

DECENTRALIZED FINANCE (DeFi): OPPORTUNITIES, CHALLENGES AND POLICY IMPLICATIONS

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1. OVERVIEW OF DEFI CHARACTERISTICS AND APPLICATIONS

1.1 Main characteristics of DeFi

Decentralised finance (DeFi)¹ refers to financial applications which are run on a permissionless blockchain² and use smart contracts automating the provision of financial services without the need for intermediaries. The use of smart contracts and the decentralised nature of the operation and governance of the platform are the two main features that distinguish DeFi from centralised blockchain systems³.

Smart contracts are self-executing programs which are stored on a blockchain and run when predetermined conditions are met. They are used to automate the execution of transactions and agreements among anonymous parties and to implement pre-determined events such as interest or dividend payments without the need for an intermediary or central institution. The fact that they are executed automatically and can be publicly verified on a permissionless blockchain means that smart contracts can provide a high level of security when they are appropriately coded and set up. Resulting transactions are also irreversible and easily trackable on the blockchain.

Decentralisation is the second key characteristic of the DeFi environment. This refers both to the absence of central institution or intermediary for implementing financial services on a DeFi platform, thanks to the use of smart contracts, and to the use of decentralised or community-based governance mechanisms, usually based on voting schemes, for making decisions concerning the protocols and the operation of the

platform. Such decisions can concern for example interest rates or collateral requirements, the services offered on the platform or the resolution of possible conflicts and operational issues. While the initial design and implementation of DeFi platforms is centralised with developers creating the architecture of the platform and the codes and making the main initial policy choices regarding the administration of the system⁴, platforms are due to evolve towards more decentralisation, as they are progressively deployed and their user base increases. The degree of decentralisation therefore varies from one DeFi project to another, depending in particular on the stage of development of the platform (see *Figure 1 below*). Governance tokens are attributed to the users of the platform, allowing them to vote on changes to DeFi protocols or applications, which are either directly implemented in the protocols (in a fully decentralised model) or implemented via a group of developers holding admin keys⁵ who follow the instructions of token holder votes (in a partially decentralised model)⁶.

However, some regulators such as the BIS, have considered in recent papers⁷ that decentralisation is not a reality for most DeFi platforms, because their administration and governance remains in the hands of a limited group of individuals, who are also predefined to a certain extent, and decisions are guided by central governance frameworks in many cases⁸. While decentralisation depends on the level of maturity of the platform to a certain extent, as previously mentioned, the BIS emphasizes that several factors drive a concentration of decisions whatever the development stage of the platform. These factors include the attribution of a substantial part of the initial coins to the team involved in the creation and funding of the project

1. This description is based on several recent papers and reports on DeFi including: The DeFi policy-maker toolkit WEF White Paper June 2021; Decentralized finance: on blockchain and contract-based financial markets Federal Reserve Bank of St Louis Second Quarter 2021; DeFi risks and the decentralisation illusion BIS Quarterly Review December 2021; Why DeFi matters and the policy implications OECD January 2022.

2. Permissionless or public blockchains such as the Ethereum blockchain (and also alternative blockchains such as Solana, Avalanche which are increasingly being used), allow anyone to transact and join as a validator. The data on these blockchains is publicly available, and complete copies of the ledgers are stored across the globe. This type of blockchain does not have any central entity who controls it, and users can remain relatively anonymous as there is no need for identifying themselves in order to perform transactions.

3. Centralised systems rely on the recording of contractual and transactional details by intermediaries, a pre-selected group of participants or a central infrastructure.

4. Core software development teams, generally funded by VCs in exchange for tokens issued by the protocol, start off the project holding the admin keys of the protocol and the power to make the most important decisions around the design of the protocol. Such decisions reflect not only technical decisions about the operation of the system, but also policy choices about the level of fees, the voting thresholds and other decisive starting points, all written in code. Source OECD Why DeFi matters and the policy implications – January 2022.

5. Admin keys allow the project core team to e.g. upgrade smart contracts on which protocols are based, perform emergency shutdowns if needed.

6. In a partially decentralised model, token holders may also only have power over certain parameters or the initial core team of developers may retain veto power.

