International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Decentralised Finance: Architectural Promises, Structural Contradictions, and the Regulatory Imperative

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Abstract: ***Decentralised finance (DeFi) represents an attempt to reconstruct financial intermediation through blockchain-based smart contracts, ostensibly eliminating the need for banks, brokers, and custodians. This paper synthesises academic, regulatory, and industry evidence to assess whether DeFi delivers on its core promises of disintermediation, transparency, and financial inclusion. The analysis reveals a persistent gap between DeFi's architectural rhetoric and its operational reality. While smart contracts enable permissionless access and composable financial services, empirical evidence shows that governance power concentrates among token holders and core development teams, that "decentralised" applications retain centralised control vectors, and that the sector remains dependent on fiat-backed stablecoins whose stability is ultimately underwritten by traditional financial institutions. Furthermore, illicit finance risks have prompted the Financial Action Task Force to conclude that the majority of jurisdictions have not implemented adequate regulatory frameworks for DeFi arrangements. The paper argues that DeFi's future trajectory depends not on the realisation of pure decentralization- an outcome that structural evidence suggests is neither achievable nor necessarily desirable- but on the construction of regulatory frameworks that accommodate programmable finance while addressing the accountability deficits that decentralisation creates.***

Keywords: Decentralised Finance (DeFi), Blockchain, Smart Contracts, Financial Regulation, Regulatory Arbitrage, Systemic Risk, Governance, Financial Architecture

1. Introduction

Decentralised finance emerged from a technical possibility: the capacity of smart contracts on programmable blockchains to execute financial agreements automatically, without a human intermediary verifying or enforcing terms. The National Bank of Slovakia defines DeFi as "a financial system built on distributed ledger technology, primarily blockchain, without the need for traditional financial intermediaries such as banks or securities dealers" . From this definition flows an ambitious claim: that lending, trading, insurance, and asset management can be conducted peer-to-peer, with code replacing institutional trust.

The sector's growth has been rapid but uneven. The Financial Action Task Force (FATF) reports that DeFi activity is highly concentrated, with the top twenty protocols accounting for more than 70% of total activity, and North America and Europe representing approximately 60% of global transactions. This concentration is itself telling: a system designed to distribute financial power has, in practice, produced new centres of gravity.

This paper asks three questions.

- First, what does DeFi actually do, as distinct from what it claims to do?
- Second, what structural contradictions emerge when the architecture of decentralisation meets the realities of governance, collateral, and regulation?
- Third, what regulatory and design responses follow from those contradictions?

The argument proceeds through

- An examination of DeFi's technical architecture,
- Its primary use cases,
- The evidence on governance concentration,
- The stablecoin dependency problem, and the emerging regulatory landscape.

The conclusion assesses whether "decentralisation" remains a useful organising concept for understanding this sector, or whether it has become a misleading label for a set of financial services that are decentralised in some dimensions and intensely centralised in others.

2. Architecture and Mechanisms

2.1 The Layered Stack

DeFi is best understood not as a single technology but as a stack of interdependent layers. The Bank for International Settlements describes this stack as comprising blockchains, smart contracts, protocols, and decentralised applications (Dapps) .

- Blockchains provide settlement and consensus.
- Smart contracts encode the rules of financial agreements.
- Protocols are combinations of smart contracts designed for specific use cases—lending, exchange, asset management.
- Dapps provide graphical interfaces through which users interact with protocols.

This layered structure produces a property that distinguishes DeFi from traditional finance: composability. Because protocols are permissionless and interoperable at the smart contract level, developers can build new financial products by combining existing protocols, much as one might combine software libraries . A lending protocol can be integrated into a yield aggregator, which can in turn be accessed through a wallet interface, without formal

partnership agreements or bilateral integration work. This property has been celebrated as a source of innovation, and it is genuinely novel. But composability also propagates risk: a vulnerability in one protocol can cascade through every application that depends on it.

2.2 Core Use Cases

The principal DeFi use cases mirror familiar financial functions.

- Decentralised exchanges (DEXs) enable peer-to-peer trading through automated market makers, in which liquidity pools and algorithmic pricing replace order books
- Lending protocols allow users to deposit assets to earn interest or borrow against collateral, with interest rates adjusting algorithmically based on utilisation
- Stablecoins- tokens designed to maintain a fixed peg to a reference asset- provide the medium of exchange and unit of account without which DeFi lending and trading would be impractical.
- Staking and yield aggregation allow users to earn returns by depositing assets into protocols, though the sustainability of such returns varies widely.

