



Decentralised Finance

Current Landscape and Regulatory Developments

June 2024

Hong Kong Institute for Monetary and Financial Research
HKIMR Applied Research Report No.1/2024



Contents

	Pages
Foreword	2
Acknowledgements	3
Executive Summary	4
Chapter 1 DeFi and its Applications	7
<p>In a rapidly evolving landscape, DeFi is developing its potential as an alternative financial system that actualises the ethos of blockchain technology.</p>	
Chapter 2 Risks and Vulnerabilities	17
<p>DeFi activities highlight a combination of existing and new vulnerabilities that are attracting the attention of financial authorities.</p>	
Chapter 3 Regulatory Challenges and International Approaches to Regulation	26
<p>Authorities in various jurisdictions are adopting diverse approaches to guide the development of DeFi in the spirit of recommendations made by international organisations.</p>	
Chapter 4 Views of Market Participants in Hong Kong	43
<p>Our survey revealed Hong Kong’s growing interest and adoption of virtual assets, despite challenges.</p>	
Chapter 5 Views and Considerations for Fostering a Healthy DeFi Ecosystem	56
<p>Effective regulation and deep-dive research can facilitate the development of a healthy and vibrant DeFi ecosystem.</p>	
Conclusion	66
Appendix A: Background of the Virtual Assets/DeFi Survey	67
Appendix B: List of Abbreviations	68
Appendix C: Glossary of Technical Terms	69
Appendix D: References	71

Foreword

Over the past two decades, the pace of technological advancement has been accelerating at an unprecedented rate, particularly since the emergence of the third generation of the Internet (Web3) encompassing individual control of personal data and the use of crypto-assets and blockchain. The attractiveness of Web3 is that it is decentralised, meaning that an intermediary is not necessary for virtual transactions between parties. This represents vast potential to transform existing business models, especially in the financial services industry.

Playing a prominent role within Web3, Decentralised Finance (or DeFi henceforth) is the delivery of financial services without traditional financial intermediaries, offering a potentially faster and more cost-effective, accessible, and secure alternative to conventional financial systems. As the regulatory environment surrounding DeFi is still evolving, a robust regulatory framework is essential, not only managing the potential risks effectively but also promoting the sustainability of financial innovations.

Against this backdrop, this report provides the investigation of the DeFi's existing landscape, covering opportunities, risks and a comprehensive discussion of the international regulatory experience, aiming to draw attention to regulatory developments and highlight potential areas for collaborations between market participants and regulators that may be important to Hong Kong's developments. To enrich

readers' understanding of the virtual asset ecosystem in Hong Kong, this report also presents the findings of a survey commissioned by the Hong Kong Institute for Monetary and Financial Research summarising the views of local financial services practitioners on the current market landscape and potential challenges of virtual asset markets. The survey participants included traditional financial institutions (such as banks, asset managers, and insurers) as major institutional customers and virtual asset service providers as major institutional providers. The report concludes by proposing some considerations for the healthy development of the DeFi market in Hong Kong.

As Hong Kong is progressively fostering a vibrant virtual assets industry, we hope that this report provides market participants and regulators, locally and internationally, with an informed perspective on regulatory developments that support DeFi innovation while managing the emerging risks with consumer protection measures in place to promote the growth of the virtual asset ecosystem.

Mr Enoch Fung

Chief Executive Officer
Hong Kong Academy of Finance

Executive Director
Hong Kong Institute for Monetary and Financial Research

Acknowledgements

This report has greatly benefitted from the contributions of various external collaborators. We thank the Financial Services and the Treasury Bureau, the Insurance Authority, the Mandatory Provident Fund Schemes Authority, the Securities and Futures Commission, and various divisions of the Hong Kong Monetary Authority, including the Communications Division, the Digital Finance Division, the External Division, the Fintech Facilitation Office, the Banking Supervision (Supervisory Technology) Division, and the Market Development Division for their comments and suggestions. We wish to extend our gratitude to Dr Philip Turner of the University of Basel for his inputs to Chapters 2, 3.1, and 5.2. We are also grateful for the collaboration of PricewaterhouseCoopers Limited in designing and administering the survey entitled 'Current Landscape and Developments of Virtual Assets/DeFi in Hong Kong's Financial Services Industry' from May to July 2023, and in conducting interviews with various market participants, including banks, insurers, asset managers, and virtual asset service providers. Finally, we thank the HKIMR Council of Advisers for Applied Research for their continued support for and guidance of the research activities of the Institute.

Executive Summary

DeFi, short for Decentralised Finance, is a revolutionary concept that aims to change the traditional financial system by leveraging blockchain technology and smart contracts. It aims to provide various financial activities, such as lending, borrowing, and trading, without relying on centralised institutions. However, DeFi remains in its nascent stage and faces several challenges. One of them is the regulatory landscape. As DeFi is inherently decentralised, it often falls outside the purview of existing financial regulations. This lack of regulatory oversight can create uncertainty and hinder broad adoption.

This report provides a comprehensive overview of the opportunities and challenges created by DeFi activities and the regulatory approaches advocated by international organisations and individual jurisdictions for crypto-asset and DeFi markets. The discussion is complemented by the findings of a survey and a set of interviews commissioned by the Hong Kong Institute for Monetary and Financial Research to solicit the views of key market participants in Hong Kong, including financial institutions and virtual asset service providers (VASPs), on the current and future applications of virtual assets (VAs). Finally, the report offers some considerations for facilitating further developments of DeFi in Hong Kong, with the aim of contributing to the discussions on improving the ecosystem and its implications for the financial services industry in Hong Kong.

Since blockchain appeared as a decentralised payment alternative in 2008, it has grown to include a broad spectrum of crypto-assets that have attracted widespread investor interest. Beginning as a small segment of the crypto-asset market, DeFi market capitalisation surged from US\$6 billion to a high of approximately US\$170 billion in 2021 within two

years, before stabilising at approximately US\$80 billion in 2023. **These numbers demonstrate that DeFi's potential cannot be ignored.** Owing to its unique characteristics ranging from atomic settlement, composability, and programmability to permissionless accessibility, **DeFi has the potential to provide new financial services, such as liquid staking, flash loans, and automated market makers, with reduced transaction speed and enhanced innovation, automation and financial inclusion.** Moreover, DeFi replicates many traditional financial services, including exchanges, borrowing and lending, derivatives, insurance, and asset management. The decentralised nature of DeFi protocols also enable their operation by forms of community-driven governance without being controlled by centralised institutions, highlighting the potential of this innovative technology to transform the financial landscape.

Nonetheless, the opportunities afforded by DeFi are not without risk. **Significant losses due to failures in DeFi markets in 2022 highlighted some risks and vulnerabilities,** leading to enhanced scrutiny by the international regulatory community to understand and mitigate the risks that DeFi poses to financial stability. With reference to published reports by international organisations and the emerging academic and policy literature, the risks and vulnerabilities of DeFi markets can be summarised into several key areas. First, **governance issues** arise from the fact that DeFi protocols often claim to be decentralised but are effectively centralised, leading to misrepresentations and moral hazards. Second, **compliance and legality** issues stem from the borderless nature of blockchain and the lack of cohesion among jurisdictions regarding legislation and its enforcement in DeFi markets. Third, **economic**

and technological vulnerabilities across multiple layers of the DeFi stack can result in the exploitation or operational failure of DeFi protocols. Fourth, the DeFi's **interconnectedness** with traditional finance (TradFi) and centralised crypto-asset finance (CeFi) can amplify financial contagion in the overall financial system. Fifth, the **high leverage and collateralisation** prevalent in the DeFi market make it volatile, especially during economic downturns. Sixth, **investor and consumer protection** measures for DeFi markets are still insufficient compared with those for TradFi markets.

The risks and vulnerabilities inherent in DeFi markets may also pose several challenges for financial authorities. Specifically, in the DeFi context, it is particularly difficult for financial authorities to identify parties to hold accountable for DeFi protocols (i.e., regulatory hooks) in the absence of obvious centralised actors. The smart contracts used to facilitate DeFi transactions may not be legally enforceable, which limits the legal protections for investors. A lack of standardised taxonomy and cohesive regulations, together with DeFi's cross-border nature, has made global coordination to regulate DeFi difficult. Furthermore, the increasing connectivity between DeFi and TradFi could lead to heightened financial instability.

In the face of the emergence on new corporate structures providing financial services, **many financial authorities over the globe advocate for 'same activity, same risk, same regulation' as the guiding principle.** Along this guiding principle, international organisations have also provided high-level recommendations for these authorities to mitigate major risks and regulatory challenges. They

put emphases on enhancing international collaboration and monitoring interconnections across markets, minimising regulatory arbitrage opportunities, and supervising entities that providing crypto-asset services. In case different regulations are needed to address different levels of risks, some leading jurisdictions in DeFi have undertaken regulatory actions by clarifying existing regulations through statements or circulars, by extending regulatory frameworks, or a combination of both approaches.

Turning to developments in Hong Kong, the Government has welcomed the growth of the VA industry and have been working with the financial regulators to support its sustainable and responsible development, as noted in their Policy Statement published in 2022. Against this background, **our survey of local VA market participants revealed their growing involvement with VAs in their business operations and expressed keen interest in expanding their involvement with VAs and related businesses in the near future.** Most VASPs were among the first movers to involve VA in their business operations, while most TradFi entities are planning to incorporate VA in the near future, expecting it to create new revenue streams, reduce costs, enhance customer experiences and provide diversification benefits in the longer run. Several major VA types, such as cryptocurrencies, non-fungible tokens, tokenised traditional assets, and stablecoins, are expected to remain prevalent in the next few years. Therefore, various products and services are expected to become increasingly popular, such as tokenisation, payment and custodian solutions, conversion and exchange services, and other technology-related solutions. In relation to DeFi activities undertaken by market participants, reported

use cases ranged widely, including mining/staking-related businesses, yield aggregators, liquidity pooling activities, and decentralised exchanges/trading.

In terms of the challenges related to their engagement in VA, the survey respondents identified several regulatory challenges, such as overall uncertainty surrounding permissible activities, difficulty in complying with anti-money laundering and counter-financing of terrorism (AML/CFT) requirements, and concerns about cybersecurity and data risks. They also identified some non-regulatory challenges, such as limited functionality and scalability, technology complexity, lack of user adoption, and volatility in the VA market. Overall, **market participants in Hong Kong agree that a well-defined regulatory framework, a robust financial infrastructure and network, and a supply of talent with blockchain-related skills are crucial to foster further development of the local DeFi and VA markets.** On the regulatory side, policymakers and financial authorities in Hong Kong have been supportive of the sustainable and responsible development of VA markets by engaging in pilot projects to explore the potential benefits of distributed ledger technology and crypto-assets.

Through a review of the insights provided by market participants and those drawn from international experiences with DeFi, this report provides some **considerations to further develop DeFi markets in Hong Kong.** First, **the regulation of DeFi should continue to be inspired by the guiding principle of 'same activity, same risk, same regulation',** with deep-dive research being of paramount importance to enhance the understanding of the risks associated with DeFi developments. Second, it would be worthwhile to **assess the possibility of co-developing centralised and decentralised financial infrastructure as a hybrid model** to enjoy the benefits of both worlds while bringing these activities within regulatory remits. Third, **promoting blockchain-related talent development** is also essential for addressing the knowledge gaps that hinder the adoption of VA and DeFi. Finally, **strengthening public-private sector dialogue and collaboration** can allow financial authorities to resolve regulatory uncertainty and better understand market needs, contributing to a healthy and vibrant DeFi ecosystem in Hong Kong.

Chapter 1

DeFi and its Applications

In a rapidly evolving landscape, decentralised finance (DeFi) is developing its potential as an alternative financial system that actualises the ethos of blockchain technology.

HIGHLIGHTS:

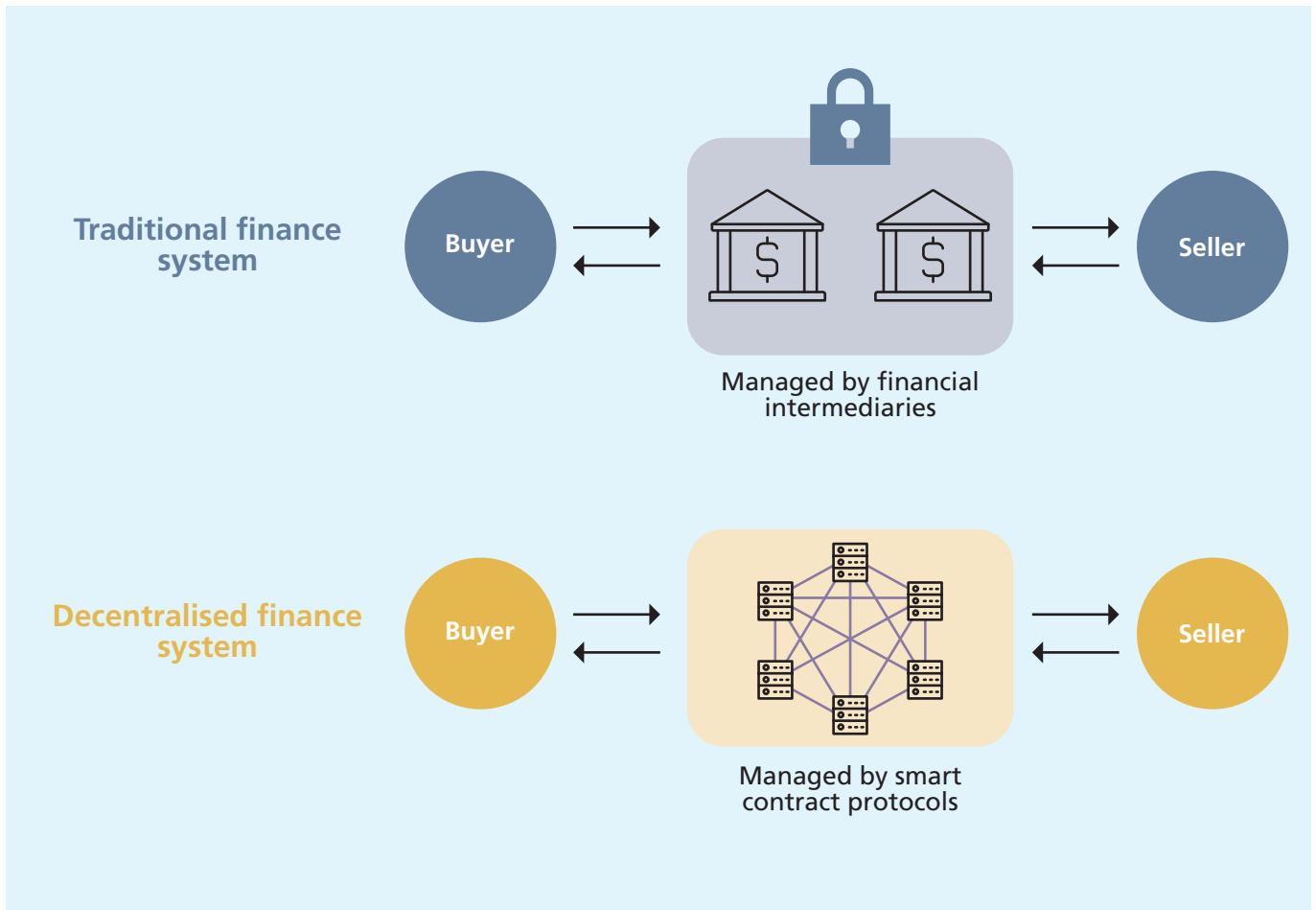
- DeFi offers a variety of financial products, services, activities, and arrangements supported by permissionless smart contract platforms.
- DeFi enables the replication of existing financial services and the creation of new financial services with numerous potential benefits.
- After a strong market correction in 2022, interest in DeFi is gradually recovering.