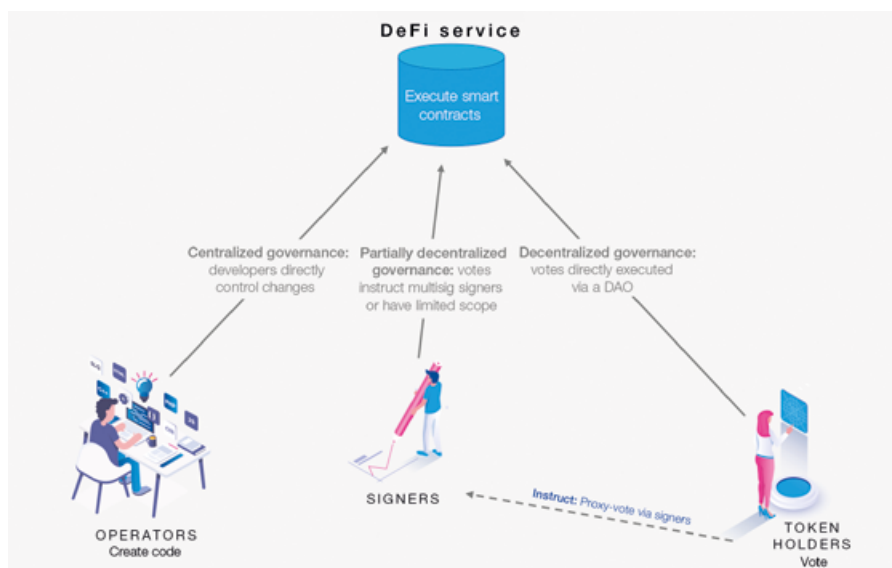
7. DeFi risks and the decentralisation illusion – BIS Quarterly Review, December 2021.

8. Most platforms use central governance frameworks to guide decisions, outlining how to set strategic and operational priorities (e.g. regarding new business lines).

FIGURE 1.

Main forms of DeFi governance : initial centralised governance, partially decentralized governance and fully decentralized governance

Source: World Economic Forum – DeFi policy-maker toolkit – June 2021



and incentive schemes which aim to increase the scale of platforms⁹. As a result, the holding of coins and also of governance tokens tends to be quite concentrated in the hands of a small group of people comprising (e.g. platform core developers¹⁰, major transaction validators, early investors in the project). Governance tokens are also tradeable in most cases, which allows holders to increase their positions. The BIS also points out that smart contracts cannot take into account all situations and contingencies, meaning that human decisions (made in a centralised way) will always be needed at some point.

A third specificity of DeFi platforms, beyond smart contracts and decentralization, is the importance of stablecoins for their operations (i.e. cryptoassets that maintain a fixed face value vis-à-vis fiat currencies such as the US dollar)¹¹. Stablecoins are used as collateral or for the payment of interest in DeFi protocols and are therefore essential to the functioning of DeFi markets facilitating fund transfers between users and across platforms. Stablecoins avoid multiple conversions to and from fiat money for DeFi market participants and also act as a bridge between crypto and traditional financial systems.

1.2 Main DeFi services and current market trends

The types of financial services that are provided by DeFi applications are similar to those offered by traditional financial players, what differs is how these services are

delivered (via smart contracts and in a decentralised way) and the fact that they are based on crypto-assets. These services include the purchase of fungible and non-fungible crypto-assets issued on DeFi blockchains, the trading of crypto-assets on decentralised exchanges (DEXs), crypto-asset based lending which is mostly collateralised similarly to securities lending or repos, asset management and payment activities and the provision of derivative and insurance products (see Appendix for a more detailed description of these services).

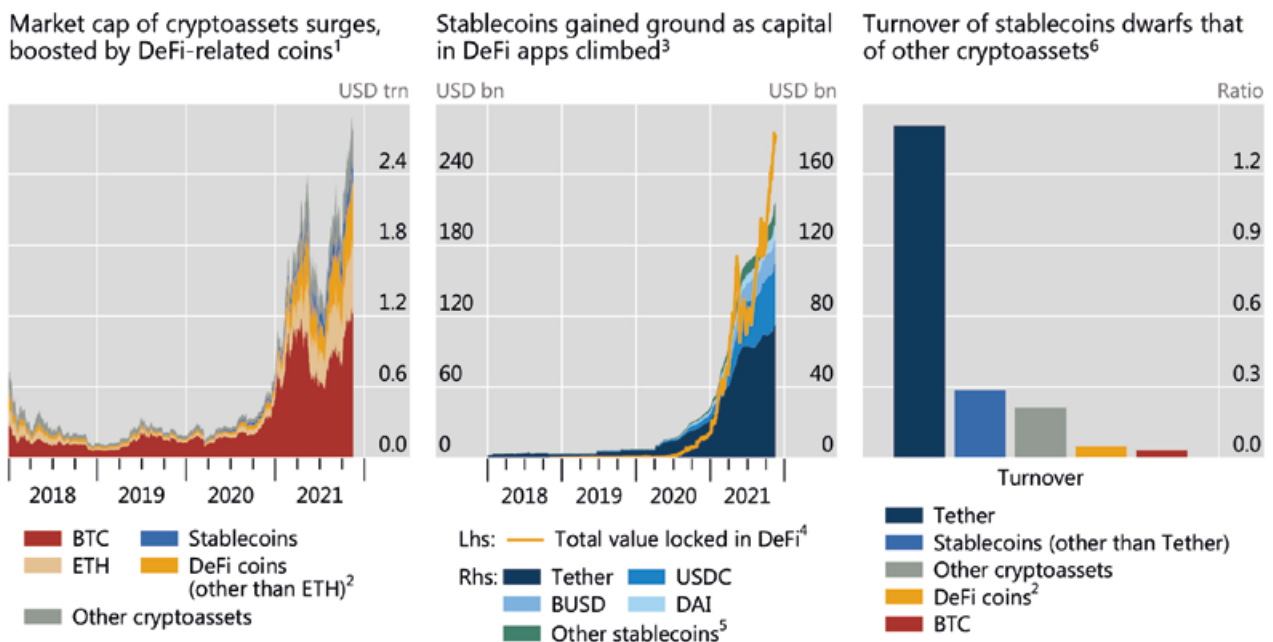
Some activities and services are however specific to DeFi systems. These include automated market-making which is used on DEXs to price transactions in a continuous way¹² and uncollateralised “flash loans” which allow assets to be borrowed and repaid with interest within the same blockchain transaction and are used in particular to support arbitrage activities¹³.