What unites these use cases is the replacement of discretionary institutional decision-making with pre-specified code. A bank approves a loan based on credit assessment; a DeFi lending protocol releases funds when collateral exceeds a threshold. A brokerage executes trades during business hours; a DEX operates continuously. These differences are real, and they carry implications for access and efficiency. But they also carry implications for recourse: when code executes incorrectly or maliciously, there is no institution to petition for reversal.

3. The Governance Contradiction

The most significant tension in DeFi lies in the relationship between its decentralisation claims and its governance realities. The FATF, in its 2026 targeted report, observed that "although many DeFi arrangements present themselves as decentralised in terms of governance, centralised elements frequently persist in practice including through governance token concentration, administrative privileges, control over upgrades, significant economic benefits, and influence over development and infrastructure". This is not an incidental observation. It strikes at the core of DeFi's legitimacy claim.

The mechanism of governance concentration is structural. Most DeFi protocols distribute governance tokens to early users, investors, and development teams. Token-weighted voting means that those with the largest holdings exercise disproportionate influence. In practice, token distribution tends to concentrate: venture capital firms, protocol treasuries, and founding teams retain substantial allocations. The result is a system in which formal governance is decentralized- any token holder may vote- but effective control is often oligarchic. The FATF explicitly identifies governance token concentration as an indicator of control, alongside administrative privileges and upgrade authority.

This contradiction has practical consequences. When a protocol faces a crisis- a exploit, a market dislocation, a parameter misconfiguration- the response typically requires decisive action by a small group of developers or large token holders. The March 2020 Ethereum crash, during which MakerDAO's DAI stablecoin experienced significant peg deviations, prompted governance interventions including the addition of USDC collateral and the introduction of a Peg Stability Module. These interventions restored stability, but they were not the product of decentralised deliberation; they were the product of a governance process in which a concentrated set of actors made consequential decisions.

Academic research has begun to address this tension directly. A bibliometric analysis of DeFi and banking innovation literature concludes that "DeFi should not be interpreted as a separate financial system but as a technological and governance development that increasingly interacts with traditional banking processes, risk frameworks, and digital service models". The implication is that the binary opposition between "decentralised" and "centralised" finance obscures more than it reveals. What exists in practice is a spectrum of arrangements, each with its own distribution of control, accountability, and risk.

4. The Stablecoin Dependency

If governance concentration is DeFi's internal contradiction, its dependence on stablecoins is its external one. Stablecoins are the bridge between volatile crypto assets and the stable unit of account required for lending, trading, and payments. Yet the stability of the most widely used stablecoins depends on reserves held in the traditional financial system.

Fiat-backed stablecoins such as USDT and USDC maintain a one-to-one reserve ratio with cash and short-term government securities. Their stability is therefore not a property of blockchain technology but a property of the issuing institution's balance sheet and the quality of its reserves. When Silicon Valley Bank failed in 2023, USDC depegged below one dollar because a portion of its reserves was held at the failed bank. The event demonstrated that shocks originating in traditional finance transmit directly into DeFi through the stablecoin channel.

Over- collateralised stablecoins such as DAI, backed by a pool of crypto assets, present a different but related vulnerability. DAI's stability depends on the value of its collateral; sharp declines in collateral values trigger deleveraging and peg deviations, as occurred during the March 2020 crash. The subsequent addition of USDC as collateral to DAI's system illustrates a recursive dependency: a decentralised stablecoin came to rely on a centralised one for stability. Algorithmic stablecoins, which attempt to maintain pegs through incentive mechanisms rather than collateral, have fared worse. The collapse of TerraUSD in May 2022 erased approximately $50 billion in value and transmitted instability across DeFi markets.

The stablecoin evidence supports a broader conclusion: DeFi does not exist in a sealed technical sphere. It is connected to traditional finance through multiple channels- reserve holdings, arbitrage mechanisms, and the settlement of fiat

on- and off-ramps- and those connections transmit risk in both directions. The Bank for International Settlements has noted that as crypto markets have grown and their connections with traditional finance have deepened, policy interventions have increased correspondingly.

5. The Regulatory Challenge

The regulatory landscape for DeFi is characterised by a mismatch between the borderless, pseudonymous nature of the technology and the territorially bounded, identity-based nature of financial regulation. The FATF's 2026 survey found that 132 of 143 reporting jurisdictions had not implemented its standards in relation to qualifying DeFi arrangements, and only two jurisdictions had licensed or registered a DeFi arrangement in practice. This is a striking gap, and it suggests that the regulatory question is not whether DeFi will be regulated but how, and by whom.