1.1. DEFI: DEFINITION AND RELEVANCE

DeFi is commonly known as an ecosystem of decentralised applications with finance functionalities built on blockchain technology that enables peer-to-peer interactions without intermediaries.¹ DeFi operates on smart contracts, which are self-executing contracts in which the terms of the agreement between the buyer and seller are directly written in lines of code, to facilitate transactions and ensure that

all parties involved in a transaction are held to their contractual obligations (Figure 1.1). Although these operations are largely independent of the traditional finance (TradFi) system, DeFi and TradFi are indirectly connected through the centralised crypto-asset finance (CeFi), which commonly serves as an entry point for users outside the DeFi ecosystem (Figure 1.2). These decentralised applications, commonly known as 'DeFi protocols', operate on decentralised networks, allowing users to access financial services directly and securely, in an open, transparent, and efficient manner.

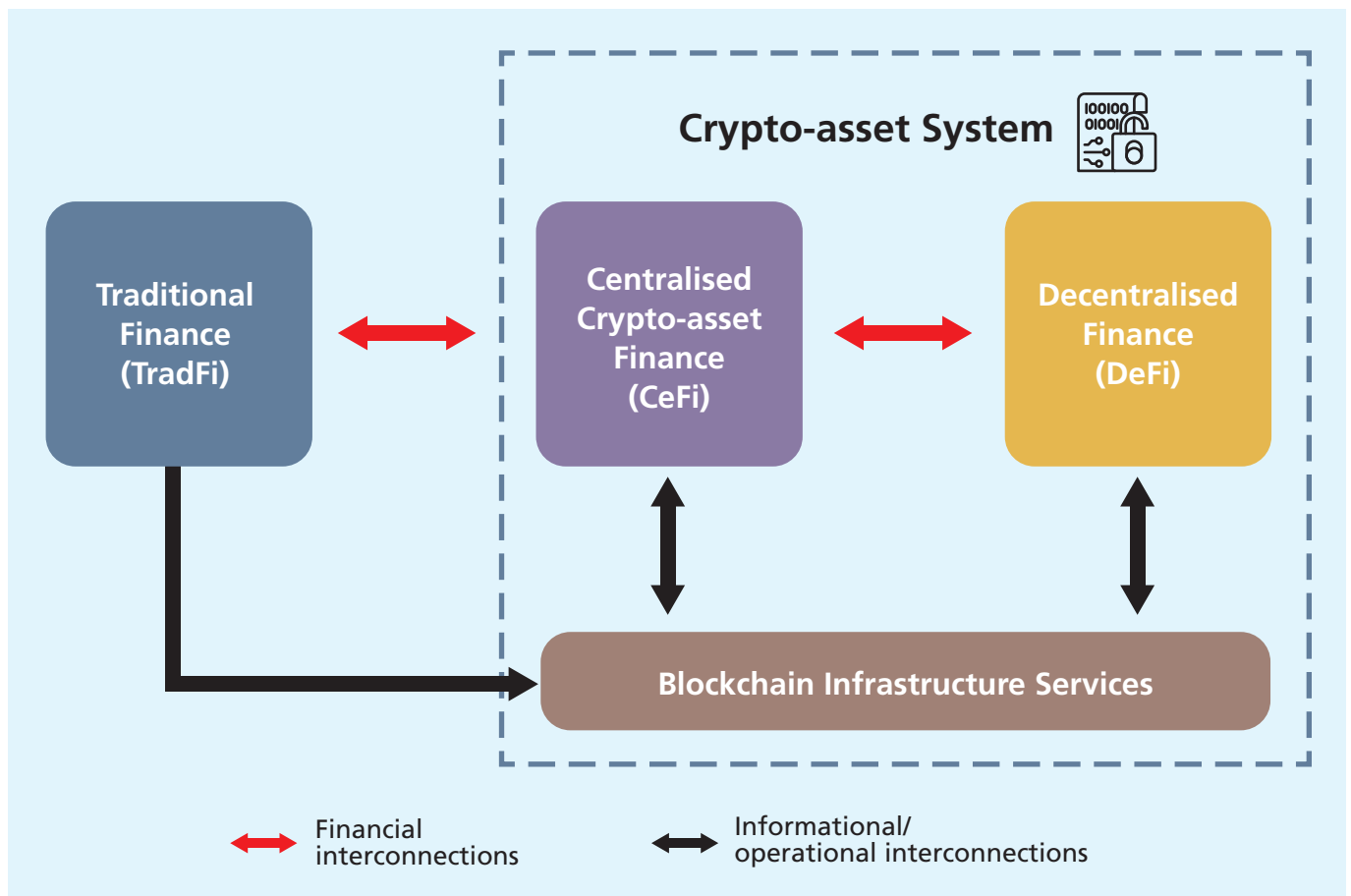
Figure 1.1: Difference between TradFi and DeFi



Source: HKIMR staff compilation

¹ IOSCO (2023c) highlighted that DeFi is a term used in industry and broader discussions and has no generally accepted definition.

Figure 1.2: Conceptual representation of the relationship between TradFi, CeFi and DeFi

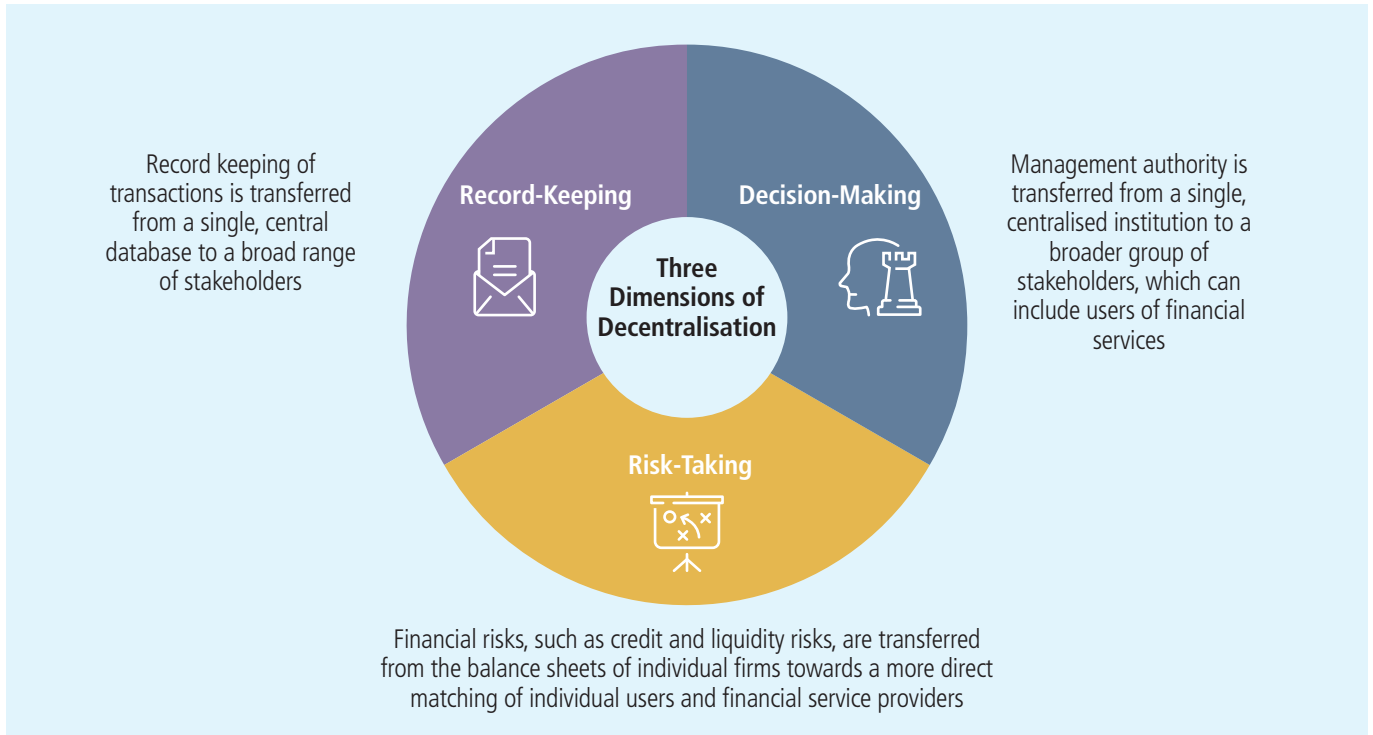


Source: HKIMR staff compilation and FSB (2023a)

As the ethos of DeFi, decentralisation can have three main dimensions (Figure 1.3). The primary contribution of blockchain technology is ‘decentralised record-keeping’ in which each node of the network keeps its own full or partially full copy of a ledger, thereby eliminating inaccurate or fraudulent record keeping at a single point. The notion of ‘decentralisation’ in the DeFi context extends to decentralised governance and operation of financial services (i.e., ‘decision-making’) and financial risks (i.e., ‘risk-taking’). TradFi, in contrast, is centralised along all three dimensions as it relies wholly on centralised financial institutions and conventional financial market infrastructure for decision-making, record-keeping, and risk-taking. CeFi represents a middle ground of partial decentralisation as it leverages blockchain technology to achieve decentralised record-keeping, but retains centralisation in decision-making and risk-taking.

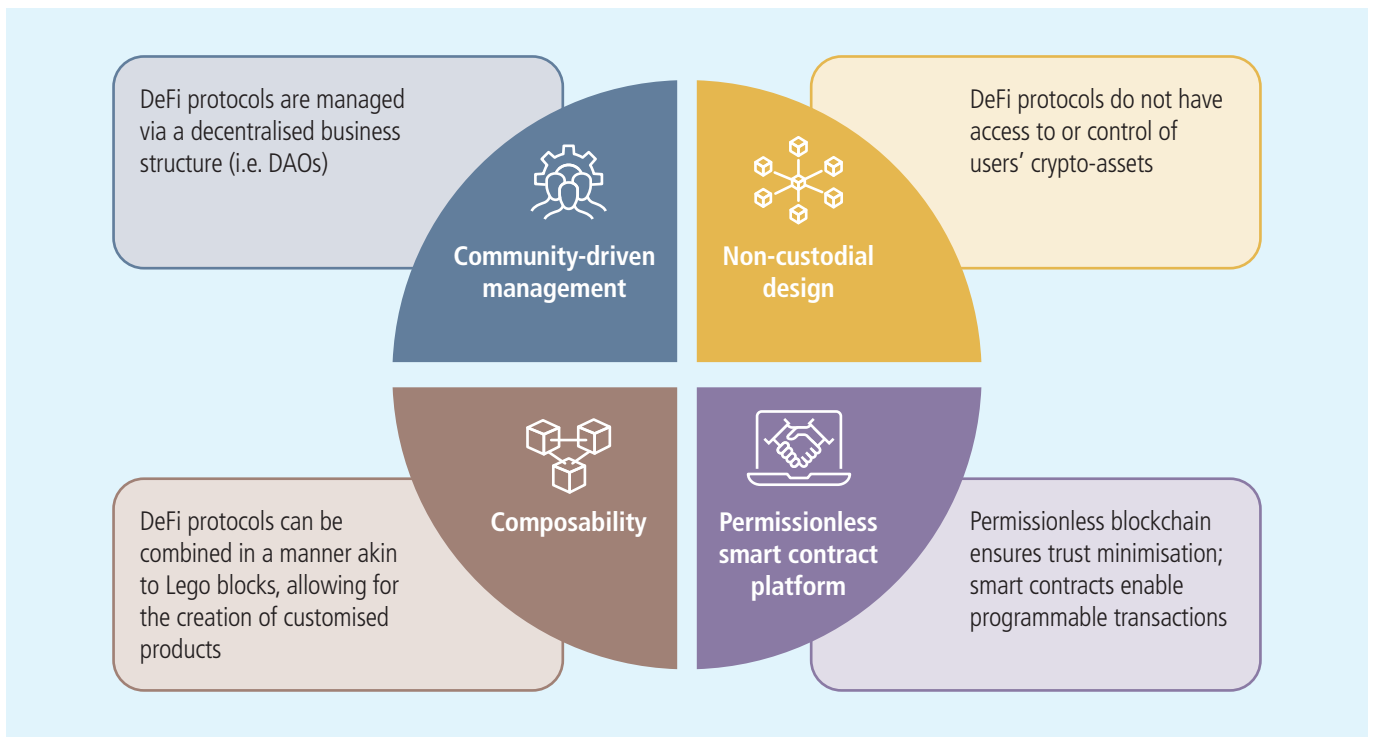
To achieve decentralisation, DeFi protocols can also be distinguished by several defining characteristics. These characteristics include: (i) community driven management; (ii) non-custodial design; (iii) public blockchain with smart contract functionality (i.e. permissionless smart contract platform); and (iv) composability (Figure 1.4). It is also important to note that while ‘full’ decentralisation is an ideal, it remains more of an aspiration than a concrete reality, as DeFi protocols typically do not embody all these characteristics. The extent to which they fulfil these characteristics can vary throughout its lifecycle, reflecting the complex and dynamic nature of the DeFi landscape and the necessity of efforts to understand these protocols and their potential impact to the financial system.

