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A review of traditional finance (TradFi) and decentralised finance (DeFi), and its challenges to the lending market.

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Abstract

In this work, we systematically analyse the differences and similarities between TradFi (Traditional Finance) and DeFi (Decentralised Finance). Financial technology is rapidly expanding, and large technology firms are making advances 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 Traditional Finance (TradFi) lending markets driven by banks and other lending institutes, as well as the opportunities of DeFi lending protocols that may support the resolution of long-standing concerns in the conventional lending landscape. Overall, fintech and big tech credit appear to complement rather than substitute the traditional forms of lending.

Keywords: *DeFi, Decentralized Finance; Financial Institution; Banking; Credit; Financing; Investment; TradFi, Traditional finance.*

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. Credit or lending & borrowing is one of the most significant financial activities in society. 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). Using cutting-edge technology, decentralised finance offers an innovative approach to the financial system. Decentralised finance systems include the decentralisation of financial assets. DeFi is a direct-to-person banking system that eliminates the requirement for intermediaries. This form of connection is also known as peer-to-peer (Schueffel, 2021). The DeFi lending marketplace has grown significantly since 2020. The Total Value Locked (TVL) in DeFi protocols exceeds $80 billion, with a more than 20-fold increase expected by 2023. Notably, DeFi rates are far higher than those given in the regular banking sector, also DeFi lending is a considerably better choice for earning passive revenue. DeFi's Total Value Locked (TVL) is approximately $42 billion (DefiLlama,2024).

Technological innovation has improved the efficiency of the financial system and allowed new financial goods and services, resulting in institutional transformation and disintermediation. Technology has been employed in finance for more than 150 years. Arner et al. (2015) identify three distinct periods, The first phase, driven by the first transatlantic cable of 1866, witnessed the steady movement in finance from analogue to digital financing. The second phase began with the introduction of automated teller machines in 1967, and the

third wave began with a widespread internet connection, which facilitated online financial transactions and banking. Technology-based finance aims to improve customer satisfaction and interaction by automating lending and borrowing processes, posing a challenge for traditional financial institutions. The emerging growth of technologies like the Internet of Value (IOV), with its distributed ledger technology (DLT) and machine learning significantly affects traditional financial systems. DeFi, which deploys protocols transparently atop a public blockchain settlement layer, has the potential to substantially challenge TradFi.

Economic analysis on lending and borrowing provides critical insights that contribute to economic stability, growth, financial inclusion, and risk mitigation, eventually leading to a more strong and resilient economy. An effective financial system is often regarded as a necessary component for developing the real economy. Financial institutions, such as banks, primarily serve as payment agents but can also engage in financial innovation. Banks may contribute to both quantity and quality by creating money, receiving bank deposits, and creating credit. There is a great deal of study and debate around liquidity, incentives and credit risk lending in the banking industry. Macroeconomic consequences of bank lending, such as credit restriction or capital limits, are frequently reflected in microdata, which focuses on individuals and firms. Furthermore, banks are less willing to lend when an asymmetry of information is high. Capital restrictions and depositor preferences have important regulatory implications for bank lending. Furthermore, a developed financial market may offer a wide range of financial products that are closely aligned with the needs of the real sector, as well as financial assets for corporate financing and economic growth. Therefore, research on lending and borrowing is crucial for financial market development, economic policy formulation and overall growth in a country.

DeFi and TradFi lending and borrowing analysis is crucial for understanding the changing financial landscape, capitalising on technology improvements, guaranteeing

regulatory compliance, fostering financial inclusion, and preserving economic stability. The decentralised finance (DeFi) field has swiftly grown into a thriving ecosystem that is generating a lot of noise within the blockchain community. Tokenized representations of traditional financial assets, the generation of borrowing capacity for stablecoins from volatile crypto assets, the provision of lending facilities based on on-chain investment strategies, and interest-yielding tokenized saving products are just a few of the investment solutions that are now available. The creation and liquidity of loan marketplaces are critical components of the DeFi ecosystem, and they are now the most attractive applications.

Both TradFi and DeFi lending have distinct advantages and disadvantages. Traditional financing provides stability, regulatory protection, and established confidence, but it may be limited and slow. DeFi lending improves accessibility, openness, and efficiency while posing regulatory and security hazards. As the financial ecosystem matures, a hybrid strategy that combines the qualities of both systems might emerge, providing more resilient and equitable financing options.

DeFi platforms have emerged to offer interest-bearing collateralized lending services, and their transaction volume has grown dramatically. However, a scant study in the extant literature compares DeFi to TradFi lending. DeFi uses blockchain technology to run smart contracts, whereas TradFi functions within the traditional financial service sector, which is supported by financial institutions. The mechanics of DeFi and TradFi are designed differently, but their ultimate purpose is to attract customers. Furthermore, to analyse the intricate process structures and operational circumstances of both credit markets, it is critical to evaluate the performance and associated features of lending services in both financial realms. 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 lending markets. The remainder of this paper is organised as follows: Section 2 An overview of traditional finance (TradFi) and decentralised finance (DeFi); Section 3 Lending institute in traditional finance (TradFi) and decentralised finance (DeFi) ; Section 4 Credit screening in traditional finance (TradFi) and decentralised finance (DeFi) ; Section 5 Interest rate dynamic on lending in DeFi and TradFi platform ; Section 6 Credit ratings on lending transform from TradFi to DeFi platform ; section 7 Evolution of Defi and Challenges to TradFi; section 8 Convergence and synergies of Defi and TradFi ; section 9 conclusion.