Although DeFi is an emerging sector of finance and still represents a small portion of cryptocurrency transactions, a sudden surge of activity was observed in 2020 and 2021. The total value of crypto-assets locked in¹⁴ DeFi applications built on Ethereum blockchains reached \$86 Bio at the end of 2021¹⁵ (down from a record \$110 Bio in November 2021) compared to \$10 Bio at the beginning of 2020¹⁶. Some estimates published by the BIS also show that the total value locked in DeFi across all cryptoassets was higher than \$160 Bio at the end of 2021 (see Graphs below). This means that the growth of DeFi was faster than that of overall cryptocurrency

9. Many DeFi systems propose financial incentives in order to promote the creation of liquidity (for trading) or the increase of locked-up collateral (for credit) leading to a concentration of coins or tokens in the hands of the main users of the platform. For example some blockchains based on proof-of-stake allow validators, who are selected randomly, to stake more of their coins (as collateral) so that they have a higher chance of winning the next block and receiving compensation.
 10. in charge of managing and upgrading protocols.
 11. Stablecoins used on DeFi platforms are mostly USD denominated tokens that are backed by financial assets held as reserves. Tether, USD Circle and Binance USD are the three main stablecoins used on DeFi platforms, representing nearly 90% of volumes.
 12. Automated market making (AMM) protocols use algorithms that continuously price transactions based on orders and available liquidity using mathematical formulas. On DEXs using AMM protocols, users are not matched with a counterparty via an orderbook, but they receive the requested token nearly instantaneously from an underlying liquidity pool.
 13. Arbitrage opportunities between different crypto-assets and related to price disparities of such assets between DEXs.
 14. « Locked » refers to the amount subject to or held by the smart contracts of the DeFi applications and protocols.
 15. Source defipulse.com
 16. The WEF report (DeFi policy-maker toolkit – June 2021) also estimates that between mid-2020 and mid-2021 the number of user wallets was multiplied by 11 reaching 1.2 million and the number of DeFi applications reached more than 200.

GRAPHS. Development of DeFi activities underpinned by the growth of locked-in stablecoins

Source: BIS Quarterly Review - December 2021 (data sources CoinGecko, Defi Llama, BIS calculations)



BTC = Bitcoin; BUSD = Binance USD; ETH = Ether; USDC = USD Coin.

¹ Market capitalisation of top 100 cryptoassets as of 15 November 2021 (seven stablecoins, 36 DeFi coins and 55 other cryptoassets). ² Cryptoassets issued by DeFi platforms. ³ Stacked areas plot stablecoins' value in circulation. The selected stablecoins are those ranked as the top four by market capitalisation as of 15 November 2021. ⁴ Total value locked refers to the size of capital pools underpinning DeFi protocols. The sample includes 679 protocols. ⁵ Includes 57 other stablecoins. ⁶ Based on the top 20 cryptoassets by market capitalisation as of 15 November 2021 (three stablecoins, 10 DeFi coins and seven other cryptoassets). Turnover is the monthly average of the daily volume-to-market capitalisation ratio from 15 October to 15 November 2021.

usage in 2021, which was multiplied by 5 with a total transaction volume reaching \$15.8 trillion¹⁷.

Lending was the largest DeFi segment in 2021, representing more than half of the value of cryptoassets locked in DeFi applications and DEXs were the second largest activity representing about one third of the value¹⁸.