Figure 1.3: Three dimensions of decentralisation



Source: HKIMR staff compilation and FSB (2019)

Figure 1.4: Characteristics of DeFi



Source: HKIMR staff compilation

1.2. POTENTIAL BENEFITS AND MAIN APPLICATIONS

Given its innovative features, DeFi activity has a large room to grow and become mainstream due to the increasing adoption of crypto-assets and the expansion of real-world applications for DeFi (FSB, 2023a). Several benefits of DeFi support this reasoning (Figure 1.5). First, securities and other real-world assets can be issued or represented in digital token form on blockchain networks, and the settlement of these tokenised securities can be expedited to shorten the

standard settlement cycle of T+1 or T+2 days to instant and simultaneous settlement (i.e., 'atomic settlement'), enhancing operational efficiency and reducing counterparty risk. Second, the decentralised governance of DeFi protocols through decentralised autonomous organisations (DAOs) allows governance token owners to directly participate in management decisions through community voting, thereby democratising decision-making and control of financial services. Third, blockchain programmability enables automated crypto-asset transactions (i.e. self-executable transactions based on programmed terms and conditions) through the use of smart contracts

Figure 1.5: Potential benefits of DeFi



Source: HKIMR staff compilation

and facilitates the introduction of complex business logic. Fourth, the interoperability of smart contracts allows DeFi protocols to be combined (i.e. 'composability'), providing flexibility that allows anyone to rapidly develop innovative products and solutions to cater to market needs. Along with the tokenisation of securities and other real-world assets, composability in DeFi can unlock liquidity in traditionally illiquid assets such as artwork and real estate. Fifth, the permissionless accessibility of the DeFi market can promote greater financial inclusion as any consumer can access DeFi protocols without restriction. Finally, smart contracts are fully transparent and visible to all parties, allowing all stakeholders to understand the risks and mechanism of a DeFi protocol before and after they engage with it.

DeFi not only replicates many TradFi activities but also has the potential to offer more. Currently, popular categories are decentralised exchanges (DEX), borrowing and lending, derivatives, insurance, and asset management (Table 1.1). Moreover, the technological underpinnings of DeFi protocols offer novel features or products that have yet to exist in TradFi. For example, many DeFi protocols across all categories are no longer controlled by TradFi counterparts but are operated by DAOs with a form of community-driven governance; and several innovations, including automated market makers (AMMs), flash loans and liquidity staking, are uniquely introduced in the DeFi ecosystem (Box 1.1). These novel features and products demonstrate the potential of this innovative technology.

Table 1.1: DeFi categories and potential benefits

Category	DeFi Product Description	Potential Benefits
Exchanges	<ul style="list-style-type: none"> Allow trade of one crypto-asset for another between two users with no central counterparty 	<ul style="list-style-type: none"> AMMs² are a type of DEX that provide income to liquidity providers
Borrowing and Lending	<ul style="list-style-type: none"> Allow crypto-asset holders to earn interest by depositing their crypto-assets into a smart contract that simultaneously allows others to borrow these assets 	<ul style="list-style-type: none"> Most DeFi protocols do not require any form of credit assessment due to the pseudonymity of blockchain participants Some DeFi protocols offer 'flash loans', which have no TradFi equivalent
Derivatives	<ul style="list-style-type: none"> Allow users to create crypto-asset derivatives, which are crypto-assets whose market values reference an underlying asset. 	<ul style="list-style-type: none"> The permissionless nature of DeFi markets increases the accessibility of users to create, buy, or sell derivatives
Insurance	<ul style="list-style-type: none"> Allow users to hedge against the risk of an event in relation to their crypto-assets (e.g., crypto-assets being stolen) Deposit crypto-assets into a pool to sell 'event contracts' to buyers who pay a small 'premium' and receive a larger payout if the covered event occurs 	<ul style="list-style-type: none"> DeFi insurance protocols play an important role in the ecosystem as TradFi entities rarely provide insurance for the crypto-asset market Any DeFi user can become an underwriter and potentially earn returns from insurance premiums

² Definitions of technical terms used throughout this report can be found in Appendix C.

Category	DeFi Product Description	Potential Benefits
Asset Management	<ul style="list-style-type: none"> • Provide asset management or advisory services for crypto-assets by analysing DeFi protocols for favourable investment opportunities • Reallocate crypto-assets automatically between DeFi protocols to optimise returns 	<ul style="list-style-type: none"> • The openness and transparency of blockchain transactions can reduce the opacity of asset management
Deposit	<ul style="list-style-type: none"> • Deposit their crypto-assets into a liquid staking protocol, and receive a 'staked token' representing their pro-rata interest • Earn validation rewards in proportion to their contributions 	<ul style="list-style-type: none"> • Liquid staking enables DeFi users to earn yield from their crypto-assets

Box 1.1: Innovations in DeFi

Automated Market Makers (AMMs)

AMMs are a new type of DeFi exchange protocol. Unlike traditional financial markets, which rely on buyers and sellers, AMMs aim to maintain liquidity in the protocol through liquidity pools of two or more crypto-assets. These crypto-assets are supplied by market makers (known as liquidity providers) which deposit crypto-assets into the liquidity pools. Paying transaction fees to the pools, market takers (known as liquidity takers) can then exchange crypto-assets for another. The exchange rates between these crypto-assets are algorithmically determined according to the ratio of the crypto-assets in the pools. The exchange rate fluctuation is influenced by the size of the trades and the depth of the liquidity pools (akin to market liquidity in TradFi exchanges).

AMM protocols employ various economic incentive mechanisms to maintain a higher level of liquidity in their liquidity pools. Liquidity providers primarily earn transaction fees as passive income and may also receive from AMM protocols a new crypto-asset known as a liquidity provider token (LP token), which can be sold, transferred, traded, or used as collateral in any other DeFi protocols. Furthermore, leveraging these AMM protocols, DeFi aggregators can query a range of AMMs to find the best yields and prices for liquidity providers or takers. These features of AMMs and LP tokens opens up numerous possibilities for DeFi users to engage in new financial activities.

Flash Loans

Flash loans are instant loans that do not require collateral from the borrower, provided that the loan amount is repaid in the same transaction. In other words, the borrower receives the funds, uses them, and repays them plus interest in the time it takes for a new block to be added to the blockchain. If the borrower is unable to repay the funds with interest at the end of the transaction execution cycle, the transaction is invalidated and its results are reverted.

Flash loans have zero counterparty or duration risks for the lender as the transaction becomes invalid if the borrower defaults. Meanwhile, the borrower can take advantage of arbitrage opportunities without having the principal needed to execute the arbitrage by (i) receiving the funds through the lending protocol; (ii) purchasing tokens from an exchange protocol; (iii) selling the tokens on another exchange protocol; and (iv) repaying the loan on the lending protocol, all within the same transaction. Flash loans facilitate rapid access to liquidity in DeFi markets, increasing the accessibility of investment opportunities that typically require having large amounts of capital on hand.

Liquid Staking

Participants in staking can earn a reward by contributing to the validation of a ledger on a distributed network, such as a blockchain. Specifically, a distributed network requires that all nodes in the network agree on the order and validity of transactions. The validation is completed by network participants who are selected by a bidding process, in which interested participants commit an amount of crypto-assets (i.e. the stake) to bid for their participation in validation. The network state is said to be agreed upon by consensus of the network when validators are able to create a matching alphanumeric string together. This consensus mechanism incentivises honest behaviour as successful validators (i.e. those whose proposed blocks are attested to by a majority of other validators) earn a reward, whereas validators who have been found to have acted maliciously would have their stake confiscated or deducted.

One problem with staking however, is that the committed crypto-assets become illiquid, as they cannot be accessed or withdrawn once they are staked. Liquid staking protocols have emerged as a solution to address this problem as it issues a new token (called a 'staked token') that represents a claim on the underlying staked asset. This staked token reintroduces liquidity into the staking process as the staked token can once again be sold, transferred, traded, or used as collateral. This enables DeFi users to enjoy the benefits of conventional staking activity while retaining liquidity of their crypto-assets.

1.3. GLOBAL TRENDS

Between 2020 and 2021, DeFi was the fastest growing sector in the crypto-asset ecosystem, drawing considerable attention from retail and institutional investors because of its high expected returns and the flexibility it offers for leveraged and speculative investments. During those two years, which are known as the 'DeFi Summer', the market capitalisation of DeFi products and services swelled from US\$6 billion in June 2020 to a record high of US\$174 billion in November 2021, representing a 28-fold increase (or, in terms of total value locked (TVL), an 101-fold increase from US\$1.87 billion to a record high of US\$191 billion) (Figure 1.6a).³ During the same period, the total number of crypto-asset wallets linked to DeFi protocols increased from approximately 200,000 to approximately 5 million.

DeFi was the fastest growing sector in the crypto-asset ecosystem because of its high expected returns and flexibility for leveraged and speculative investments

After the 'DeFi Summer' came the 'Crypto Winter', with a dramatic reduction in the size of the crypto-asset and DeFi markets in 2022. The positive market sentiment during the 'DeFi Summer' mostly disappeared amid concerns about market vulnerabilities uncovered by the collapse of major crypto-asset service providers, such as crypto venture capital firm Three Arrows Capital, CeFi trading platform FTX and the TerraUSD/Luna algorithmic stablecoin pair (among the top 10 stablecoins in circulation at the time), undermining many investors' belief in the promise and future viability of DeFi.

Crypto-asset prices fell by as much as 75% from their peaks in late 2021 (ESRB, 2023), while DeFi's market capitalisation shrank to US\$34 billion (or US\$40 billion in terms of TVL) by the end of 2022. Since then, interest in and market sentiment towards the crypto-asset and DeFi markets gradually improved, as evidenced by a rebound in DeFi market capitalisation from October 2023 onwards.

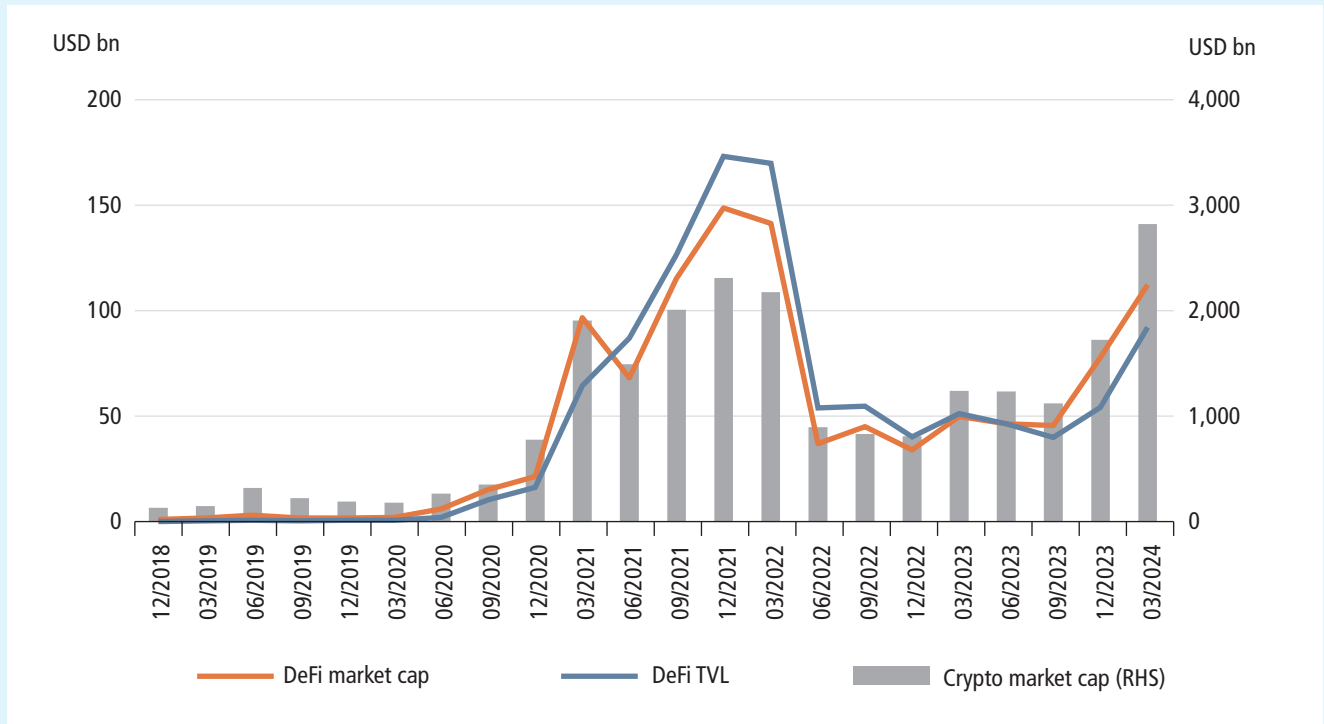
DeFi remains a small subsector of the crypto-asset ecosystem and has a high degree of market concentration. At the end of March 2024, the market capitalisation of the DeFi market was US\$112.3 billion (or US\$92.2 billion in terms of TVL), representing only 4% of the total crypto-asset market value of US\$2.82 trillion. Moreover, the DeFi ecosystem is highly concentrated as more than half of the DeFi market was built on the Ethereum blockchain (Figure 1.6b), which was the first blockchain that enabled the deployment of smart contracts. As of the end of March 2024, approximately 57% of the TVL in DeFi protocols was on the Ethereum blockchain, followed by other blockchains such as Tron (11%) and Binance Smart Chain (6%).