2. An overview of traditional finance (TradFi) and decentralised finance (DeFi).

The term TradFi describes the traditional 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 TradFi. TradFi 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 TradFi or conventional financial institutions.

TradFi 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 TradFi offers better protection for customers and regulatory compliance (FWX, 2023), they are often criticised for their inefficiencies, higher costs, and exclusivity. Furthermore, the 2008 financial crisis shows that TradFi institutions may be prone to financial crises and economic downturns.

Centralised control, regulatory compliance, intermediation, and limited accessibility were among TradFi's distinctive characteristics compared to DeFi. Centralised institutions that retain control over operations and user assets oversee financial transactions and services (Deloitte, 2022). TradFi 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). Due to their heavy reliance on intermediaries like banks, traditional financial systems are susceptible to higher expenses and transaction delays (BIS 2023). Not everyone may be able to use TradFi services, especially in areas with a lacklustre banking system or for those without a formal banking link (Deloitte 2022).

Table 1: A relative comparison of characteristics between of traditional finance (TradFi) and decentralised finance (DeFi).

Characteristic	**TradFi**	**DeFi**
Degree of automation	Low	High
Network Structure	Centralised	Decentralised
Self-custodial	No	Yes
Trustless	No	Yes
Technology importance	Low	High
Intermediary importance	High	Low
Costs of service	High	Low
Product Focus	High	Low
Single Point of Failure	Yes	No
Counterparty risk	High	Low
Anonymous	No	Yes
Inclusive	No	Yes
Transparent	No	Yes
Open Source	No	Yes
Permissionless	No	Yes
Flexibility	Low	High
Security	Low	High
Regulated	Yes	No

However, the concept of decentralised finance (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- 2). 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 2 shows the three largest protocols Total value locked (TVL) as of December 2021 (DeFi Pulse 2022).

Sl	**Protocol**	**Category**	**TVL [USD bn]**
1	MakerDAO	Lending	16.48
2	Aave	Lending	11.01
3	Compound	Lending	7.83

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,). 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 TradFi and DeFi offer. TradFi 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 traditional finance (Bartoletti et al. 2021). Xu and Vadgama (2022) state that, TradFi 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 TradFi, 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. Lending institute in traditional finance (TradFi) and decentralised finance (DeFi).

Customers and businesses make use of two types of institutions to meet their lending needs: firstly, banks and secondly new lending marketplaces/specialised organisations.

3.1 Lending Institution in Traditional Finance (TradFi)

3.1.1 Banks

Banks retain a unique position in the lending market as a "money creator" (Werner, 2014). Whenever a bank makes a loan, it expands its balance sheet by raising both assets (loans receivable) and liabilities (borrower deposits) (Lindner, 2015). The quantity of money that commercial banks may lend is not as simple as the multiplier effect of the reserves they have at the central bank; rather, it is determined by several variables including market dynamics, interest rates, borrower behaviour, risk and regulatory policies. Most broad money in economies (particularly in the United Kingdom) is bank deposits, which account for 97% of total money in circulation and are created through loans (McLeay & Thomas, 2014).

3.1.2 Central Bank

When a new loan granted by a central bank has the potential to enhance the bank's total money supply. A central bank serves as the "lender of last resort," offering large-scale loans to bail out commercial banks during financial crises. Since the global financial crisis of 2007-2009, this approach has been used on occasion as Quantitative Easing (QE), in which central bank reserves are produced to acquire financial assets, mostly from non-bank financial corporations (McLeay & Thomas, 2014). Excessive central bank loan issuance can increase monetary supply and contribute to currency depreciation. Whereas Bailout plans, where central banks "print" more money to assure market liquidity, have historically faced criticism as the action dilutes the value of money.

3.1.3 Commercial Bank

Commercial banks can utilise newly generated deposits from loan issuance as money, meaning they can be accepted as payment by non-banks. This effect, a deposit in a commercial bank represents the bank's guarantee to pay central bank funds. Unable to collect a sufficient amount of outstanding loans, as a result of borrowers' inability to repay, constitutes a breach of

contract on the part of the commercial bank, potentially leading to bankruptcy and, more seriously, confidence in the broader banking system. This was the precise narrative of the global financial crisis, in which banks failed owing to a high rate of default in the secondary mortgage market.

3.1.4 Lending companies and marketplaces

Typical lending companies, unlike banks, serve as intermediaries for loanable funds and cannot generate funds. Therefore, lending companies have to have initial funds from investors before providing loans to borrowing clients. Lending companies may function literally as commercial banks by offering loans by creating a new deposit with a form "promise to pay central bank money", where deposits do not need to completely cover the loans. However, unlike commercial banks, lending companies' "promises" cannot be employed as legal tender. Therefore, the borrowers may find difficulties in using their newly generated deposits for payments outside of the lending platform. Minsky (1986) argues that everyone can make money; the problem is getting it accepted. However, some derivatives, such as collateralized debt obligations (CDOs), might be fungible in capital markets. for instance, plain vanilla loans can be transferred to individuals who accept them as an alternative to fiat payments. Generally, there exist three routes within non-bank lending Quote driven market, Order driven exchange, and Over the counter.