DeFi, as a basis for a more decentralised and permissionless approach to finance, provides new functionalities and opportunities that may be beneficial to the wider financial ecosystem in the future.

However, the growth of DeFi systems is mainly driven at present by the speculation on crypto-assets issued and used on DeFi platforms, the recycling of profits made from other cryptoasset activities and arbitrage across different cryptoassets and also by the additional leverage opportunities offered by DeFi to professional investors,

DeFi moreover faces significant challenges in terms of scalability of the underlying blockchain-based settlement layer and its uptake, beyond speculative crypto-asset trading and arbitrage, is also dependent on the development of asset tokenisation and available

liquidity. There is moreover a particular scalability challenge for DeFi due to the decentralised nature of the platforms, which increases the challenge to keep up with demand for block space and may lead to higher transaction fees and longer confirmation times than with more centralised systems.

1.3 Architecture of DeFi platforms

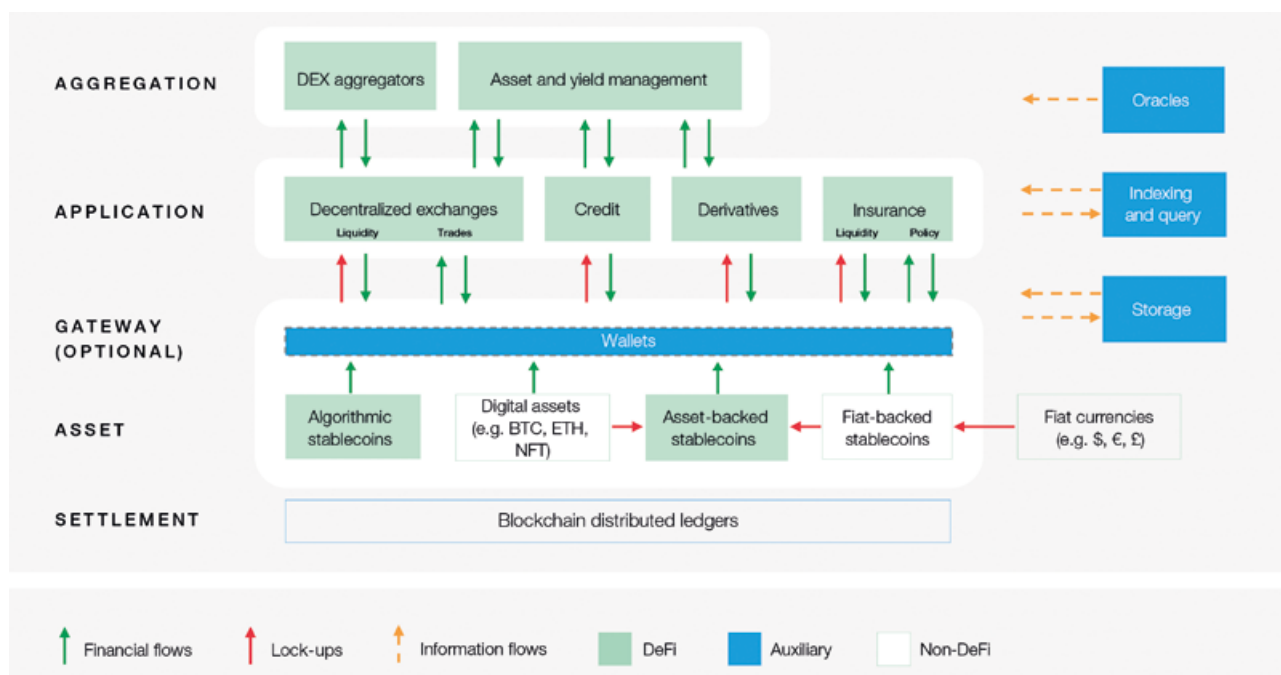
In terms of architecture, DeFi platforms are constituted of several building blocks or layers which interact with each other in order to provide different types of financial services (see Figure 2 below). The foundation of DeFi platforms is a permissionless blockchain system, which stores ownership information securely and ensures that any state changes adhere to defined rules (the settlement layer). This bottom layer corresponds to the order execution and settlement functions of conventional financial services. The second layer is the asset layer which consists of all digital assets that are issued on the blockchain, including fungible tokens, non-fungible tokenised assets, and also native assets and stablecoins. On top of these two layers is the protocol layer, which provides standards for executing the different financial services that may be delivered on the DeFi platform (i.e. trading, loans, derivatives...). These standards are usually implemented as a set of

17. Source Chainalysis <https://blog.chainalysis.com/reports/2022-crypto-crime-report-introduction/>

18. Source defipulse.com

FIGURE 2. THE DEFI ARCHITECTURE

Source: World Economic Forum – DeFi policy-maker toolkit – June 2021



smart contracts that can be accessed in an interoperable way by any DeFi application. These applications which are positioned in a fourth layer of the DeFi system (the application layer) provide user-oriented interfaces allowing customers to purchase services or execute transactions. Applications corresponding to generic financial services can be aggregated to provide more sophisticated or customized services (such as cryptoasset management services).