In addition to DeFi protocols, stablecoins are critical elements for the growth of DeFi. The Bank for International Settlements (BIS) highlighted that stablecoins play a crucial role in bridging the crypto-asset and TradFi markets, allowing DeFi market participants to avoid frequent conversion to and from fiat currency and facilitating fund transfers across platforms and between users (BIS, 2021). Moreover, stablecoins are a stable and liquid form of crypto-asset, which helps to solve the issue of price volatility of crypto-assets, thereby enhancing the functionality of DeFi protocols. Concurrent with the growth of the DeFi market, stablecoins have experienced exponential growth since June 2020 (Figure 1.6c), with a total market capitalisation of US\$151 billion at the end of March 2024.

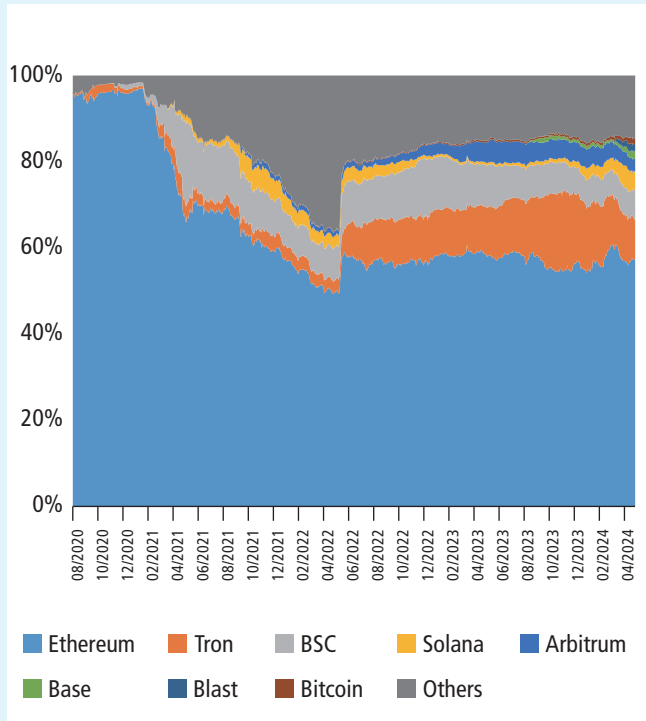
³ 'Market capitalisation' refers to total market value of all tokens being minted, calculated by multiplying the circulating supply of each token by its market price, while TVL is defined as the total market value of crypto-assets staked/locked on smart contracts or DeFi protocols.

Figure 1.6: DeFi market statistics

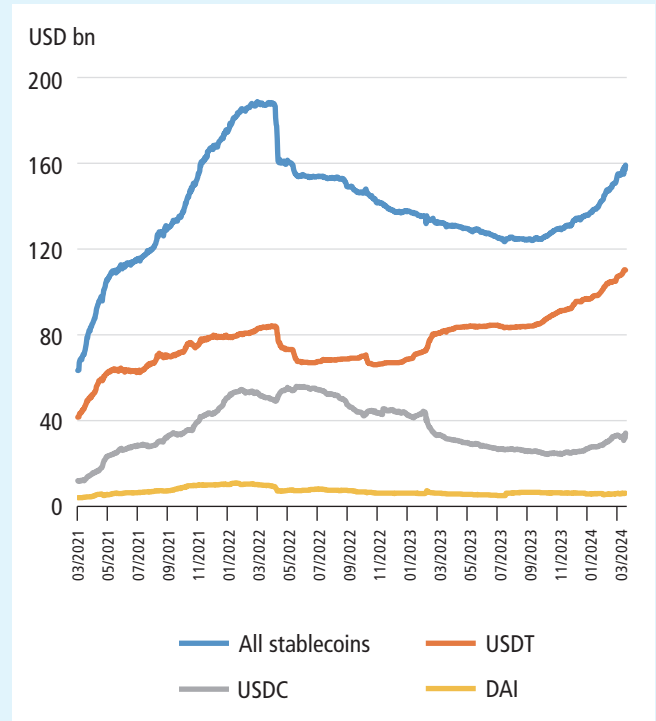
(a) Total market capitalisation of crypto-asset market and DeFi market, and DeFi's TVL



(b) Top blockchains used in DeFi protocols in terms of % in DeFi TVL



(c) Total market capitalisation of stablecoin market and top 3 stablecoins



Sources: HKIMR staff compilation, DefiLlama, Coingecko

Chapter 2

Risks and Vulnerabilities

DeFi activities highlight a combination of existing and new vulnerabilities that are attracting the attention of financial authorities.

HIGHLIGHTS:

- Aiming to replicate the roles of TradFi intermediaries and market infrastructures, DeFi presents new risks and vulnerabilities that are attracting the attention of financial authorities.
- These risks and vulnerabilities can be varied and cover issues of governance, compliance and legality, economic and technological fragilities, interconnectedness, leverage, liquidity and maturity mismatches, and investor and consumer protection.

Although DeFi offers many promises of financial disintermediation and presents substantial innovative potential, it also gives rise to a number of vulnerabilities – some inherent to blockchain technology and others specific to DeFi. Based on major discussions of DeFi risks,⁴ DeFi vulnerabilities can be separated into six broad categories (Figure 2.1).

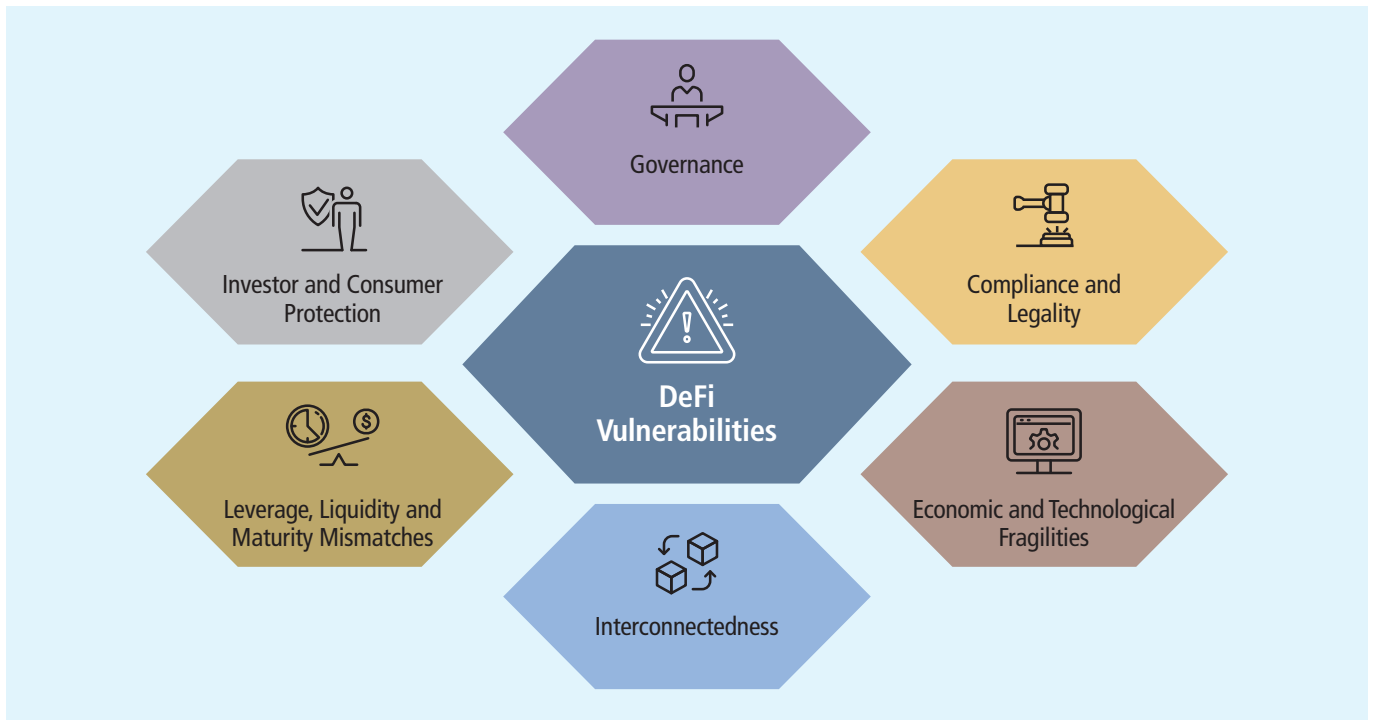
2.1. GOVERNANCE

While many DeFi protocols purport to be decentralised, their governance structures often exhibit de facto centralisation. As highlighted by the International Organisation of Securities Commissions (IOSCO), decentralisation can be viewed as a spectrum ranging from fully centralised to fully decentralised (Figure 2.2), but in fact, many DeFi protocols are centralised at an economic reality level.⁵ Holdings of governance tokens, which represent voting power in DAOs, can be disproportionately concentrated in a small number of stakeholders, such as initial venture capital investors

which receive governance tokens from protocol developers as compensation or third parties whose voting rights are delegated by governance token holders. Various international organisations have also emphasised that DeFi protocols are highly centralised at the founding and development stages, as it is customary for software developers to retain administrative privileges to be able to fix flaws or bugs or make upgrades.⁶ In their empirical study of DAO governance systems, Feichtinger et al. (2023) found that 17 of the 21 DAOs sampled were controlled by fewer than 10 participants. These findings suggest that DeFi protocols are rarely, if ever, fully decentralised and can still be vulnerable to manipulation by a small number of stakeholders. Box 2.1 provides an overview of DAOs in DeFi.

The de facto centralisation of governance ownership structures, combined with the lack of disclosure requirements in the broader crypto-asset market, can introduce a number of misrepresentations and

Figure 2.1: DeFi vulnerabilities



Source: HKIMR staff compilation

⁴ These reports are BoF (2023), FSB (2023a), FSI (2023), OECD (2022), and WEF (2021).

⁵ Numerous international organisations have also described this phenomenon as ‘decentralised in name only’ or the ‘decentralisation illusion’.

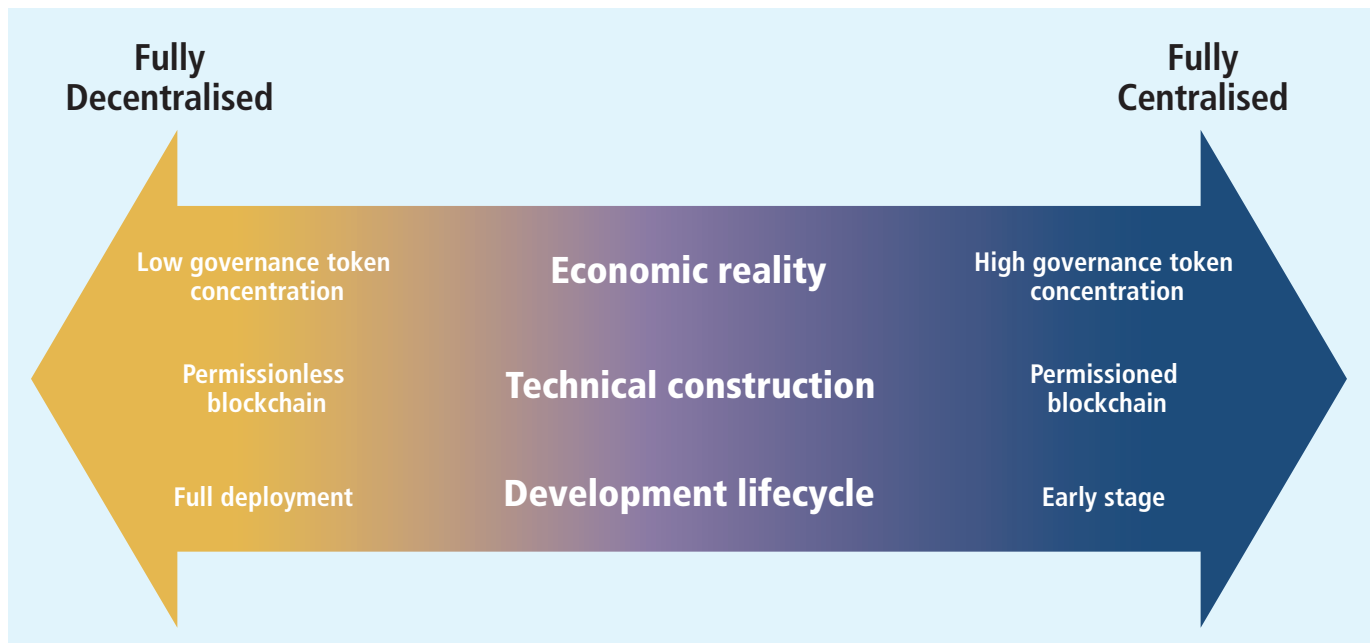
⁶ Major references include IOSCO (2022), WEF (2021), and OECD (2022).

Box 2.1: Innovation in DeFi: DAOs

DAOs are a novel organisational form that has emerged from the crypto-asset ecosystem in recent years. There is no universally accepted definition of DAOs, but DAOs are typically organisations created with one mission in mind: to achieve decentralised governance by coding their rules into smart contracts (Harvey et al., 2021; IOSCO, 2022).

Proponents of DeFi and DAOs argue that their decentralised nature can address the shortcomings of centralised governance, providing a more equitable form of management. Rather than a management committee or a board of directors as is the case with a centrally governed entity, management decisions in a DAO are made by its users through community voting, and membership and voting rights are granted by the issuance of governance tokens by the DAO (FSI, 2023). In principle, any member of the DAO can submit a proposal to its user community and governance token holders are asked to vote for the approval or rejection of the proposal (OECD, 2022).