The FATF's framework addresses this by focusing on control rather than architecture. Its standards apply where a natural or legal person exercises "control or sufficient influence" over a DeFi arrangement, regardless of how decentralised the arrangement claims to be. This approach acknowledges the governance reality described above: behind the smart contracts, there are almost always identifiable actors who can modify parameters, upgrade contracts, or influence governance votes. The FATF identifies on-chain and off-chain indicators of such control, providing a basis for supervisory intervention that does not depend on the fiction of perfect decentralisation.

The illicit finance risks are substantial and documented. The FATF reports that in April 2026 alone, two major cyberattacks on DeFi platforms attributed to the Democratic People's Republic of Korea accounted for approximately 76% of all annual losses from virtual asset hacking incidents, with combined proceeds exceeding $570 million. Fraud schemes such as SafeMoon and Forsage illustrate how actors can retain hidden control over DeFi platforms to defraud investors. These are not marginal problems. They suggest that the permissionless, pseudonymous properties that make DeFi attractive for legitimate innovation also make it attractive for exploitation.

A risk-based approach, as advocated by the FATF, would prioritise engagement with the largest and most systemically relevant protocols. Given the concentration of DeFi activity in a small number of protocols and jurisdictions, such targeting is feasible. But it raises a question: if regulation focuses on the identifiable control points within DeFi, does it not thereby reinforce the centralisation that DeFi's ideology rejects? This is not necessarily a problem. If decentralisation is a spectrum rather than a binary, regulatory engagement with the centralised elements of DeFi is simply regulation of the system as it actually exists, rather than as it is imagined to exist.

6. Discussion: What Remains of Decentralisation?

The evidence assembled in this paper supports a qualified conclusion. DeFi has produced genuine innovations in financial architecture: composable protocols, automated market making, permissionless access to lending and trading, and a model of transparent, on-chain settlement that traditional finance has begun to emulate through tokenisation initiatives. These are not trivial achievements. The Bank for International Settlements' layered model of DeFi- blockchains, smart contracts, protocols, Dapps- captures a real and functional system.

But the decentralisation that gives DeFi its name and its ideological energy is more fragile than the label suggests. Governance concentrates. Stablecoins depend on traditional finance. Dapps function as "de facto centralisation vectors". The FATF finds persistent centralised control behind decentralised facades. And academic research on DeFi-based entrepreneurial financing finds that "productive DeFi ventures often reintroduce forms of centralisation, such as venture capital backing, suggesting complementarity rather than substitution with traditional financing mechanisms".

What follows from this? First, the analytical vocabulary should shift from "decentralised versus centralised" to something more precise. A useful distinction is between architectural decentralisation (the absence of a single point of technical failure) and governance decentralisation (the distribution of decision-making power). DeFi often achieves the former while falling short on the latter. Second, regulation should focus on control and accountability rather than on architectural form. The FATF's control-based approach is a step in this direction. Third, the most consequential innovations in DeFi may prove to be not the elimination of intermediaries but the programmability of financial agreements- a property that traditional finance can and is beginning to adopt through tokenisation and smart contract experimentation.

The question for researchers and policymakers is therefore not whether DeFi will replace traditional finance. It will not. The question is what a hybrid system looks like: one in which programmable, permissionless components coexist with accountable, regulated institutions, and in which the benefits of both- innovation and stability, access and recourse- are available without the pathologies of either. That is a less dramatic question than the one DeFi's founders posed. It is also a more tractable one.

7. Conclusion

Decentralised finance is neither the revolutionary displacement of banking nor a mere footnote to it. It is a set of technologies and institutional experiments that reveal, with unusual clarity, the tensions inherent in any attempt to govern financial activity through code. Smart contracts can automate execution, but they cannot resolve disputes, adapt to unforeseen circumstances, or allocate losses in ways that affected parties regard as legitimate. Those functions require institutions—formal or informal, decentralised or not.

The evidence reviewed here suggests that DeFi's trajectory will be shaped less by the purity of its decentralisation than by the quality of its governance and the adequacy of its regulation. The protocols that survive and grow will be those that find ways to combine programmability with

accountability, permissionless access with consumer protection, and composability with risk management. The regulatory frameworks that succeed will be those that identify control points without demanding a centralisation that the technology cannot provide and the ideology cannot accept.

For researchers, the agenda is clear. More work is needed on the empirical distribution of governance power in DeFi protocols, on the transmission channels between traditional finance and DeFi beyond stablecoins, and on the design of regulatory mechanisms that can accommodate pseudonymous participation without sacrificing the integrity of the financial system. The questions are difficult. But they are the right questions, which is more than can be said for the question of whether DeFi will replace banks. It will not. What it will become is still being written.

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