Interfaces are also established between DeFi platforms and various external applications. So-called oracle services allow data and content external to the blockchain (e.g. asset prices needed to execute transactions or to price derivatives), to be incorporated into the DeFi transaction flow, enabling the execution of smart contracts. Connections can also be established with external wallets, allowing users to store, transfer and manage their digital assets.

DeFi protocols and applications are moreover “composable”, meaning that they are normally designed so that the programmatic components underlying them are interoperable and can be combined to create new financial instruments and services operating on the shared settlement layer of the blockchain. DeFi advocates sometimes suggest visualizing this concept as akin to building blocks or legos. This is facilitated by the widespread use of open-source code and the permissionless nature of the network which allow any participant to look into the code and integrate or fork¹⁹ different components in order to create new services and products or customize existing ones. This feature supports innovation on DeFi platforms and increases network effects, since participants can re-use assets on different applications, but it may also add to the complexity of using such platforms.

2. MAIN OPPORTUNITIES AND CHALLENGES ASSOCIATED WITH THE DEFI ECOSYSTEM

2.1 Opportunities and benefits associated with DeFi

DeFi offers many potential opportunities that may contribute to increasing the efficiency, flexibility, transparency and accessibility of the financial system, provided a sufficient scale and level of liquidity can be achieved.

Efficiency and flexibility. The use of smart contracts on DeFi platforms potentially eliminates the need for institutions such as market infrastructures or financial intermediaries for handling the transactions concerned. This may reduce costs and intermediation risks, although some features of DeFi such as the high levels of collateralisation may also diminish capital efficiency, potentially offsetting part of these benefits. In addition, token transfers can be much faster and easier to implement with DeFi than traditional financial transactions on a domestic and cross-border level. DeFi platforms are moreover highly flexible due to the composability of protocols and applications.

Transparency and accessibility. The use and assessment of DeFi applications and smart contract codes are in theory accessible to all stakeholders of a DeFi platform, contributing to the openness of these systems. Restrictions to the access to certain tokens (for example security or derivative tokens) can however be built into the token contract if needed for reasons e.g. of customer protection. The transactions recorded are also traceable and verifiable on the blockchain, albeit in a pseudonymous way.

19. Fork code i.e. take source code and create an independent development.

Trust. The fact that DeFi services are implemented via a set of smart contracts and according to the logic of transparent DeFi protocols means that they are executed and recorded automatically according to predetermined rules, eliminating intermediation or custody risks. In addition, changes to the protocols of the settlement layer or of DeFi applications are normally executed through transparent governance mechanisms in which all users holding governance tokens can participate²⁰.

2.2 Potential risks posed by DeFi applications

Generally speaking, the financial risks associated with DeFi activities (e.g. counterparty, leverage, liquidity risks...) are similar to those of traditional finance since they concern the same types of services, whereas operational and technology risks and to a certain extent illicit activity risks are more specific, due to the decentralised nature and particular technical features of the DeFi architecture. Moreover, DeFi activities are mostly unregulated at present, which introduces additional consumer protection and regulatory arbitrage risks compared to traditional finance. But this situation is due to evolve in the EU with the implementation of MiCA and the update of AML/CFT rules (see section 3).

Spillover risks and related financial stability issues related to the linkages between DeFi and the traditional financial system also need considering (e.g. with the use within DeFi protocols of stablecoins backed by fiat collateral²¹ and the expected increase in the use of tokenised assets as collateral). These risks are limited at present by relatively low asset and liability side exposures, but may grow as DeFi develops.

2.2.1 Financial risks

Financial activities performed on DeFi applications give rise to market, leverage, liquidity and counterparty risks in the same way as those that are processed by traditional financial players. However the nature and magnitude of these risks may differ due to the particular features of crypto-assets and crypto-asset transactions.

Counterparty and intermediation risks should be in theory lower with DeFi than with traditional finance or even inexistent, due to the use of smart contracts and over-collateralisation and because there is no separate settlement step (transactions are executed through a transfer of the underlying value on the blockchain). However, the absence of public backstop and access to central bank balance sheets in DeFi platforms introduces potential financial risks in periods of stress and also limitations (e.g. in the volumes of credit provision). In

addition, the high volatility of underlying digital assets may reduce the initial level of collateralisation of loans in certain periods, although platforms can put in place mechanisms to liquidate under-collateralised loans automatically. At the current stage of development of the DeFi market there is moreover a significant concentration risk due to the fact that a large part of the activity is concentrated in a limited number of protocols running mostly on the Ethereum blockchain²² and that many key operations are held in the hands of a relatively small number of persons or entities (e.g. the core development team).