3.1.4.1 Quote-driven market

The loan platform attracts both lenders and borrowers simultaneously in a quote-driven market. These platforms allow both institutional wealth managers and regular investors to act as lenders. Examples of these sorts of platforms are the US-based LendingClub and the UK-based Funding Circle. Due to the preferred the platforms economies of scale when dealing with larger investors, the market trend has been an increasing amount of institutional financing being drawn to these platforms (Ziegler et al., 2020). The borrowers, who often consist of

individuals or small- to medium-sized businesses, apply for loans by providing pertinent details including the needed loan principal, the length of the loan, and their credit history. A lending platform often assesses borrowers' risk to some extent based on their profile, while functioning as an agent and without taking on any credit risk, to ensure the minimum quality of loans that are listed. To better diversify risks for their investment pool, most platforms at the moment pull funds and manage a set of diverse borrowers rather than linking individual quotations from lenders and borrowers. As loans are fractionalized, lenders can invest in a lot of these tiny loan portions to lower idiosyncratic risks and attain exposure by their risk tolerance.

3.1.4.2 Order-driven exchange

In an order-driven exchange platform, orders to borrow and lend at various price levels (for example, annual interest rate) are automatically cleared through an order book. Both quote- and order-driven markets relate to digital financial marketplaces, which are electronic stock (bond, or other securities) exchanges. Orders to lend and borrow with different price levels (such as interest rates annually) are automatically cleared through an order book in an order-driven exchange platform. Upon making an order, borrowers may have to supply adequate collateral to minimise default risk. Typically, this method is used for trading in international debt markets.

3.1.4.3 Over-the-counter

An exclusively bilateral lending mechanism is referred to as an over-the-counter model. OTC stock loans are non-recourse loans in which the borrower holds OTC-traded equities as collateral. These loans are generally short-term (3 months to 10 years) and offer competitive interest rates based on the prime rate. Where a borrower initially submits a request to the platform with personal data, credit history, etc., in an approach similar to quote-driven markets. After assessing the request, the platform determines an interest rate appropriate for the borrower's specific needs and creditworthiness. The request is then made public on the site so

that lenders have the option of granting each request individually. This strategy is used by peer-to-peer lending companies like PPDai, which operates in China. This was the usual approach used by earlier lending platforms prior to switching to a quote-driven market framework.

3.2 Lending Institution in Decentralised Finance (DeFi)

compared to traditional bank-facilitated lending, DeFi lending uses smart contracts on open blockchain networks. Decentralised Finance (DeFi) seeks to transform existing financial systems by replacing centralised institutions with peer-to-peer interactions. In DeFi lenders use smart contracts to transfer their tokens (cryptocurrencies) into a "money market." The smart contract gives lenders interest tokens (for example, aTokens in Aave or Dai in Maker). on the other hand, Borrowers can access these funds by borrowing from the money markets. Lenders and interest on deposited assets that can be redeemed afterwards. DeFi lending platforms are decentralised applications (dApps) that allow people to lend and borrow digital currencies without the need for third-party intermediaries like banks. Some of the most prominent DeFi lending platforms include Aave, Compound, and Maker.

3.2.1 MakerDAI

The Maker framework is powered by 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 smart contract. The collateral might consist of one or more assets., which might be ETH (Ethereum's native coin) or ERC20 tokens (digital assets). The collateral value calculated by the smart contract depends on quantity and market value, which is obtained from an external data feed source (oracle). In the Maker landing platform, the borrower could request a DAI amount less than a predefined proportion of the collateral value using the smart contract. The liquidation process in MarkerDAO works as follows: (i)The threshold fraction determines

whether collateral will be liquidated. (ii) To avoid having their collateral liquidated due to a small price drop, borrowers should aim for a DAI issuance amount that is slightly lower than the threshold. (iii) Unlike traditional margin trading platforms, there is no margin call system in place in MarkerDAO. (iv) Instead, borrowers are required to either add more collateral or repay their DAI loan if there is a significant price decrease. (v) If a borrower's debt-to-value ratio exceeds the liquidation threshold, other participants in the network can bid on their collateral by repaying a portion of the loan, effectively liquidating their position. To redeem collateral from the vault, the borrower must return their DAI loan and interest, known as the stability fee. The stability fee grows over time and that's value is dynamically changed. When the stability charge is large, the borrower is encouraged to repay some DAI, which is later burned by the smart contract. The stability fee steers the circulating supply of DAI, preventing the currency from deviating too much from its peg. DAI has no set loan length and can be repaid in part or full at any moment.

3.2.2 Compound

The Compound protocol allows users to supply and borrow ETH and ERC-20 tokens. Individuals that deposit crypto assets into the protocol's smart contract will get an equal cToken (e.g., aETH, cDAI) that may be used to trade the deposited asset plus future interest. Leshner and Hayes (2019) describe a cToken as an interest-bearing token with an increasing exchange rate against the deposited asset. To borrow from the protocol, users require that they deposit funds as collateral. In this context, a borrower must first and foremost be a depositor. The Compound protocol automatically and continually changes borrowing and lending interest rates for each asset depending on deposits, locks, and borrowing amounts (Perez et al., 2021). As a result, the borrowed money accrues interest at different rates throughout time. The user can borrow a maximum amount of funds using their collateral. The protocol's price oracle determines the market value of assets. Borrowers' collateralization percentage varies owing to

price movements and interest accruals on borrowed and collateralized assets. The borrowers should overcollateralize their loan position to prevent other network members from liquidating the collateral, even if the loan length is not specified.