Figure 2.2: Decentralisation spectrum



Source: HKIMR staff compilation

moral hazards. For example, Feichtinger et al. (2023) found that DAOs can be used as a marketing tool, or worse, as a way to justify and hide the decisions of the major governance token holders behind the facade of a community. The Organisation for Economic Co-operation and Development (OECD) identified that, in extreme cases, malicious actors can purchase enough DAO governance tokens to

manipulate the outcome of a vote to the detriment of minority token holders (OECD, 2022). The number of governance tokens held by founders, developers, or venture capital investors is rarely disclosed or understood by retail investors or financial authorities, and the economic incentives for developers and founders of DeFi protocols are yet to be fully understood. This creates an opportunity for retail

investors to become victims to fraud or ‘rug pulls’, in which retail investors are misled about the nature of a DeFi protocol and are exposed to substantial financial losses (BIS, 2023a).⁷

2.2. COMPLIANCE AND LEGALITY

Purported decentralisation can be misused as an excuse to circumvent existing regulatory requirements. While the decentralised and disintermediated nature of DeFi raises questions about the applicability of existing intermediary-focused regulatory approaches, many DeFi activities may, when broken down into its components, constitute regulated activities for which comprehensive frameworks are already in place to preserve financial stability, protect consumers and investors, and mitigate illicit finance risks. (OECD, 2022). As shown in Figure 2.2, the degree of decentralisation of a DeFi protocol depends on the specific facts and circumstances surrounding its financial activities and its underlying architecture. In principle, as long as a financial service is provided, the service provider is liable, regardless of their purported level of decentralisation. However, many developers continue to use the decentralised and disintermediated nature of DeFi protocols as an argument to escape regulatory requirements and legal liability. As noted by the US Department of the Treasury (USDOT), some crypto-asset service providers claim that transitioning to a DAO will exempt them from anti-money laundering (AML) and counter-financing of terrorism (CFT) obligations and protect their operations from regulatory oversight and accountability in the host jurisdiction (USDOT, 2023). Some DeFi protocol operators even claim not to have a headquarters or host jurisdiction in which they are subject to regulatory obligations.

The borderless nature of crypto-asset transactions present challenges for DeFi supervision and compliance.

Like the internet, the crypto-asset and DeFi markets are borderless and have a global reach, and DeFi transactions are often cross-border in nature. Key stakeholders of a DeFi protocol can also span multiple jurisdictions, with developers and operators located in different countries. In addition to the systemic risks arising from the cross-border nature of DeFi protocols, this presents challenges in determining the host jurisdiction and geographic location of operators, as well as the jurisdictions to which products or services are provided. This jurisdictional uncertainty can impede the ability of DeFi operators to comply with applicable regulations and hinder the ability for financial authorities to supervise DeFi (OECD, 2022).

A lack of cohesion across jurisdictions in terms of the enforcement on DeFi protocols increases the risks associated with AML/CFT. The USDOT (2023) revealed that the greatest risk of illicit financing linked to crypto-assets comes from crypto-asset service providers ‘operating in countries with deficient AML/CFT programmes’. However, an assessment conducted by the Financial Action Task Force (FATF) in June 2022 showed that the majority of the 53 jurisdictions evaluated still needed progress in applying relevant AML/CFT standards to crypto-assets and crypto-asset service providers (FATF, 2022). In its subsequent assessment, conducted in June 2023, the FATF determined that 75% of the assessed jurisdictions were only partially compliant or not at all compliant with its requirements. Excluding jurisdictions that have completely banned crypto-asset service providers, more than half have not implemented the FATF’s Travel Rule to request personally identifiable information for all digital fund transfers (FATF, 2023).⁸ The current inadequate and uneven implementation of AML/CFT requirements allows malicious actors to use DeFi for illicit financing activities and regulatory arbitrage.⁹

⁷ Rug pulls are a form of fraud in the crypto-asset market whereby developers create a new product and then disappear with investors’ money.

⁸ Introduced in June 2019, the ‘Travel Rule’ requires a sender’s service provider to obtain and hold personally identifiable information about the sender and recipient for VA transfers.

⁹ For example, the USDOT (2023) detailed how Tornado Cash, a DeFi protocol providing crypto-asset mixing services, was used to obfuscate the movement of over US\$455 million in stolen crypto-assets.

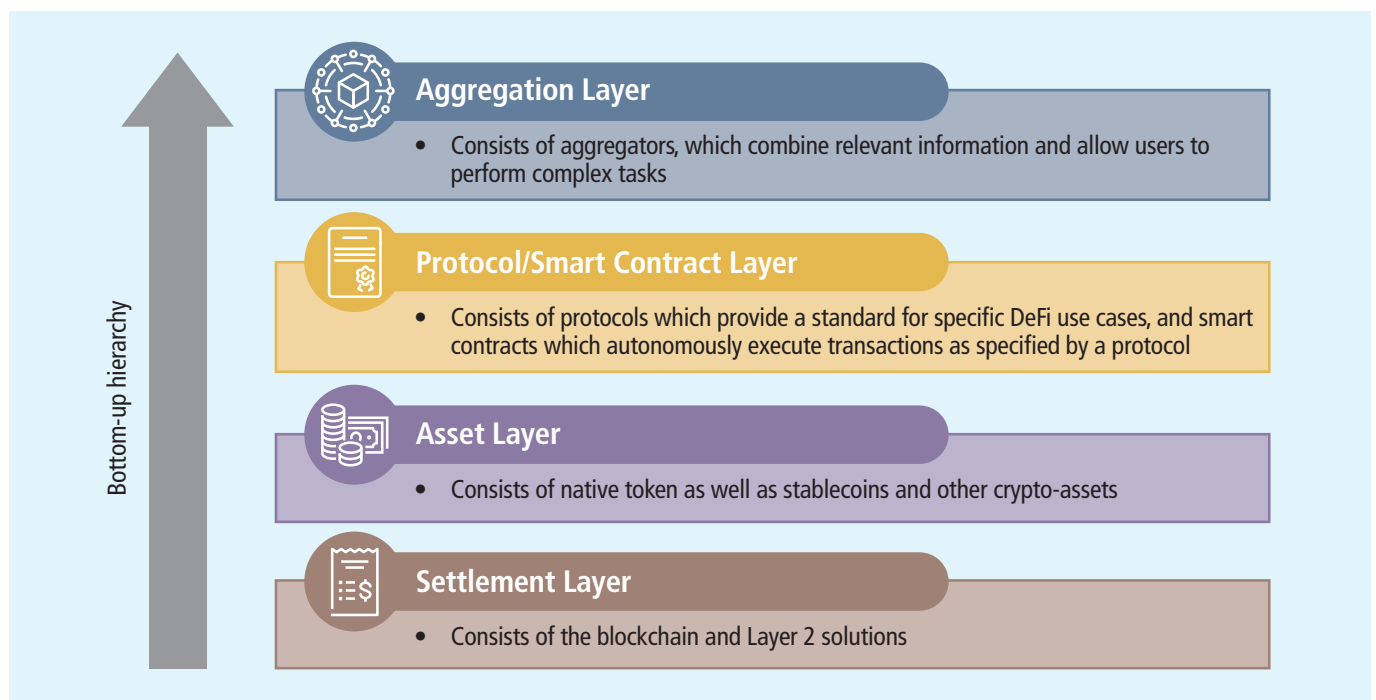
2.3. ECONOMIC/TECHNOLOGICAL FRAGILITIES

A number of economic and technological vulnerabilities across multiple layers of the DeFi stack can lead to the exploitation or operational failure of DeFi products and services (Figure 2.3). The Federal Reserve Bank of St. Louis (FRBSL) noted that the layers of the DeFi stack are hierarchical, meaning that each layer is only as secure as the layer below, and none of the subsequent layers will be secure if the settlement layer blockchain is compromised (FRBSL, 2021).

At the settlement layer, the settlement blockchain can be subject to scalability limitations and market manipulation risks. DeFi's settlement blockchains may struggle to process increased transaction volume without compromising security due to the blockchain trilemma, which is a challenge faced by all public

blockchains. This trilemma states that all blockchains can only fulfil two of three desired properties: security, scalability, and decentralisation. Security, which refers to the ability of the blockchain network to ensure the integrity and immutability of recorded transactions, can be enhanced through increased decentralisation and incentives, although increasing incentives leads to congestion and limited scalability (BIS, 2023a). Conversely, a blockchain that prioritises high transaction volume (i.e. scalability) can be achieved by limiting the number of network validators to expedite the consensus process and imposing higher hardware requirements to process more transactions at the same time. However, both possibilities will make the blockchain more vulnerable to attacks.¹⁰ Blockchains may also be susceptible to market manipulation, as validators can rearrange or censor transactions that have been posted to the blockchain to maximise their own profit.¹¹

Figure 2.3: The technical design of DeFi products and services



Source: HKIMR staff compilation, FRBSL (2021) and Schuler et al. (2024)

¹⁰ These types of attacks, namely '51% attacks', refer to the case where a majority (more than 50%) of the validators in a blockchain network are compromised, allowing attackers to manipulate blockchain transactions and disrupt the security and integrity of the network.

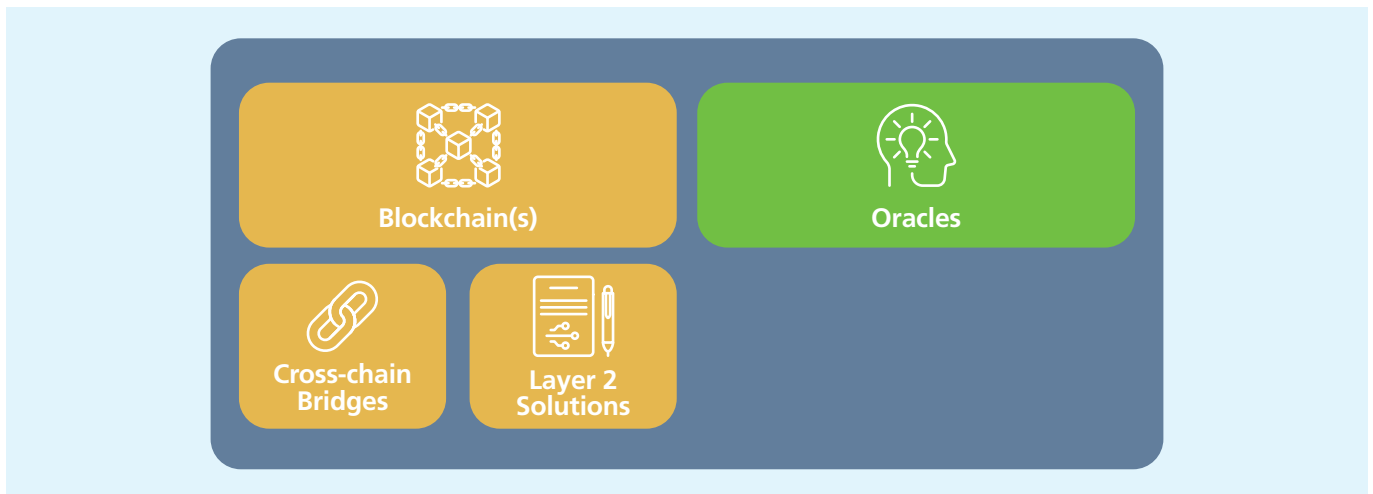
¹¹ Referred to as 'Maximal extractable value', an example of market manipulation activity involves taking advantage of the transparency and reorderability of blockchain transactions to perform front-running, in which malicious actors pay higher transaction fees to place the front-running transaction at the front of a queue and receive more favourable transaction terms.

At the protocol/smart contract layer, smart contracts may be subject to economic or technological exploitation. A logic error or software bug can cause a DeFi protocol to fail operationally, leaving users' crypto-assets locked in the smart contract with no method of recovery. Alternatively, even without a logic error or software bug, a DeFi protocol can be subject to economic exploitation, whereby a malicious actor influences market conditions to profit at the expense of the protocol (Harvey et al., 2021). Furthermore, due to the immutability of blockchain transactions, any financial loss due to an error in the smart contract may not be rectifiable even after the vulnerability is discovered.¹² In addition to these economic and technological vulnerabilities, the issues raised by considering a smart contract as 'applicable law' between the participating parties remain controversial. Using the 'code is law' ethos as an excuse, a hacker or malicious actor outwitting a smart contract's protocol may argue that their actions are permitted by the smart contract's design.¹³ Thus, DeFi users should be mindful

of various potential issues related to the use of smart contracts.

Infrastructure services that support DeFi functionality are susceptible to exploitation by their operator or external parties. These services include oracles that bring external data to DeFi systems, cross-chain bridges that enable transactions across different blockchains, and Layer 2 solutions that improve the processing capacity of the base (i.e. Layer 1) blockchain (Figure 2.4). These services can reintroduce a vector of centralisation in DeFi protocols. A high degree of centralisation in these infrastructure services can effectively override the security and decentralisation provided by blockchain consensus mechanisms and DAO governance-ownership structures (BIS, 2023a). Centralisation in these infrastructure services pose major risks to the DeFi protocols they help support. If the cost of corruption is lower than an attacker's potential profit from corruption, these infrastructure services will be extremely vulnerable to attacks (Harvey et al., 2021).

Figure 2.4: Overview of blockchain infrastructure services



Source: HKIMR staff compilation

¹² These DeFi activities may be considered less acute owing to the transparency of blockchain transactions. Malicious actors may face increased community scrutiny and struggle to cash out by moving their funds to centralised platforms, leading to arbitration and an agreement to partially return the funds. For example, a hacker stole US\$197 million in crypto-assets from a DeFi protocol named Euler Finance in March 2023 and then returned over US\$177 million in the same month. Another protocol named Curve Finance was drained of over US\$60 million in July 2023 and recouped around 70% of the hacked funds in the following month after negotiation.

¹³ More discussions can be found from an online article 'TradFi and DeFi: Same Problems, Different Solutions' by Cecchetti and Schoenholtz. That said, in Canada, the Ontario Superior Court of Justice granted a preservation order against a hacker who misappropriated tokens on a DeFi platform using the 'code is law' defence, posing that 'code is law' as a defence argument remains debatable.

2.4. INTERCONNECTEDNESS

High systemic risk can be technically inherited from the composability feature of smart contracts. By design, each smart contract is a self-contained component serving a specific function that can be assembled in certain combinations with other smart contracts to form a DeFi protocol. Multiple DeFi protocols can be combined to form a new protocol or become part of protocol groups, making these protocols highly interdependent. Given this interconnectedness, the failure of a single smart contract can affect other smart contracts that depend on it and extend to all protocol groups and, in the worst case, spread to the entire DeFi market (BIS, 2023a). These multiple interconnected contracts can amplify the scope and speed of financial contagion in DeFi or lead smart contracts to behave in unexpected ways (FSB, 2023a).