Leverage risks are also limited normally by over-collateralisation, with the caveats mentioned above, but a certain number of restrictions concerning credit creation that exist for regulated financial activities do not apply to DeFi at present. For example, funds borrowed on a DeFi platform can be re-used as collateral in other transactions increasing exposure; DEXs allow higher margins and leverage for derivative contracts than traditional exchanges²³. Flash loans, which are uncollateralised, may also create additional leverage and credit risks if they were to expand.

As for liquidity and market risks, the difficulty of assessing the intrinsic quality and value of crypto-assets may also exacerbate these risks, particularly in periods of stress or in case of loss of trust concerning a particular type of crypto-asset, leading to possible runs.

2.2.2 Illicit activity risks

Crypto-asset transactions are usually associated with a high risk of illicit activity (financial crime, fraud and market manipulation), due to some of their features such as the potential for increased anonymity of transaction flows and counterparties and the speed of transactions. Some sources quoted by the BIS have estimated that in 2019 about 1.1% of all cryptocurrency transactions worth around \$ 11 billion were illicit²⁴. More recent figures however show that illicit activity concerning cryptoassets has gone down since 2019 in relative terms, when taking into account the growth of the market²⁵, reaching 0.15% of transaction volumes in 2021, down from 3.37% in 2019. The recent review of AML / CFT rules at the EU and global levels to take into account crypto-asset based transactions should further facilitate the mitigation of these risks going forward (see 3. Further down).

DeFi may increase illicit activity risks associated with cryptoassets, because transactions take place without the involvement of financial intermediaries which means that AML/CFT²⁶ preventive measures such as customer due diligence, record-keeping and suspicious

20. In some less decentralised DeFi platforms token holders may only have power over certain parameters or the initial core team of developers may retain veto power.

21. Issuers of stablecoins pegged to national currencies and backed by fiat collateral are increasingly investing in commercial paper (CP) and other short term assets for example, as part of their reserve management strategies, which may potentially disrupt the CP market and related money market funds (MMF) in case of mass redemption event – source OECD.

22. Source OECD Why DeFi matters and the policy implications – January 2022.

23. See DeFi risks and decentralisation illusion pp. 29-30 – BIS Quarterly Review December 2021.

24. Source FSI Insight N°31 Supervising cryptoassets for anti-money laundering – April 2021.

25. Source Chainalysis - Crypto Crime Trends for 2022: Illicit Transaction Activity Reaches All-Time High in Value, All-Time Low in Share of All Cryptocurrency Activity – January 6 2022 <https://blog.chainalysis.com/reports/2022-crypto-crime-report-introduction/>

26. AML / CFT: Anti-Money Laundering and Combating the Financing of Terrorism.

transaction reporting are more difficult to implement. DeFi, due to its novelty, is also a source of new scams and thefts and the underlying smart contracts are also an additional target for hackers.

2.2.3 Operational and technology risks

The settlement layer of DeFi systems is exposed to risks that are common to all blockchain-based systems, such as possible attacks on the blockchain network or miner risks (due to the malicious behaviour of miners or manipulations e.g. in the order in which transactions are executed).

The architecture and technical features of DeFi platforms expose them also to some specific risks. The first are smart contract risks, related to programming flaws that may lead code to not execute as intended or that may create vulnerabilities that malicious attackers may exploit. These coding risks also exist on centralised systems, but they are exacerbated in DeFi by the fact that smart contracts are due to function in an automated way and that possible errors are not easy to redress (they are usually subject to a decentralised arbitration mechanism). Oracle-dependent DeFi protocols are also exposed to possible manipulations or attacks that may impact data feeds or corrupt protocols.

DeFi protocols and applications themselves are also exposed to operational security risks which can be due to hacks, a corruption of the admin keys used by the core developer team, if these are not stored securely, or to the malicious behaviour of members of the core team. The BIS mentions for example the risk that transaction validators holding a large proportion of coins earned through the validation process may alter the blockchain for financial gain, congest the chain with artificial trades in order to raise fees or front-run large orders. A variety of techniques are however used to mitigate these risks including requiring multiple signatures (multisig) and implementing timelocks specifying the earliest time at which a transaction can be confirmed.

3. POLICY IMPLICATIONS OF DEFI

In the EU, crypto-asset activities, whether they are centralised or decentralised, are due to be regulated by the Markets in Crypto-Assets (MiCA) regulation, which adopts a technology-neutral approach (same risks, same rules). The Digital Operational Resilience Act (DORA) should moreover help to mitigate ICT risks such as cyber-risks that may affect DeFi platforms and their different components among others.