3.2.3 Aave

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. According to Aave (www.aave.com,2020), the balance of aETH rises over time as interest is paid on the deposit. aToken holders can redeem the underlying asset at a 1:1 exchange rate by submitting their token to the smart contract and getting an equivalent amount of the asset from the smart contract. Aave users' borrow positions, like Compound, require collateral and are subject to liquidation risk if undercollateralized. Aave allows borrowers to utilise deposited assets as collateral and move between variable and fixed interest rates at any moment. Aave additionally supports "flash loans". According to Wolff (2018), flash loans allow users to borrow and then repay funds in a single transaction without requiring collateral. Flash loans are commonly employed for arbitrage opportunities and to liquidate under-collateralized borrow positions on lending platforms.

4. Credit screening in traditional finance (TradFi) and decentralised finance (DeFi).

Verifying and assessing a potential customer's creditworthiness by examination of their financial situation, credit reports, and business cash flows is known as financial analysis. Finding out how much of a default risk a customer poses to the business and the damages the bank would incur in the event of a default are the two main objectives of credit analysis. The financial institution's decision on a loan application's approval or rejection, as well as the amount provided, is based on the risk level that the customer provides.

Credit history review – Typically, standard credit ratings from companies like Equifax, Experian, and TransUnion are not used by DeFi platforms. Rather, they benefit from several data sources and blockchain technology's built-in procedures. DeFi platforms offer a way to analyse a person's blockchain transaction history. This covers usage of wallets, past loan history, payment habits, and communication with different DeFi protocols. As part of the evaluation procedure, the assets and current balances in the user's cryptocurrency wallets can be reviewed. The user's interactions with smart contracts—such as their staking and liquidity provisioning—can also provide information about their reliability and financial behaviour.

Financial Assessment - To make sure the applicant has a steady and sufficient income to repay the loan, banks check the applicant's income using pay stubs, tax returns, and employment verification. As blockchain technology is decentralised and pseudonymous, it is different from traditional procedures in the DeFi (Decentralised Finance) ecosystem for evaluating a borrower's financial health. To assess a borrower's creditworthiness and financial situation, however, several cutting-edge techniques are used. looking through the borrower's previous blockchain transactions to evaluate the volume, consistency, and degree of activity related to using DeFi protocols. keeping track of the borrower's repayment history from any prior DeFi loans to evaluate their dependability and timeliness.

Collateral evaluation- Over-collateralization is required on many DeFi lending platforms due to the absence of traditional credit scores. To secure the loan, borrowers must offer collateral valued higher than the amount they want to borrow. Mechanisms of Liquidation in DeFi, To shield lenders from losses, automated liquidation procedures are initiated if the collateral's value drops below a certain level.

References and reputation - Reputation assessments resulting from on-chain behaviour are used by certain DeFi protocols. These ratings compile information on users' dependability in loan repayment, network interaction, and agreement compliance. A digital credit profile can

be established with the use of emerging standards for decentralised identities. Users may choose the information they reveal to lenders and have control over their identification thanks to Decentralised Identity (DID) systems.

Regulatory and Compliance Checks- Blockchain technology's decentralised and often pseudonymous nature creates new opportunities and problems for regulatory and compliance checks in DeFi lending. Although the goal of DeFi platforms is to function outside of established financial institutions, maintaining regulatory compliance is essential to the long-term success and adoption of these platforms. Certain DeFi platforms incorporate decentralised KYC solutions, allowing users to authenticate themselves using other services without jeopardising the security of their personal information. Identity verification systems based on blockchain technology may be used in this, enabling users to exchange credentials only with certain parties. To keep surveillance for suspicious activity, transactions can be monitored using automated anti-money laundering (AML) methods. Potential money laundering activities can be identified and flagged with the use of machine learning algorithms and pattern recognition.

5. Interest rate dynamic on lending in DeFi and TradFi platform

Interest rates on loans have a significant impact on how people borrow money, which has an impact on individuals, companies, and the economy as a whole. A wide range of unique and macroeconomic factors impact the intricate process of interest rate generation. Considering these factors that influence loan interest rates is crucial, as evidenced by the financing studies of Bester (1985) and Stiglitz & Weiss (1981), as well as the abundance of research since the mid-1980s. The issue of information asymmetry and its effects on borrowing rates have also been extensively studied in the microeconomic literature on banking (Kusi and Opoku-Mensah, 2017). The information asymmetry between lenders and borrowers makes it

challenging for banks to determine a borrower's creditworthiness. Such information asymmetry can result in adverse selection, in which higher-risk borrowers are more inclined to seek loans, as well as moral hazard, in which borrowers may engage in riskier behaviour after receiving the loan. It is challenging to determine an unbiased borrowing rate stems from the fact that lenders have to rely on borrower information which might be imperfect and biased when assessing borrowers' creditworthiness. Therefore, lenders may charge higher interest rates to compensate for perceived risk, creating unfair borrowing rates for borrowers.

Traditional finance relies on the demand and supply of money to determine interest rates. High demand for loans and credit leads to increased interest rates, while low demand may result in a decline. Factors such as loan type, creditworthiness, and market conditions also influence interest rates. Banks act as intermediaries between lenders and borrowers, charging for intermediation and compensating fund providers. Lower interest rates are observed in stable economies due to policy changes, inflation forecasts, and recessions. Individuals with higher credit ratings qualify for reduced interest rates, while those with low scores may face higher rates to minimize loan default risks. Lenders consider the debt-to-income ratio (DTI) and borrower's savings to determine the ability to repay the loan. Lenders also assess the borrower's risk to calculate the probability of default, with higher risk incurring higher interest rates. Each lender has its policy for establishing interest rates, with secured loans often offering lower interest than unsecured loans.