Besides technical reasons, a possible source of systemic risk lies in the financial linkages between DeFi and CeFi. The level of risk is high when the DeFi and CeFi ecosystems are highly interconnected through financial and operational dependencies (Figure 1.2). As a notable example, centralised crypto-asset exchanges (CEXs) have a number of interlinkages with DeFi protocols through various channels, namely (i) CEXs serve as user-friendly interfaces to interact with DeFi protocols; (ii) some CEXs offer products that indirectly enable participation in DeFi protocols; (iii) crypto-assets generated by DeFi protocols can be traded on CEXs; and (iv) DeFi users can realise their DeFi investment profits on CEXs, linking CEXs to counterparties across the DeFi ecosystem. As such, a crash in one market can cause financial contagion in another. The importance of such interlinkages has been demonstrated by market events such as the FTX crash in November 2022, which raised concerns among investors about the integrity of the blockchain

platforms involved, leading to a substantial decline in the prices of the associated tokens and the closure of these platforms.¹⁴

As demonstrated in the ‘Crypto Winter’ of 2022, TradFi entities have been involved in contagion linked to the crypto-asset market. The rapid decline in crypto-asset prices in 2022 has brought to light many unsuspected connections between the crypto-asset market and the banking sector. For instance, the collapse of FTX led to a flight of deposits from two US banks with heavy exposure to crypto-assets (Silvergate and Signature) through their proprietary distributed ledger technology (DLT) trading platforms, which enabled customers to make payments 24 hours a day and 7 days a week. Similarly, contagion in the crypto-asset market has been shown to originate from the banking sector. Specifically, the bankruptcy of Silicon Valley Bank (SVB), triggered by an outflow of US\$42 billion in deposits within 5 hours, led to a drop in the prices of several major stablecoins, including one of the major stablecoins in circulation to trade at a steep 12% discount due to the deposit of US\$3.3 billion of its reserve assets in SVB by its operating entity. These examples demonstrate that financial institutions’ exposure to crypto-assets and the wealth effects arising from fluctuations in the market capitalisation of crypto-assets are valid transmission channels that can lead to spillover risks between DeFi and TradFi, which has caught attention of various international organisations, such as the Basel Committee on Banking Supervision (BCBS), Financial Stability Board (FSB), International Monetary Fund (IMF), and IOSCO.

The rapid decline in crypto-asset prices in 2022 brought to light unsuspected connections between the crypto-asset market and the banking sector

¹⁴ FTX held a significant stake in the Solana blockchain’s native token, SOL. It also largely controlled a DEX named Serum, which was built on the Solana blockchain. The collapse of FTX raised investor concerns about the integrity of both Serum and the Solana blockchain, leading to the near collapse of the price of SOL and the cessation of Serum. More details can be found in FSB (2023a).

2.5. LEVERAGE, LIQUIDITY AND MATURITY MISMATCHES

The DeFi market features high levels of leverage and collateralisation. Because of the pseudonymity of blockchain and DeFi users and the inherent price volatility of unbacked crypto-assets, DeFi lending protocols often require over-collateralisation (with the exception of flash loans, which are uncollateralised but carry their own risks) to provide lenders with additional security. Borrowed crypto-assets can be 're-collateralised' repeatedly to form 'collateral chains', meaning that borrowed crypto-assets can be used as collateral again and again for additional loans. Given this market feature, reportedly, many trading platforms once reached 100-fold leverage for perpetual derivatives, suggesting that the over-collateralisation and re-collateralisation of crypto-assets in the DeFi market can intensify the financial linkages between the underlying crypto-assets and TradFi assets, and therefore potentially result in a highly complex and fragile system (Makarov and Schoar, 2022).

The DeFi market features high levels of leverage and collateralisation

Highly leveraged investors in crypto-assets may react to financial shocks more procyclically, further exacerbating price volatility during economic downturns. Research studies identified that shocks caused by external factors such as monetary conditions in the US can be profound, and along with the sell-off pressure induced by automated liquidation mechanisms embedded in DeFi protocols, can cause the prices of

all associated crypto-asset collateral to collapse during times of financial stress, thereby calling into question the financial stability of the DeFi market (HKMA, 2023; FSB, 2023a).

Liquidity and maturity mismatches are another concerning DeFi vulnerability, resulting from imbalanced asset–liability profiles of relevant entities (FSB, 2023a). These types of mismatches may be more prominent in stablecoins, which can give rise to redemption runs from stablecoins whose reserve assets' quality are questionable, and negative spillovers to other parts of the financial system in extreme circumstances (HKMA, 2022a & 2022b). For example, the collapse of the algorithmic stablecoin system created by TerraUSD and Luna in June 2022 was partly arising from its endogenous backing design which failed to control the stablecoin supply and maintain their peg to the backing assets. The collapse also led to the failure of its closely linked DeFi lending protocol, Anchor, and was one of the main factors contributing to the 'Crypto Winter' of 2022. In comparison, fiat-collateralised stablecoins in which the issuer maintains 'reserves' invested in more liquid TradFi assets are less subject to run risk.

These mismatches can also arise in other segments of DeFi (and CeFi) intermediation, notably in the context of lending protocols. One way in which some lending protocols offer high returns is by promising investors immediate redemption while investing deposit proceeds in less liquid assets, often using borrowers' collateral to borrow and invest more. When inflows exceed outflows, the model allows a fund or platform to benefit from a liquidity/maturity premium. However, when market sentiment changes and redemption demand increases, the fund or platform may fail to meet these redemptions (FSB, 2023a).

2.6. INVESTOR AND CONSUMER PROTECTION

DeFi protocols lack comprehensive investor and consumer protection measures (OECD, 2022). Due to the permissionless accessibility of the crypto-asset market, any developer can create and deploy a DeFi protocol and attract investments without any auditing or testing, increasing the risk of post-launch malfunctions or failures, which can lead to significant losses for investors. Unlike many TradFi products and services that provide clear disclosure statements regarding their features, risks, and costs in plain language, as required by law, the nascent and technically complex nature of DeFi protocols can be difficult for an average retail investor to fully comprehend.

Any developer can create a DeFi protocol and attract investments without any auditing or testing, increasing the risk of post-launch malfunctions

Investor and consumer protection risks are exacerbated by the immutability of crypto-asset transactions, while regulatory responses are still at an early stage of development. In other words, when fraud or malicious activity is involved, the recovery schemes or resolution mechanisms for the loss of crypto-assets may only rely on the collective effort of the community to monitor the subsequent fund flow of malicious actors and negotiate the return of the stolen crypto-assets, which is not necessarily successful. As crypto-asset regulations have not yet reached the level of refinement and maturity of their TradFi counterparts, defrauded users may find it difficult to identify the responsible regulatory authority to turn to for recourse. From a regulatory standpoint, these limitations present supervision and enforcement challenges and increase the likelihood that fraudulent activity will occur.

Chapter 3

Regulatory Challenges and International Approaches to Regulation

Authorities in various jurisdictions are adopting diverse approaches to guide the development of DeFi in the spirit of recommendations made by international organisations.

HIGHLIGHTS:

- DeFi presents a number of challenges for regulators due to its risks and vulnerabilities.
- In evaluating the coverage of existing regulatory perimeters for DeFi innovations, many international organisations have used the guiding principle of ‘same activity, same risk, same regulation’.
- International organisations and financial authorities have considered diverse approaches to address these challenges. Some leading jurisdictions in DeFi have clarified existing regulations; others have amended relevant laws or introduced bespoke regulations.
- Hong Kong is one of the jurisdictions that explicitly welcomes the virtual asset (VA) industry and seeks to support its sustainable and responsible development with a comprehensive and balanced regulatory framework and risk-based guardrails.

Owing to their vulnerabilities and technological construction, DeFi protocols present new challenges for authorities. The question of how to best address these challenges remains open, but the regulatory challenges posed by new technologies are not an unprecedented phenomenon. There are relevant parallels between DeFi today and past innovations enabled by the digital revolution. Learning from past cases of FinTech and non-banking financial intermediaries (NBFIs), international organisations, which include international bodies (e.g. the BIS, FSB, IMF, and OECD) and international standard-setting bodies (e.g. IOSCO, FATF, and BCBS), have developed high-level regulatory principles to set a baseline level of comprehensiveness and consistency in terms of regulatory approaches to crypto-assets and DeFi, and jurisdictions have taken stock of these principles and adopted various regulatory responses accordingly.

3.1. REGULATORY CHALLENGES

The rapid evolution and international nature of the DeFi and crypto-asset markets have increased the potential for regulatory fragmentation and arbitrage. This section summarises several key challenges identified by international organisations and major research studies that merit attention from authorities when developing a regulatory framework for these markets (Figure 3.1).

i) Accountability behind Disintermediation/Decentralisation

The lack of easily identifiable regulatory hooks in DeFi protocols can cause the problem of ‘who to hold accountable’. Current regulatory tools, such as company registration and licencing regimes, rely on the existence of centralised entities that can serve as regulatory hooks. However, many DAOs do not have centralised entities due to their decentralised governance structures, creating challenges to regulatory agencies’ efforts to identify ‘who to hold accountable’. Beyond the intentional non-compliance of DAOs, many key participants are actually involved in facilitating the development and operation of DeFi protocols (IOSCO, 2022, 2023c), including i) venture capital investors funding the development of the protocols; ii) the creators and developers of the protocol; iii) significant holders of governance tokens; iv) operators of applications that facilitate access to DeFi protocols;¹⁵ v) operators of blockchain infrastructure services such as oracles and bridges; and vi) operators of the settlement layer blockchain (i.e. miners and validators). The large number of primary participants in DeFi protocols further complicates financial authorities’ efforts to identify decision-making entities and accountable parties that should be subject to applicable regulatory frameworks.¹⁶

Figure 3.1: DeFi regulatory challenges



Source: HKIMR staff compilation

¹⁵ These applications are typically third-party centralised entities that facilitate institutional investor’s access to DeFi protocols as these institutional investors prefer keeping their crypto-assets in the custody of a third-party centralised entity for the purposes of internal control and risk management (IOSCO, 2022).

¹⁶ In some jurisdictions, a DAO can be considered a partnership by law and be held accountable in a manner consistent with its legal characterisation, and may therefore incur personal liability for its members.

The large number of primary participants complicates efforts to identify accountable parties

Some international organisations have provided high-level regulatory recommendations to identify and supervise de facto centralised actors in a purported DeFi protocol. The FATF (2021) suggested that creators, owners, operators, or others who retain control or sufficient influence over DeFi arrangements, even if these 'arrangements' appear decentralised, should be considered a virtual asset service provider (VASP) and the responsible party. Likewise, IOSCO (2023a, 2023c) recommended that regulators work to identify the natural persons and entities that are de facto 'centralised actors' in a purported 'DeFi project' as regulatory hooks, by weighing their roles, abilities, control or influence, and economic benefits in relation to DeFi activity. Nevertheless, these recommendations remain at a high level and certain practical and fundamental difficulties, such as the pseudonymity of DeFi users, may continue to be a major challenge for financial authorities.

ii) Legal Enforceability of Smart Contracts

Unlike legal contracts, smart contracts used to facilitate DeFi transactions may not be legally enforceable.¹⁷ Despite their name, smart contracts are not by default considered legal contracts under civil law. Smart contracts are not considered to fully fulfil the functions of a legal contract because (i) the pseudonymous, irreversible, and immutable qualities of blockchain technology may lead to complications in the identification of contracting parties and post-contract adjustment mechanisms; (ii) determining liability becomes challenging when a smart contract

fails to perform due to coding or design issues; and (iii) blockchain technology is borderless and is not readily subjectable to any particular jurisdiction or applicable law (DiMatteo et al., 2019).¹⁸ All of these factors raise questions about the suitability of existing regulatory frameworks in ensuring the regular performance of basic and legal regulatory functions such as ascertaining liability, determining applicable regulations, and carrying out supervision and enforcement (OECD & KDI, 2021).

As such, DeFi users may only benefit from limited legal protections under contract law. As legal uncertainty regarding the enforceability of smart contracts may result in corresponding legal uncertainty regarding rights arising from smart contract-based services, any fraud, transaction errors, or contractual disagreement in DeFi has no method for court adjudication or legal recourse. While some financial authorities have already issued guidance, others will need to explore the applicability of existing contract laws to enforce agreements encoded in smart contracts and provide methods for dispute resolution.

iii) Regulatory Fragmentation/Global Coordination

Regulatory oversight and supervision may become less effective, given that the DeFi and crypto-asset markets are borderless and global in nature, with DeFi entities, actors, and activities often spanning multiple jurisdictions. In fact, regulatory views and approaches to crypto-assets and DeFi vary across jurisdictions, with some seeking to adopt a light regulatory approach, and others seeking a stricter approach, or even a complete ban on crypto-asset activities (WEF, 2023b). This regulatory fragmentation across jurisdictions creates opportunities for regulatory arbitrage, where non-compliant operators and service providers can relocate to and exploit jurisdictions with weak or no

¹⁷ A legal contract is an agreement between the contracting parties giving rise to obligations recognised and enforceable by law, the key elements of which include i) the intention to create legal relations; ii) offer; iii) acceptance; iv) consideration; v) capacity to contract; and vi) certainty. The prevailing view is that smart contracts are not legal contracts by default but can either be i) the means of entering into a legal contract; or ii) a complete or partially complete legal contract, depending on its design.