MiCA proposes a new EU legal framework for crypto-assets (including stablecoins), that do not fall under existing EU legislation²⁷, which is the case of most

tokens issued, traded or used as collateral on DeFi platforms. In terms of scope, these rules apply to currently unregulated crypto-asset issuers and service providers and their users. Although cryptoasset exchanges, trading platforms and wallet providers are the main service providers explicitly mentioned in the legislative text, it can be expected that MiCA will apply to all activities provided on DeFi platforms except those that may be in the scope of other regulations, such as payment activities.

MiCA aims to provide legal certainty for crypto-asset issuers and providers, enhance consumer protection and ensure financial stability while supporting innovation. To this end MiCA requires crypto-asset service providers to be authorised and physically present in the EU and mandates the implementation of a certain number of safeguards including capital requirements, the segregation of client's assets, the implementation of procedures concerning complaints and investor rights, as well as provisions for the supervision of cryptoasset issuers and service providers. MiCA also establishes uniform disclosure and transparency rules related to crypto-assets, such as the publication of a white paper and requirements for the offering and marketing of crypto-assets to the public, aiming to improve the protection of participants in these platforms. Cryptoasset service providers authorised in one Member State will also be able to passport their services across the EU.

AML / CFT requirements are moreover being reviewed at the EU and global levels to adapt them to financial activities involving crypto-assets and the service providers and users concerned and will therefore apply to DeFi platforms. In October 2018 and June 2019, the Financial Action Task Force (FATF) adopted changes to its international AML/CFT recommendations to clarify that they apply to financial activities involving virtual assets such as cryptoassets, and virtual asset service providers and this was followed in October 2021 by the publication of a more detailed risk-based guidance²⁸. In the EU, AML / CFT rules are also being revised in order to extend their scope to cryptoassets, their holders and related service providers²⁹. The EU proposals aim in particular to extend the information requirements currently applying to traditional transfers of funds to cryptoasset transfers. Measures proposed include the requirement for the customers of cryptoasset service providers to be subject to due diligence, the full traceability of transactions and the prohibition of anonymous cryptoasset wallets³⁰.

Concerning the regulation of DeFi activities, an issue that is often put forward — besides the challenge of finding an appropriate balance between risk mitigation

27. Some derivatives may for example qualify as financial instruments and be regulated under MiFID II / MiFIR, and therefore be out of the scope of MiCA.

28. Greater guidance from the FATF is provided in 6 key areas: (i) clarification of the definition of VA and VASP (virtual assets and virtual asset service providers), (ii) guidance on how the FATF standards apply to stablecoins and the range of entities the standards apply to, (iii) additional guidance on the risks and tools available to address AML/TF risks for peer-to-peer transactions, (iv) updated guidance on the licensing and registration of VASPs, (v) additional guidance on the implementation of the 'travel rule', and (vi) principles for information-sharing and cooperation among VASP supervisors. Source FATF - Updated guidance: a risk-based approach to virtual assets and virtual asset service providers October 2021.

29. An agreement was reached in December 2021 at Council level on a mandate to negotiate these proposals with the European Parliament.

30. The crypto-asset service provider of the originator will therefore need to ensure that transfers of crypto-assets are accompanied by the relevant information on the originator. In addition, the crypto-asset service provider of the beneficiary must implement effective procedures to detect whether the information on the originator is included in, or follows the transfer of crypto-assets as well as effective procedures, including, where appropriate, ex-post monitoring or real-time monitoring, to detect whether the required information on the originator or the beneficiary is missing.

and supporting innovation, which is common to all digital policy initiatives — is the difficulty of implementing and enforcing policy provisions in a decentralised environment. Although DeFi does not significantly increase the likelihood of illicit activity per se, its decentralised, non-custodial and composable structure may indeed make it more difficult to identify responsibilities, liabilities and accountable entities. For example, the possibility to implement certain ‘entity-centric’ provisions of MiCA such as the requirement for the service provider to be authorised and physically present in the EU is questioned. Some requirements of existing financial regulations may also need to be reviewed to adapt them to the decentralised environment of DeFi. As previously mentioned, some public authorities such as the BIS have however argued that most DeFi platforms adopt a certain form of centralisation in their governance (e.g. around holders of governance tokens or admin keys, the use of governance guidelines) and that decisions are taken and implemented by a limited group of stakeholders in most cases (notably the core team of developers), which provides a basis or entry point for regulating and supervising these platforms. This may nevertheless evolve as DeFi platforms expand and implement further decentralisation notably in terms of governance. A first step would be to ensure that MiCA transparency requirements provide sufficient information regarding in particular the governance and operational arrangements used on DeFi platforms (e.g. the attribution of governance tokens, voting schemes, admin keys...).