Unlike traditional financial systems, which set interest rates through centralised institutions, DeFi platforms rely on market dynamics to determine lending and borrowing rates (Appendix 1 & 2 show DeFi's hypothetical interest rate scenario). While precise interest rate models may differ among platforms, certain prevalent variables impact interest rates. The borrowing rate is a major issue in the academic literature on microeconomics and banking.

Stiglitz and Weiss (1981) explore credit rationing in imperfect information markets, emphasising the difficulty of establishing borrowing rates and the importance of rigorous modelling. Researchers emphasise how adverse selection and moral hazard might affect borrowing rate setting. To eliminate dependency on intermediaries, DeFi protocols like Aave and Compound use algorithms to establish rates. The interest rate algorithm is designed to control liquidity risk and maximise utilisation. The borrow interest rates are calculated using the utilisation rate. The utilisation rate indicates the availability of funds within the pool. The interest rate model deals with liquidity risk in the protocol by incentivizing users to support liquidity. When funds are available, low interest rates stimulate borrowing, whereas high interest rates encourage debt repayment or an additional supply of funds. DeFi lending platforms often require borrowers to provide cryptocurrency collateral, which can influence interest rates. Higher collateral levels are linked to lower interest rates as they reduce the risk of default. DeFi platforms may have distinct interest rate models, such as governance token incentives, reserve factors, and risk assessment mechanisms, which can vary across platforms, resulting in varying interest rate determinations. Price volatility, liquidity, and sentiment may all impact interest rates on DeFi lending platforms, with strong market volatility resulting in higher interest rates to account for lending and borrowing risks.

In DeFi The interest rate cannot be negative. They can reach 80% if there is an imbalance between borrowers and lenders. Interest rates in traditional money markets should resemble those of stablecoins that uphold a quasi-fixed parity with the dollar (after taking into consideration risk premiums unique to the crypto-asset markets, such as the risk of a platform default or a de-pegging, etc.). Each Ethereum (ETH) block affects the interest rates in DeFi, therefore variable interest rates might fluctuate from one block to the next. The base rate can fluctuate dramatically based on the price of an item and the amount traded, as information is processed incrementally throughout each block. The interest rate that borrowers pay to lenders,

along with any accumulated interest and the repayment period, is referred to as the borrower's annual percentage (APY). Usually, DeFi interest rates are higher than traditional market rates. Peer-to-peer lending promotes rivalry, which lowers rates in response to demand from customers. For instance, Compound and Aave are two distinct protocols that offer disparate loan alternatives. Compound only offers variable rates, however Aave offers both stable and variable rates.

DeFi lending often provides attractive interest rates, particularly for lenders, due to decreased operating costs and the lack of middlemen. Interest rates are regulated by supply and demand dynamics on the platform, which can result in better returns for lenders. However, borrowers may face higher rates due to the over-collateralization requirement. Whereas TradFi Lending Interest rates fluctuate according to the borrower's creditworthiness, market conditions, and central bank rates. Borrowers with strong credit and a regular income may be able to get lower interest rates, but this usually comes with extra middlemen and administrative charges. For example, consider a loan from the Compound platform where the borrower has 20ETH, the present value of ETH is $1000/ETH, and the borrowing interest rate is 5.9%. If the platform defines the loan-to-value ratio as 60%, the loan amount will be $12,000 [(20ETH X 1000) X60%]. Therefore, borrowing interest will be $708 (12000 x 5.9%). If traditional banks, such as HSBC, offer an interest rate of 7.9%, the interest on $12000 would be $948. This example shows TradFi to have a higher cost of lending than DeFi.

6. Credit ratings on lending transform from TradFi to DeFi platform

Credit scores are critically significant in bank lending as credit reports provide key information about an individual's creditworthiness, allowing banks to make informed judgements and effectively manage loan risks. It supports assessing an individual's creditworthiness and ability to repay debt. It also provides an overview of an individual's financial history, exposing past credit usage and repayment behaviours. Credit ratings help

banks make more informed lending decisions by analysing the likelihood of repayment and limiting potential losses.

Credit scoring has evolved significantly since the 1950s, determining an individual's eligibility for credit and financial goods. Traditional approaches assess financial risk based on mainstream financial linkages; however, alternative models do so use different data sources. These strategies have improved access to credit and financial services for previously disadvantaged groups. Traditional credit scoring techniques, such as the FICO score, utilise statistical analysis to determine an individual's creditworthiness (Packin & Yafit, 2018). These models generally evaluate payment history, credit utilisation, duration of credit history, credit mix, and new credit applications. Traditional credit models depend largely on prior financial behaviour, making it difficult for those with minimal or no credit history to get loans. The financial marginalisation of major sectors of the population raises fairness concerns and entrepreneurial opportunities. Lenders and financial institutions are increasingly using alternative credit data sources, such as utility and rent payment histories, insurance premiums, and recurring expenses, in addition to traditional credit reports. Machine Learning and advanced Artificial Intelligence (AI) capabilities have expanded the pool of credit data sources, with online sources like social media and online shopping being increasingly used. AI-based credit services have experienced growth in the past decade due to their speedy automated scoring process, claimed accuracy, and cost-effectiveness. Zest AI, Trust Science, and Applied Data Finance are pioneers in the creditworthiness assessment sector. Zest AI generates its score using LexisNexis and credit agency data, Trust Science examines more data points than FICO and gathers and keeps its data, and ADF employs a proprietary AI-based technique to assess the creditworthiness of persons with limited credit histories.