¹⁸ Only a few jurisdictions providing an interpretation of legal status of smart contracts, although these interpretations vary. Some parties have argued that existing contract law is sufficient to address the novelty of smart contracts, while others have recognised the need to adapt regulations to create a mechanism to enforce smart contracts as legal contracts. Details can be found in FSI (2023).

supervision, while financial regulators may have difficulty collecting relevant information, compromising their ability to achieve satisfactory regulatory outcomes in areas such as AML/CFT controls and investor protection guardrails within their own jurisdictions.¹⁹

Regulatory fragmentation creates opportunities for regulatory arbitrage, where non-compliant operators can exploit jurisdictions with weak or no supervision

Global cooperation in the regulation of crypto-assets and DeFi is further hampered by the lack of standardised definitions, classifications, and taxonomy. To date, there is no universally accepted classification of crypto-assets or financial service activities based on smart contracts (FSI, 2023). At the market participant level, DeFi users often use informal or heterogeneous vocabulary to refer to crypto-assets that may not accurately reflect their technological construction or economic use. This presents challenges for financial authorities seeking to analyse and ascertain the true nature of various crypto-asset products. At the financial authority level, many authorities have created their own classification based on the economic functions of crypto-assets (such as payment, utility, or security tokens), but these classifications differ across jurisdictions and present challenges for cross-border business activities, requiring collaborative supervision and communication between multiple authorities. Different classifications may also have implications for the relevant authority in charge of regulating an asset or for the laws and standards applicable to a particular crypto-asset, presenting

another set of concerns about the legal compatibility of crypto-asset regulation at the international level (FSI, 2023).

iv) Financial Stability

Without the necessary regulatory guardrails, the growing interconnections between the DeFi and TradFi markets could potentially generate financial shocks to the TradFi market. The degree to which DeFi vulnerabilities can generate systemic risk to financial stability hinges on the nature and strength of the connections and channels between DeFi and TradFi, such as financial institutions' exposure to DeFi, the confidence and wealth effects stemming from the involvement of households and firms in DeFi, and the extent to which DeFi protocols can facilitate the use of crypto-assets for payments and settlements (FSB, 2023a).

Given DeFi's limited interconnectedness with TradFi, the likelihood that a disturbance in the DeFi market will substantially affect the broader economy remains limited, as evidenced by the modest impact of the 2022 crypto-asset market crisis on TradFi stability (FSB, 2023a). Nevertheless, DeFi could play a larger role in the future, in view of the technological advancements and growing use of digital technology in finance.²⁰ The inherent volatility of the crypto-assets that underpin DeFi activity, coupled with DeFi's complex web of interdependencies and its reliance on smart contracts and collateralisation, could give rise to liquidity mismatches, excessive leverage, and operational vulnerabilities. These factors could lead to contagion risks, in which disruptions to the DeFi market could spill over into the broader financial system, particularly if DeFi's links to TradFi deepen (BIS, 2023a).

¹⁹ Regulatory fragmentation is also reflected in the low level of compliance with the FATF's Travel Rule (as discussed in Chapter 2), which highlights the issue of delays in implementation and different enforcement timelines across jurisdictions, giving rise to what the FATF called the 'sunrise issue, which allows VASPs (including applicable DeFi entities) to operate with foreign counterparties that are not subject to relevant AML/CFT measures and creates challenges for both 'DeFi arrangements' seeking to comply with the regulatory requirements of different countries and for jurisdictions in mitigating the risk of DeFi-facilitated illicit financing activities. Details can be found in FATF (2023).

²⁰ The widespread adoption of crypto assets could also bring macroeconomic risk and fiscal sustainability issues (IMF, 2023a, 2023b). This may be attributable to the fact that wider adoption of crypto assets would intensify 'cryptoisation' (i.e., substitution of domestic fiat currency with crypto-assets), which could weaken the effectiveness of monetary policy and bypass existing capital flow regulations. Furthermore, the spread of crypto assets could increase fiscal risks for public finances, arising from the fact that crypto-assets may not be applicable to existing taxation regimes given its crypto-assets' pseudonymous and borderless natures, which presents significant challenges for tax revenue collection and compliance. These factors illustrate the continued need for authorities and international bodies to monitor DeFi and crypto-asset market developments.

3.2. INTERNATIONAL REGULATORY INITIATIVES

With the emergence of new business structures providing financial services, many financial authorities around the world are advocating the guiding principle of ‘same activity, same risk, same regulation’. According to this guiding principle, any business activity that performs the same economic function and produces the same risks should be subject to the same regulatory treatment, to ensure that all businesses compete on a level playing field, without any entity or underlying technology benefiting from favourable regulatory coverage or comprehensiveness (i.e. technology neutrality).

In applying the guiding principle, regulators should first consider applying existing regulatory frameworks, as applying existing rules to new institutional forms is often consistent with the intent of the original legislation. The consideration should also take into account some subtleties, such as: (i) the risks associated with an activity may vary considerably depending on the underlying technologies used; (ii) the ‘same’ regulatory treatment does not imply identical treatment; the guiding principle seeks to ensure the achievement of common regulatory outcomes, which may require equivalent rather than identical regulation (IIF, 2022); and (iii) different

regulations for the same economic activity may be warranted to the extent that technological innovation can help firms circumvent existing measures.

Alongside this guiding principle or close variants of it, international organisations have recommended potential approaches to mitigate major risks and regulatory challenges in the ecosystem. These high-level policy recommendations are designed to (i) assist financial authorities in achieving the same regulatory outcomes for crypto-asset activities as those for TradFi business activities and capturing new risks specific to crypto-assets and DeFi not covered in the frameworks; (ii) clarify the application of existing principles to crypto-asset and DeFi activities; and (iii) promote the development of effective and internationally consistent regulatory frameworks. At the G20’s request, the FSB (2023b) finalised a set of high-level recommendations for crypto-asset activities and markets, including those conducted through DeFi, which seek to establish a global regulatory baseline for jurisdictions and promote greater consistency in formulating relevant regulatory and supervisory approaches around the world (Figure 3.2). Based on these recommendations and those developed by other international organisations, the IMF-FSB (2023) have also set out a synthesis paper to clarify how the recommendations developed by different international organisations fit together and interact with each other.

Figure 3.2: The FSB’s 2023 high-level recommendations for the regulation, supervision, and oversight of crypto-asset activities and markets



Source: HKIMR staff compilation, FSB (2023b)

In addition to the guiding principle, international organisations have placed emphasis on overseeing the governance of the crypto-asset ecosystem at a high level (Table 3.1). The most common emphasis is on international cooperation, focusing on mechanisms for communication and data sharing among regulators, particularly to minimise regulatory arbitrage opportunities. Emphasis is also placed on

AML/CFT measures for monitoring and supervision of VASPs (FATF, 2021), retail investor protection and media monitoring (IOSCO, 2023c), and minimum capital requirements for banks' exposure to crypto-assets (BCBS, 2022). Although these recommendations remain at a high level, they provide insight for financial authorities in supervising the crypto-asset market.

Table 3.1: Regulatory initiatives by international organisations for crypto-asset markets

Publication	Key risks addressed	Key suggestions for financial authorities
IMF (2023a)	<ul style="list-style-type: none"> • Interconnectedness • Other risks (macroeconomic risk, data gaps) 	<ul style="list-style-type: none"> • Mitigate substantial risks to the effectiveness of monetary policy, exchange rate management, capital flow management measures, and fiscal sustainability; also banks' deposits losing and so lending being curtailed • Require changes in central bank reserve holdings and global financial safety net • Develop more granular, relevant, and consistent data across countries to inform policymaking
IMF (2023b)	<ul style="list-style-type: none"> • Interconnectedness • Compliance and legality • Investor and consumer protection • Technological fragilities • Other risks (macroeconomic risks, fiscal risks) 	<ul style="list-style-type: none"> • Safeguard monetary sovereignty and stability, maintain effectiveness of capital flow management measures, and adopt unambiguous tax treatment • Establish legal certainty of crypto-assets, and develop and enforce requirements to all actors • Establish international collaborative arrangements, and strengthen global cooperation to develop digital infrastructures
IOSCO (2023b)	<ul style="list-style-type: none"> • Interconnectedness • Governance • Technological fragilities • Investor and consumer protection 	<ul style="list-style-type: none"> • Adhere to the 'Same activities, same risks, same regulation' • Require CASPs to have effective governance arrangements and disclose conflicts and other information • Encourage CASPs to adopt international data standards • Monitor media to mitigate market manipulation • Enhance cross-border co-operation and information sharing

Publication	Key risks addressed	Key suggestions for financial authorities
BCBS (2022)	<ul style="list-style-type: none"> • Leverage, liquidity and maturity mismatches 	<ul style="list-style-type: none"> • Strengthen regulation and supervision of banks worldwide for financial stability • Classifying crypto-assets into Groups 1 and 2 based on risk levels under the consolidated Basel framework, subject to different minimum capital requirements
FATF (2021)	<ul style="list-style-type: none"> • Compliance and legality 	<ul style="list-style-type: none"> • Take a risk-based approach • Apply relevant FATF Standards to supervise VASPs • Enhance global co-operation and information sharing • Keep VASPs' supervision away from 'self-regulatory bodies'

Source: HKIMR staff compilation

In addition, international organisations have proposed several specific recommendations to deal with the unique characteristics and risks of the DeFi market (Table 3.2). For instance, in light of the rapid evolution of DeFi, the FSB (2023a) and OECD (2022) emphasised the importance of continuously monitoring DeFi

development and its interconnectedness with TradFi and potential spillover risks. IOSCO (2023c) focused on identifying key players exercising significant control or influence over a purported 'DeFi arrangement', requiring them to identify and address conflicts of interest, material risks, and disclosure issues.

Table 3.2: Regulatory initiatives by international organisations for DeFi

Publication	Key risks addressed	Key suggestions for financial authorities
FSB (2023a)	<ul style="list-style-type: none"> • Interconnectedness • Governance • Technological fragilities • Other risks (macroeconomic risks) 	<ul style="list-style-type: none"> • Gauge DeFi's vulnerabilities, evolution, and spillover risks to TradFi and the real economy • Fill data gaps and promote data sharing and market intelligence • Assess the regulatory perimeter across jurisdictions and identify DeFi users' entry points
IOSCO (2022, 2023a, 2023c)	<ul style="list-style-type: none"> • Interconnectedness • Governance • Compliance and legality • Technological fragilities 	<ul style="list-style-type: none"> • Adhere to the 'same activity, same risk, same regulation' • Analyse DeFi at the 'economic reality', 'functional' and 'technical' levels • Require Responsible Persons to address conflicts of interest and material risks • Assess interconnections among markets and enhance global co-operation

Publication	Key risks addressed	Key suggestions for financial authorities
OECD (2022)	<ul style="list-style-type: none"> • Interconnectedness • Governance • Compliance and legality • Technological fragilities • Leverage, liquidity and maturity mismatches • Investor and consumer protection 	<ul style="list-style-type: none"> • Require enhanced disclosure • Provide investor protection updates and education to raise awareness of DeFi risks • Implement prudential treatment on TradFi intermediaries' exposure to crypto-assets • Enhance global co-operation • 'Recentralise' DeFi to hold at least one party accountable

Source: HKIMR staff compilation

For stablecoin markets, the FSB, the BIS Committee on Payments and Market Infrastructure (CPMI) and IOSCO suggested that systemically important stablecoins widely adopted within and across one or more jurisdictions should be required to build comprehensive governance structures to ensure appropriate risk management, data storage and reporting, disclosure, and settlement;

otherwise, their failure or distress could have a significant impact on the entire financial system (Table 3.3). The FSI (2024) and FSB (2023c) recognised the importance of global cooperation and information sharing among regulators to ensure a consistent regulatory framework to address risks posed by stablecoins and prevent regulatory arbitrage to ensure a level playing field.

Table 3.3 Regulatory initiatives by international organisations for stablecoins

Publication	Key risks addressed	Key suggestions for financial authorities
FSI (2024)	<ul style="list-style-type: none"> • Interconnectedness • Governance • Compliance and legality • Technological fragilities • Investor and consumer protection 	<ul style="list-style-type: none"> • Strike a balance between fostering innovation and mitigating risks, along with continued monitoring, research and global co-operation • Allow stablecoins and other tokenised assets to coexist on the same programmable platform • Explore stablecoins' relationship with other digital assets
FSB (2023c)	<ul style="list-style-type: none"> • Interconnectedness • Governance 	<ul style="list-style-type: none"> • Adhere to 'same activity, same risk, same regulation' • Enhance global cooperation and information sharing • Put 'global stablecoin' arrangements in place to ensure appropriate governance, data reporting, resolution plans, disclosure, timely redemption, and legal claims
CPMI- IOSCO (2022)	<ul style="list-style-type: none"> • Interconnectedness • governance • investor and consumer protection 	<ul style="list-style-type: none"> • Adhere to 'same business, same risks, same rules' • Apply the Principles for Financial Market Infrastructures to systemically important stablecoin arrangements (SAs) • Require SAs to enhance governance and risk-management, and define the point of irrevocability of stablecoin transfer

Source: HKIMR staff compilation

3.3. REGULATORY APPROACHES ADOPTED BY FINANCIAL AUTHORITIES

3.3.1. Crypto-asset markets

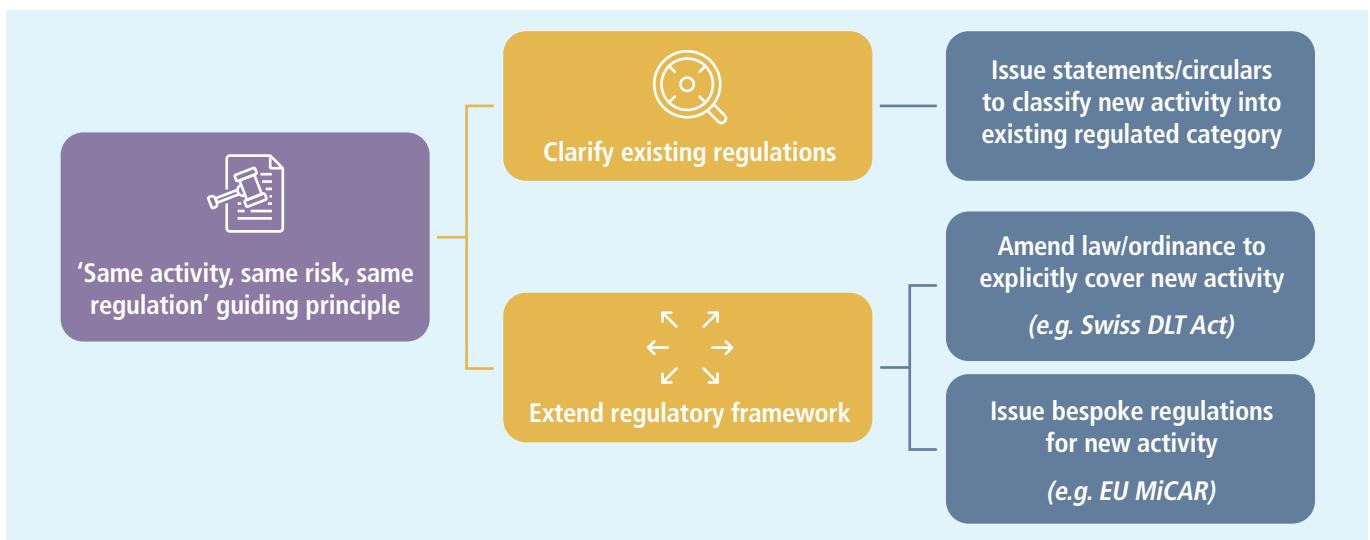
When applying the guiding principle of ‘same activity, same risk, same regulation’, in some cases authorities could conveniently classify a crypto-asset into an existing asset class and apply the relevant existing regulatory framework to supervise it (i.e. clarify existing regulations). However, this could leave crypto-assets which cannot be classified under a broad category or fall under more than one category unregulated (Blandin et al., 2019). According to the same principle, in certain cases where existing regulatory frameworks are considered insufficient to cover a crypto-asset, regulators could extend their regulatory perimeter by amending existing law or developing bespoke regulations (Figure 3.3).

