to take the current transaction costs into account as well.

Throughout the servicing and monitoring phase, the borrower pays principal and interest, while the lender keeps track of the remaining debt and ensures that payments are made on time and correctly. The lender also modifies the loan amortisation schedule and interest rate by the conditions of the loan agreement. While the underlying smart contract enforces the logic and timing of payment flows, assets may be transferred automatically in the DeFi scenario without the involvement of both parties, greatly automating maintenance and monitoring. Because interest rate modifications are predetermined (e.g., based on the current value of the collateral) and automatically enforced throughout the credit arrangement, they are also fully automated.

The lender repays all of the remaining loan amount, including accumulated interest, during the final collection phase. Smart contracts in the DeFi environment make sure that payback occurs on time, in full, and without the borrower having to take any action. In CeFi,

a loan's restructuring and workout are usually the result of a borrower's default. DeFi, on the other hand, depends on automated liquidations and over-collateralization to prevent loan losses.

Flash loans are a unique lending algorithm that is exclusive to DeFi (Kaihua.2021a). That functions under the stipulation that the loan is obtained and repaid in one transaction. The transaction reverts as if it never happened if it cannot be repaid. Liquidity pools, which are large collections of money utilised for borrowing, are where the often-used funds are kept. When these funds aren't being utilised at the given moment, someone has the chance to borrow them, use them for business, and pay them back in full—quite literally, at the same time they are borrowed. Initiating and repaying a flash loan is done in a single, atomic blockchain transaction where the borrower *B* completes the following three tasks: Initially, *B* asks for assets from a lending pool for flash loans. Second, *B* is allowed to utilise the borrowed resources whatever they like. Finally, *B* reimburses the lending pool for the flash loan plus interest. The transaction atomicity property guarantees that the on-chain state stays unmodified (that is as if no flash loan was given) in the event that the borrower is unable to repay the loan by the transaction's conclusion (Sarah et al., 2020; 158Kaihua, 2021a). Thus, even if the borrowers do not provide collateral for the loan, lenders can still be certain that the borrowers will not be defaulters and unable to repay the debt.

7. Convergence and Coevolution of DeFi and CeFi

DeFi is largely dependent on the long-established conventional financial system. The value of crypto assets on DeFi is still notably measured and gauged with fiat value. Stablecoins, such as DAI, are attractive crypto assets with fiat currency backing. Therefore Central banks will remain indispensable due to DeFi's reliance on fiat currency for the foreseeable future. CeFi lending platforms like Salt, Celsius, and YouHodler bridge the gap between conventional and crypto markets. These services allow users to borrow fiat money directly (rather than fiat-pegged stablecoins), using their crypto holdings as collateral.

Registered firms manage these platforms as counterparties for both depositing and borrowing customers, these firms are also known as cryptocurrency banks.

Our analysis suggests that DeFi is an innovative addition to CeFi. DeFi protocols optimise essential CeFi functions to fit the unique qualities of blockchains. In DeFi, a new exchange mechanism known as Automated Market Maker (AMM) (Liyi, 2020) has replaced CeFi's order-book approach. An AMM is a smart contract that accepts assets from liquidity providers. Traders trade against the AMM smart contract rather than directly negotiating with liquidity providers. The AMM architecture involves fewer interactions from market makers than a CeFi order book, resulting in lower transaction costs. CeFi is adopting these advancements in turn. Centralised exchanges, like as Binance, begin to provide market-making services using an AMM model (Binance.com). We expect novel DeFi protocols, such as liquidity mining and lending pools with algorithmic interest rates, to be implemented in CeFi in the near future.

Furthermore, DeFi collapsed a lesson for Cefi, for example On March 12, 2020, the cryptocurrency market collapsed, with the ETH price dropping over 30% in 24 hours (Schmidt, 2021b). On May 19, 2021, the ETH price decreased by about 40% (Pound, 2021). CeFi markets faced comparable hardship (although with less drastic daily swings), with the Dow Jones Industrial Average dropping by 9.99% on "Black Thursday". Both CeFi and DeFi endured high stress during these incidents. Centralised exchange services were disrupted owing to an extraordinary quantity of trading operations (for example, Coinbase paused trading for nearly an hour (Aave. (n.d.-b)), and exchanges were briefly shut down after exceeding pre-determined daily movement limitations (Bloom & Franck, 2020, March 12). On Ethereum, petrol prices skyrocketed, making frequent ETH transfers more than USD 100. In February 2020, MakerDAO liquidation bots failed because of network congestion and

delayed transaction confirmation (Osato, 2020, MAY 4). While CeFi and DeFi have distinct settlement methods and user behaviours, DeFi's stress testing may offer significant insights for CeFi. CeFi uses circuit breakers to reduce asset volatility (investopedia.com). DeFi, on the other hand, appears to function fine without such disruptions. This may help CeFi better understand its limitations.

8. Conclusion

This paper presents an approach for differentiating between CeFi and DeFi platforms in particular lending markets. Despite their distinctions, both sectors are looking towards innovation, with DeFi experimenting with governance structures and CeFi using blockchain technology, we believe is to build resilient, user-friendly, and efficient financial ecosystems by bridging the gap between CeFi and DeFi audiences and learning from one another's failures. DeFi differs from CeFi in its blockchain settlement layer, which ensures non-custody, transparency, and decentralisation. However, the blockchain limits DeFi's transaction speed, confirmation delay, and privacy. Both DeFi and CeFi aim to offer high-quality lending as well as financial goods and services to customers, while also boosting the economy. In conclusion, both DeFi and CeFi have advantages and limitations that cannot be simply combined. As a result, we believe that these two separate but interwoven financial systems will coexist and benefit one another.

DeFi has rapidly grown, as has CeFi; yet this expansion has come with risks and challenges this study will help policymakers oversee these concerns. Moreover, DeFi is rapidly interacting with conventional markets; understanding this connection is crucial for effective regulation and risk management. While DeFi confronts challenges, it has several intriguing characteristics, such as decentralised lending and borrowing services. Researchers can investigate how DeFi complements or affects CeFi (conventional finance) systems.

Furthermore, DeFi has the potential to beat conventional financial systems. By researching its characteristics, hazards, and advantages, scholars can help to shape its development and adoption.

AUTHOR DECLARATION

I wish to draw the attention of the Editor to the following facts which may be considered potential conflicts of interest and significant financial contributions to this work.

- I confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. I further confirm that all have approved the order of authors listed in the manuscript.
- I confirm that I have considered protecting the associated intellectual property. with this work and that there are no impediments to publication, including the timing of publication, concerning intellectual property. In so doing I confirm that I have followed the regulations of our institutions concerning intellectual property.
- I further confirm that any aspect of the work covered in this manuscript that has involved either experimental animals or human patients has been conducted with the ethical approval of all relevant bodies and such approvals are acknowledged within the manuscript.
- I understand that the Corresponding Author is the sole contact for the Editorial process (including the Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.
- The authors declare no conflicts of interest regarding this manuscript.”
- This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors
- Data sharing not applicable – no new data generated
- I confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. I further confirm that all have approved the order of authors listed in the manuscript.
- There is no human or animal participation in this study.

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