AI is not the only innovative technology with a potential financial future. Blockchain technology is expected to alter several industries, particularly banking (Marecki & Wójcik-

Czerniawska, 2021). Blockchain is a democratic governance system that distributes authority and influence among participants, preventing dominance by a single entity (Comolli & Korver, 2021). According to Chen and Bellavitis (2020), this technology improves user security, privacy, and efficiency by utilising a secure, distributed ledger maintained jointly by its members. The launch of Bitcoin, quickly followed by other digital currencies, fostered a larger concept of decentralisation in banking and set the ground for the rise of DeFi (Argile, 2023). Decentralized credit scoring, a form of credit assessment, is a fully automated process executed on the blockchain by Decentralized Finance (DeFi) platforms. Originally an alternative to the centralized traditional finance (TradFi) system, it combines DeFi data with traditional data from various sources. Despite its fairness, these hybrid scores are subject to algorithmic distortions and have unique fairness issues. The use of smart contracts and external algorithms, known as oracles, introduces heightened potential for error and bias in the credit scoring process. Such as "black box 3.0" issues can lead to opaque automation of biased processes and perpetuate social injustices. Therefore, regulatory intervention is needed to strengthen the linkage points between DeFi and TradFi and protect consumers from the consequences of decentralized credit scoring (Packin and Yafit, 2024).

7. Evolution of Defi and Challenges to TradFi

DeFi challenges traditional banks by providing a more decentralised, efficient, and transparent alternative. Though it poses risks, it also creates new opportunities for the financial environment. As a result of DeFi's evolution, TradFI confronts a variety of challenges.

Following the global financial crisis, banks faced stricter lending regulations and underwriting methods. Consequently, the credit rating criteria were enhanced to reduce default risk. However, stringent rules and regulations inhibit financial inclusion in TradFi. However Decentralised Finance (DeFi) is transforming financial inclusion by making services available to individuals who do not have traditional lending access. DeFi, using blockchain technology,

enables borrowing, lending, investing, and saving without an intermediary. It has a particularly significant effect on locations with inadequate financial systems. DeFi offers services to unbanked individuals by providing a chance to overcome the boundaries established by traditional financial service providers and interact with finance on a global scale.

Traditional lending are typically delayed in reaching end customer due to inadequate information flow and policy implementation, resulting in passthrough issues in TradFi. During the Coronavirus pandemic, commercial banks in the UK experienced difficulties to effectively distribute loans to SMEs (Barrett et al., 2020). Delays in passing on interest rate adjustments resulted in high lending rates in a low savings interest environment, negatively impacting borrowers. In the UK, the Bank of England's rate reductions do not always translate into lower mortgage rates for consumers (Singh, 2020). By eliminating intermediaries, DeFi lending reduces passthrough issues and enhances financial inclusivity.

TradFI involves intermediate costs, which raise the cost of loans. Regulatory impediments keep lending firms' entry barriers high, resulting in an oligopoly market with imperfect competition. Centralising lending services increases intermediary costs and market friction, resulting in inefficient use of liquidity and a failure to maximise utilitarian society utility. In 2016, the UK government aimed to undermine the oligopoly of high-street banks by promoting expansion in the alternative lending sector. In the meantime, new players only account for 20% of the market (Prill, 2020). DeFi lending platforms use a decentralised architecture, which implies there are no intermediaries required. This results in much cheaper costs than typical lending through TradFi. Unlike an oligopolistic structure, in which a few firms control the market, DeFi allows anyone to participate as a lender or borrower. This greater competition reduces interest rates, which benefits both lender or borrower. This decentralisation encourages healthy competition between diverse lending methods.

Prevailing lending procedures in the typical market result in suboptimal liquidity results in TradFi. Both the supply and demand sides of liquidity are arbitrarily divided into segmented submarkets depending on characteristics such as lending duration, interest rate, credit rating, and so on, even within the same lending platform. The excess liquidity in one submarket cannot be quickly shifted to meet the demand in another submarket. Liquidity pools play a vital role in DeFi lending as decentralised apps (dApps) require liquidity to function properly. Increased liquidity levels boost the efficiency and effectiveness of the services supplied, attracting more customers. DeFi users deposit the digital currency into these pools, resulting in a fund reserve that borrowers may access. Liquidity pools use smart contracts to automate and safeguard transactions. Lenders add their assets to the pool, providing the liquidity required for borrowing.

Traditional lending organisations' inadequate IT infrastructure hinders efficiency increases in TradFi. Customer credit histories are often fragmented and opaque due to a lack of data sharing between financial institutions and a monitoring system, leading to financial exclusion and fraud. According to Deloitte UK (2016), new lending platforms with substantially lower operational costs (half those of commercial banks) are unable to compete with commercial banks' lower cost of funds. DeFi offerings function without intermediaries such as banks, resulting in much cheaper fees than traditional lending systems. DeFi financing, which leverages crypto, smart contracts, and blockchain technology, provides liquidity, higher interest rates, and a decentralised alternative to traditional lending.