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APPENDIX

Description of the main services currently provided on DeFi platforms

Purchase of tokenised assets Tokenised assets are issued on DeFi blockchains in the form of cryptoassets representing the value of physical assets, securities or digital assets. These tokens can include a promise such as interest payments, dividends or the delivery of a service, the delivery of which is secured by smart contracts allowing an automatic execution in a transparent way. Claims are usually collateralised within the smart contract, meaning that the cryptoasset issuer receives collateral (i.e. assets such as stablecoins) in exchange for the liability represented by the cryptoasset. Although this may resemble a banking process, the buyers of such cryptoassets do not benefit from any deposit insurance or public backstop and issuers rely solely on collateral.

Decentralised exchanges (DEX) allow customers to trade digital assets which may be stable coins or floating value tokens. Unlike centralised crypto-asset exchanges (CEX)³¹, DEXs do not take custody of user funds and do not control matching or execution because trade execution happens through a smart contract performing both sides of the transaction in one indivisible transaction and mitigating potential counterparty risk. Some DEXs match through order books which can be on-chain and therefore totally decentralised or more frequently off-chain, managed by centralised third-parties which provide participants with the information they need to select an order they would like to match. Other DEXs use automated market-maker (AMM) protocols, where an algorithm continuously prices transactions based on orders and available liquidity using mathematical formulas. In this latter case, users are not matched with a counterparty via an orderbook but they receive the requested token nearly instantaneously from an underlying liquidity pool making it a pool-to-peer transaction rather than a peer-to-peer transaction. Liquidity is ensured by liquidity providers who are awarded fees and governance tokens and can potentially work for several DEXs.

Lending in DeFi involves the creation of interest-bearing instruments that must be repaid at maturity. Loans are granted between anonymous borrowers and lenders, either bilaterally (peer-to-peer) or based on pooled capital and interest rates are determined by the supply and demand of liquidity rather than by the creditworthiness of the borrower. The collateral deposited in the form of crypto-assets is locked into a smart contract and only released once the debt is repaid³². The lack of intermediating function³³ replaced by automated, decentralised and non-custodial protocols, the absence of ratings and legal recourse and also the high volatility of crypto-assets mean that these loans are nearly always over-collateralised. DeFi lending activities thus mirror market-based lending (securities lending, repo) rather than traditional bank lending.

To protect the lender, loans can also be automatically liquidated in some cases when the collateralisation ratio falls below a certain threshold. DeFi platforms also offer uncollateralised “flash loans” in which assets are borrowed and repaid with interest within the same blockchain transaction. These loans are mostly used for arbitrage and portfolio restructuring activities, allowing arbitrageurs to act without their own capital by taking out a loan for the entire arbitrage trade and then repaying the loan. If the borrower has not returned the funds plus interest at the end of the transaction’s execution cycle, the whole transaction including the loan itself will be reverted.

Decentralised derivatives or insurance also exist on DeFi. They are tokens that can be programmed to derive their value from the performance of an underlying asset or group of assets, the outcome of an event or any other observable variables. For example a synthetic asset can be created that behaves as a stock, commodity, swap or a digital asset such as a NFT (non-fungible token). It can also be tied to the activity of a business or the materialisation of a risk or market evolution. They usually require an oracle connecting the blockchain to an external information system to track the variables on which the derivative is based, thus introducing some dependencies and centralised components in the DeFi system. Insurance products are based on tokens similar to those used for derivatives, allowing the spreading of risks across a common capital pool.

Decentralised asset or portfolio management can be used to follow pre-determined investment strategies involving crypto-assets. Decentralised investment funds allow users to invest in a basket of crypto-assets and employ a variety of strategies without having to handle the tokens individually and also without having to go through a custodian, since the crypto-assets are locked up in a smart contract. Tokens corresponding to a partial ownership of a fund (i.e. of the crypto-assets locked into the smart contract) are issued to investors who can redeem them at a later stage on a DEX. Portfolios can be managed automatically through strategies coded in the smart contract (e.g. with an automatic rebalancing of portfolio weights) or more actively with the support of an asset manager. In the latter case the smart contract ensures that asset managers adhere to the rules and risk profile of the fund.

31. CEXs maintain off-chain records of outstanding orders posted by traders in the form of limit order books. CEXs and DEXs have both substantially grown since 2020, but DEX transaction volumes represent less than 10% of the total – Source BIS Quarterly Review December 2021.

32. Lenders are rewarded with tokens which are native to the platform.

33. E.g. to evaluate of the capacity to repay the loan.