However, DeFi is not impervious to risk. Smart contract security remains an important concern. Smart contract vulnerabilities can cause significant financial losses, as demonstrated by previous cases. Ensuring DeFi platform security requires rigorous inspection and coding methods (chainlink, 2023). Addressing the complex web of regulatory uncertainty presents a further critical challenge. DeFi's decentralised structure might create legal uncertainty and

complexity when compared to traditional regulatory framework. Maintaining a balance between innovation and compliance is crucial for achieving sustainable growth (Nakamoto, 2008). Scalability is an ongoing challenge for DeFi's widespread adoption. Hefty network congestion on blockchains can lead to sluggish transaction processing and substantial costs. Synthetix (2023) suggests layer-two scaling as a solution to overcome restrictions and promote development in the DeFi ecosystem.

8. Convergence and synergies of Defi and TradFi

TradFi and DeFi systems have distinct operating philosophies, however, have fundamental commonalities. Both seek to facilitate financial activities such as lending and borrowing. The convergence of DeFi and TradFi financing has the potential to transform the financial industry by leveraging the capabilities of both systems. This interplay might result in improved efficiency, accessibility, and transparency in financial services. To achieve this, enormous regulatory, technological, and cultural barriers must be overcome. Blockchain technology might be used by TradFi organisations to boost transparency, minimise fraud, and build trust through immutable transaction records. Smart contracts also may automate loan agreements, repayments, and collateral management, resulting in increased efficiency and lower operating expenses. On the other side, implementing TradFi regulatory standards might boost DeFi platforms' reputation and legitimacy, attracting more users and institutional investors. Implementing TradFi's regulatory criteria in DeFi can improve consumer protection while lowering risk for borrowers and lenders. Offering insurance products or guarantees in DeFi comparable to those in TradFi can help lenders reduce their risk. Regular audits and compliance checks, which are prevalent in TradFi, can assist detect vulnerabilities and assure the stability of DeFi platforms. Implementing Know Your Customer (KYC) and Anti-Money Laundering (AML) policies can help to avoid fraud and criminal activity in DeFi lending, hence boosting overall platform security.

An integrated approach to DeFi and TradFi might transform the financial industry by incorporating the greatest features of both systems. This hybrid financial ecosystem would provide increased access, efficiency, innovation, and transparency. However, attaining this integration would need considerable governmental, technical, and cultural changes. Collaboration among stakeholders will be critical in developing a more inclusive, efficient, and resilient financial system. DeFi's global nature allows it to provide financial services to unbanked and underbanked people all around the world. Smart contracts may automate regular operations like loan approvals, settlements, and compliance, lowering operating costs and mistakes. In comparison to existing banking systems, blockchain technology has the potential to drastically accelerate transaction speeds. Blockchain's transparent and immutable ledger can help to prevent fraud and boost participant confidence. However, there are several challenges, such as implementing Know Your Customer (KYC) and Anti-Money Laundering (AML) protocols in DeFi while maintaining the decentralised spirit. DeFi occurs in a largely unregulated environment, whereas TradFi is severely regulated. Aligning the two can be difficult. System integration, which ensures smooth communication between blockchain-based DeFi systems and traditional financial systems, might be tricky. High volatility in cryptocurrency markets may discourage traditional financial institutions from embracing DeFi. Also, protecting users from the dangers connected with DeFi, such as high volatility and the possibility of loss due to smart contract failures, is a significant challenge. The convergence of DeFi and TradFi has enormous potential to alter the financial sector by increasing accessibility, efficiency, and creativity. However, realising this potential necessitates tackling a slew of issues on legislative, technological, cultural, financial, legal, and strategic levels. Regulators, DeFi platforms, and conventional financial institutions must work together to overcome these obstacles and build a more inclusive, efficient, and resilient financial environment.

Technological innovations have played an important role in determining the future of finance. This involves developing secure and effective blockchain protocols, improving smart contract technologies to decrease vulnerabilities, and creating financial products that combine TradFi with DeFi. Research on the ethical and social consequences of DeFi, including financial inclusion and the impact on inequality, is crucial for future growth.

9. Conclusion

Blockchain technology has laid the groundwork for decentralized finance (DeFi), enabling the emergence of decentralized financial platforms that challenge traditional financial framework (TradFi) . Key components include smart contracts, decentralized exchanges, and lending protocols, enabling the provision of innovative financial services without intermediaries.However , decentralized finance (DefI) projects face compliance risks such as regulatory ambiguity, KYC/AML compliance, securities regulation, and legal liability. To foster trust, transparency, and legitimacy, collaboration and engagement with regulatory bodies are crucial. Our finding suggest that by bridging the gap between TradFi and DeFi audiences and learning from one another's failures can be build resilient, user-friendly, and efficient financial ecosystems.

In conclusion, the link between DeFi and traditional banking is neither individually convergent nor inherently divergent. Instead, it moves through a range of possibilities, moulded by regulations, technology breakthroughs, and demand from customers. The confluence of Decentralised Finance (DeFi) and Traditional Finance (TradFi) marks a significant change in the financial industry. This convergence seeks to combine the creative, decentralised characteristics of DeFi with the established, controlled structures of traditional finance. Traditional financial institutions are developing alliances with DeFi platforms and fintech firms

to utilise their technology and innovation skills. Yet, DeFI has to establish technological safety, a regulatory framework, and improved fraud protection for customers.

Shaping the future of finance, policymakers confront both opportunities and challenges as the usage of decentralised financing (DeFi) evolves. Policymakers ought to formulate robust regulations for decentralised funding. Clear regulations may increase investor confidence, trust, and responsible innovation in the DeFi ecosystem. Policymakers have to find a balance between innovation and regulatory compliance. Decentralised finance may thrive with flexible regulatory policies that promote innovation and minimise risk. To protect the interests of customers and minimise risks associated with decentralised money, governments should prioritise protecting customers' initiatives. Providing transparency, investor education, and dispute resolution can increase client trust in DeFi systems.

Future study should evaluate the efficiency and welfare advantages of transitioning from CeFi to DeFi protocols. Research on DeFi governance and regulation is needed, especially in response to systemic stress. Further research is needed to enhance blockchain scalability while maintaining security and decentralisation, as well as preserving privacy without compromising transparency.

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Appendix 1- A hypothetical loan repayment schedule of HSBC Bank under different circumstances (2024).

Stable Economy	**Recession**	**High Credit score client**	**Low Credit score client**
• net loan amount: £25,000 • effective annual Interest Rate: 7.9% APR • loan term: 60 months • monthly repayment: £582 • total amount payable: £ 34,920 • total interest: £9,920.	• net loan amount: £25,000 • effective annual interest rate: 4.5% • loan term: 60 months • monthly repayment: £510 • total amount payable: £30,600 • total interest: £5,600.	• net loan amount: £25,000 • effective annual interest rate: 6.5% • loan term: 60 months. • monthly repayment: £552 • total amount payable: £33,120 • total interest: £8,120.	• net loan amount: £25,000 • effective annual interest rate: 20% • loan term: 60 months. • monthly repayment: £833 • total amount payable: £49,980 • total interest: £24,980

Appendix 2- A hypothetical loan repayment schedule of Aave under different circumstances (2024).

Liquidation Scenario	**Borrowing with Stable investment in a bull market**	**Borrower in recession**	**High volatility market with significant profit**
•collateral: 10 ETH • initial ETH price: $1,500/ETH • loan-to-value ratio: 50% • liquidation threshold: 70% • ETH price drop: 40%. • initial collateral value: 10 ETH x $1,500/ETH = $15,000 • loan amount: 50% of $15,000 = $7,500 • new ETH price after drop: $1,500 - 40% = $900/ETH • new collateral value: 10 ETH x $900/ETH = $9,000. • liquidation check: new collateral value ($9,000) < liquidation threshold (70% of $15,000, i.e., $10,500)	• collateral: 20 ETH • initial ETH price: $1,200/ETH • loan-to-value ratio: 60% • borrowing interest rate: 4% annually • market return rate: 10% annually • loan term: 1 year. • initial collateral value: 20 ETH x $1,200/ETH = $24,000 • loan amount: 60% of $24,000 = $14,400 • interest paid on loan: $14,400 x 4% = $576 • market returns: $14,400 x 10% = $1,440 • net profit: market returns - interest paid = $1,440 - $576 = $864.	• collateral: 15 ETH • Initial ETH Price: $900/ETH (due to recession). • loan-to-value ratio: 50% • Borrowing interest rate: 5% annually (due to competitiveness) • market return rate: (-) 3% annually • loan term: 1 year. • initial Collateral Value: 15 ETH x $900/ETH = $13,500 • Loan Amount: 50% of $13,500 = $6,750 • interest Paid on Loan: $6,750 x 5% = $337.50 • market Returns (Loss): $6,750 x -3% = -$202.50 • net Loss: Market Returns - Interest Paid (-)202.50 +(-) 337.5 = -$540	•collateral: 25 ETH • Initial ETH Price: $1,000/ETH • loan-to-value ratio: 70% • Borrowing interest rate: 5% annually • Market return rate: 50% annually (high volatility). • loan term: 1-year • Initial collateral value: 25 ETH x $1,000/ETH = $25,000 • loan amount: 70% of $25,000 = $17,500 • interest paid on loan: $17,500 x 5% = $875 • market returns: $17,500 x 50% = $8,750 • net profit: market returns - interest paid = $8,750 - $875 = $7,875.

Table 3- A hypothetical loan repayment schedule of Compound under different circumstances (2024).

Earning during traditional market recession	**Compound deposit gain**	**Deposit loss on volatile assets in Compound**
•collateral: 30 ETH • Initial ETH Price: $800/ETH (considering recession in traditional finance) • Loan-to-value ratio: 65% • Borrowing Interest Rate: 6.95% (based on Compound's current rates) • market return Rate: 30% (high-return crypto investment) • loan term: 1 year • initial collateral value: 30 ETH x $800/ETH = $24,000 • loan amount: 65% of $24,000 = $15,600 • interest on loan: $15,600 x 6.95% = $1,084.20 • market returns: $15,600 x 30% = $4,680 • net profit: market returns - interest = $4,680 - $1,084.20 = $3,595.80.	• deposit: USDC (stablecoin) 30 • Deposit Amount: $20,000 • Annual supply interest rate: 4.54% (for USDC on Compound). • interest earned in one year: $20,000 x 4.54% = $908	• deposit: Ethereum (ETH), a volatile cryptocurrency • initial deposit amount: 10 ETH • initial ETH price: $1,200 • ETH price drop: 30% over the year • annual supply interest rate for ETH: 5.9% on Compound. • initial deposit value: 10 ETH x $1,200/ETH = $12,000 • new ETH price after drop: $1,200 - 30% = $840/ETH • new deposit value after price drop: 10 ETH x $840/ETH = $8,400 • interest earned on ETH: $12,000 x 5.9% = $708 • net loss: (initial deposit value - new deposit value) - interest earned = ($12,000 - $8,400) - $708 = $2,892