Indeed, some jurisdictions have amended existing laws or regulations to explicitly cover specific crypto-asset activities (Table 3.4). For instance, Switzerland adopted a blanket act on DLT in 2021, called the ‘Federal Act on the Adaptation of Federal Law to Developments in Distributed Electronic Register Technology’ (Swiss DLT

Act), which involved amending several federal laws to provide a legal basis for digital assets held on DLT, covering areas such as property rights, custodians, and licences; Japan amended its Payment Services Act (Japan PSA) to regulate crypto-assets and stablecoins in June 2023; and Singapore amended its Payment Services Act (Singapore PSA) and subsidiary legislation in April 2024 to bring third-party custodian services within its regulatory framework and impose additional requirements on AML/CFT, user protection, and financial stability on regulated crypto-asset activities.

In comparison, taking a further step by issuing bespoke regulations on crypto-assets is currently less popular. The European Union (EU) was one of the first to set out a specific regulatory framework for crypto-asset activities and market infrastructures. The framework, known as the European Commission’s 2020 Digital Finance Package, covers two regulatory aspects. The first aspect, namely ‘Markets in Crypto Assets Regulation’ (MiCAR), applies to crypto-asset issuers and service providers not covered elsewhere in EU financial legislation. Having integrated these market participants into its regulatory scope, MiCAR provides the EU with regulatory oversight over existing regulatory gaps and harmonises previously fragmented regulatory regimes into a sound and predictable legal environment (EPRS, 2023). The second aspect of the

Figure 3.3: High-level regulatory approaches under the guiding principle of ‘same activity, same risk, same regulation’



Source: HKIMR staff compilation

framework, namely ‘Regulation on a Pilot Regime for Market Infrastructures based on DLT’, applies EU financial instruments issued with DLT not covered by MiCAR. Besides the EU, other examples of bespoke regulatory responses include Malta’s Virtual Financial

Assets Act, Abu Dhabi’s Crypto Asset Spot Framework, and Mexico’s Law to Regulate Financial Technology Institutions in 2018, but these frameworks have yet to be fully tested given the rapid evolution of the crypto-asset ecosystem.

Table 3.4: Examples of extending regulatory frameworks to supervise crypto-assets

	<i>Amending existing law</i>	<i>Issuing bespoke regulations</i>	
	Switzerland	EU	
	Swiss DLT Act	MiCAR	Regulation on a Pilot Regime for Market Infrastructures based on DLT
Effective date	September 2021	<ul style="list-style-type: none"> • June 2024 (Titles III and IV) • December 2024 (all other provisions) 	March 2023
Assets covered	Digital assets held on distributed ledgers	<ul style="list-style-type: none"> • Asset-backed stablecoins collateralised by fiat currencies, commodities, or other cryptocurrencies • Utility tokens 	EU financial instruments issued with DLT not covered by MiCAR
Highlights	<p>Amended several federal laws to provide a legal basis for DLT assets</p> <ul style="list-style-type: none"> • Introduce DLT rights as a new type of right for digital assets • Allow crypto-assets to be segregated from other assets as off-balance sheet for FIs in event of bankruptcy • Waived the banking licence requirement for custodians of crypto assets qualified as ‘custodial assets’ • Establish a new licence category for DLT trading systems on which securities registered on distributed ledgers can be traded 	<p>First cross-jurisdictional regulatory framework for crypto-assets</p> <ul style="list-style-type: none"> • Any crypto-asset service provider and issuers of asset-referenced tokens and electronic money tokens shall be licensed by the jurisdictional authority • Issuers are required to publish a crypto-asset white paper to disclose information on the issuer, offeror, project, rights and obligations during the public offering 	<p>Regulations to facilitate the regulatory sandbox for companies to test and develop DLT-based solutions</p> <ul style="list-style-type: none"> • Establish requirements on DLT market infrastructures and their operators, such as obtaining prior specific permission and supervision as well as conditional temporary exemption from EU TradFi regulations

Source: HKIMR staff compilation

Nevertheless, some jurisdictions prefer a more restrictive approach for crypto-asset activities. One approach is to insulate TradFi entities from crypto ‘infection’ by limiting the fund flow into and out of the crypto-asset market and curbing any crypto links with TradFi and with the real economy (BIS, 2023a). Some jurisdictions, such as Mainland China and Bolivia, have introduced a complete ban on crypto-asset activities.

Overall, these regulatory responses are not mutually exclusive. Jurisdictional regulators may adopt a combination of regulatory responses to meet their jurisdiction’s needs, based on the risk implications of different crypto-asset activities. In addition, given the global nature of the crypto-asset market and its use to circumvent national laws, regulators must be aware of policies in other jurisdictions and may on occasion need to adjust their own policies.

3.3.2. DeFi markets

Regulations specific to DeFi activities remain rare, as DeFi is still in the early stages of development. A more relevant example is the ‘DLT Foundations Regulations 2023’ (DLTFR 2023) introduced by the Abu Dhabi Global Market Registration Authority (ADGM RA) of the United Arab Emirates (UAE). As an example of bespoke regulation directly relevant to DeFi, the DLTFR 2023 aims to provide legal recognition for DAOs by creating a new legal structure that captures the characteristics of DAOs called ‘DLT Foundations’. Registered DLT Foundations are required to provide the necessary information (e.g. governance structure, minimum asset values) and fall within the ADGM RA’s regulatory perimeter defined by the DLT Foundations Regulations 2023. A brief summary of the DLT Foundations Regulations 2023 is provided in Box 3.1.

Box 3.1: DLT Foundations Regulations 2023 introduced by ADGM RA

The DLTFR 2023 was created by the ADGM RA in October 2023 as a bespoke regulation for blockchain-enabled organisational structures (ADGM RA, 2023). It defined an entity structure called ‘DLT Foundations’ as ‘any legal entity with separate legal personality established to use, deploy, facilitate or support DLT or to issue tokens’, with the aim of capturing the features and characteristics of DAOs, thereby bringing DAOs within its regulatory perimeter and allowing the ADGM RA to introduce regulatory requirements on DAOs operating within its jurisdiction.

There are several requirements for an entity to register as a ‘DLT Foundation’. For example, the founder is required to submit a charter to a designated registrar, clarifying the objects, activities, governance, and beneficiaries of the ‘DLT Foundation’, as well as the rights and obligations of token holders. Registered ‘DLT Foundations’ must also have a minimum initial asset value, and the assets of a ‘DLT Foundation’ are subject to separate custody requirements. Registered ‘DLT Foundations’ are also subject to governance requirements. The ‘DLT Foundations Regulations 2023’ stipulates that registered ‘DLT Foundations’ must be governed by a foundation council, a guardian, and its token holders. The governance council must be composed of at least two and no more than 16 councilors subject to knowledge and competency requirements. Finally, ‘DLT Foundations’ are subject to reporting obligations. They must keep accounting records and prepare annual records, which are audited by an independent auditor.

In comparison, many jurisdictions are at the stage of publishing analytical papers and conducting research to prepare the formulation of a DeFi-specific regulatory framework. For example, the UK Law Commission is exploring the legal characterisation of DAOs, given that a DAO does not necessarily represent a particular type of organisational structure and therefore cannot, on its own, imply any particular regulatory treatment.²¹ The EU's MiCAR has brought crypto-asset issuers and activities within the regulatory perimeter, however, DeFi protocols are considered out of scope.

3.3.3. Stablecoins

Stablecoins are considered increasingly crucial to the crypto-asset ecosystem, as their interconnectedness with TradFi increases and the associated spillover risks to the financial system are expected to be more direct and imminent. In view of this development, a number of financial authorities in developed economies have already taken important steps to expand their regulatory framework to regulate stablecoins (Table 3.5).²² For example, in Europe, the Swiss Financial Market Supervisory Authority (FINMA) was among the first to issue guidelines on stablecoins in 2019, while the MiCAR provisions for stablecoins will soon apply (mid-2024). The UK passed the Financial Services and Markets Act 2023 (FSMA 2023) in mid-2023, then issued proposals in late 2023 to consult on the regulation of fiat-backed stablecoins in Phase 1 and other crypto-assets in Phase 2. In general, these regulations aim to impose

requirements on stablecoin issuers in terms of reserve assets, redemption rights, prudential obligations, governance and risk management, technology and cyber security, AML/CFT, and disclosure and marketing (FSI, 2024).

In Asia, Japan and Singapore were among the early movers in stablecoin regulations. In the amendment of Japan PSA, the legal status of fiat-referenced stablecoins in 2022 has been newly defined, which prompted key stablecoin issuers to partner with local Japanese financial institutions to enter the market after the Japan PSA took effect in mid-2023. The Monetary Authority of Singapore (MAS) developed its stablecoin regulatory framework by amending the Singapore PSA in August 2023. After the Act took effect, a series of in-principle licence approvals were granted to stablecoin issuers in the second half of 2023.

In the US, the development of federal regulatory frameworks on stablecoins and crypto-assets have remained underway. The recent framework called the Clarity for Payment Stablecoins Act seeks to change the way stablecoins are regulated in the US. Proposing a regulatory framework and licencing process that will provide a common approach across all states, the Act was first passed by the US House Financial Services Committee in July 2023 and is awaiting full approval by the House. Meanwhile, individual states such as New York, Texas, and Nebraska have more relevant regulatory developments on stablecoins.²³

²¹ Many DAOs establish a formal entity structure such as a corporation, limited liability company, partnership, or foundation to define their legal treatment and conduct administrative tasks that require the establishment of a legal entity. The entity structures adopted by DAOs vary greatly across the crypto-asset landscape, with important implications for the applicability of existing regulations. Further discussions can be found in the UK Law Commission's website on DAOs.

²² Details of these developments can be found in official websites, such as State Secretariat for International Finance SIF (Switzerland), BoE/FCA (UK), MAS (Singapore), NYDFS (US).

²³ Details can be found in a review titled '50 State Review of Cryptocurrency and Blockchain Regulation' published by the Stevens Center for Innovation in Finance, University of Pennsylvania, in March 2024.

Table 3.5: Regulatory developments related to stablecoins in recent years

Area	Jurisdiction	Regulatory development	Permitted stablecoin issuers
Europe	Switzerland	September 2019: Published 'stablecoin' guidelines by FINMA outlining the continued adoption of 'substance over form' and 'same risk, same rules' towards stablecoins	<ul style="list-style-type: none"> • There is no specific regulations for stablecoins so far
	EU	<p>June 2023: Published MiCAR in the EU's Official Journal and entered into force</p> <p>June 2024: MiCAR's provisions for stablecoins to take effect</p>	<ul style="list-style-type: none"> • Banks and licensed NBFIs <ul style="list-style-type: none"> ◦ Banks and 'electronic money institutions' established in the EU can issue e-money tokens
	UK	<p>June 2023: Passed FSMA 2023, introducing a preliminary regulatory framework for crypto-assets</p> <p>November 2023: Published discussion paper outlining their proposed approach to regulating fiat-backed stablecoins</p>	<ul style="list-style-type: none"> • Any entity that obtains a crypto-specific license <ul style="list-style-type: none"> ◦ All entities, regardless of business type, are required to seek authorisation from the FCA to issue stablecoins
Asia	Japan	<p>June 2022: Passed bill to impose a licensing regime on stablecoin issuers (Japan PSA)</p> <p>December 2022: Lifted a ban on foreign-issued stablecoins</p> <p>June 2023: Japan PSA took effect²⁴</p>	<ul style="list-style-type: none"> • Banks and licensed NBFIs[HZJ6] <ul style="list-style-type: none"> ◦ 'Fund Transfer Service Providers' can issue stablecoins as claims on outstanding obligations ◦ 'Trust Companies' can issue stablecoins as trust beneficiary rights
	Singapore	<p>October 2022: Issued Consultation Paper on Proposed Regulatory Approach for Stablecoin-Related Activities</p> <p>August 2023: Finalised the stablecoin regulatory framework labelling stablecoins as 'MAS-regulated stablecoins'²⁵</p>	<ul style="list-style-type: none"> • Banks and licensed NBFIs <ul style="list-style-type: none"> ◦ Banks are exempt from licensing regime ◦ NBFIs are required to apply for a license to issue stablecoins

²⁴ After the PSA takes effective, Circle, the second largest stablecoin issuer of USDC, partnered with Japan's SBI Holdings in November 2023 aiming to circulate the USDC in Japan in 2024.

²⁵ In November 2023, the MAS granted approvals in-principle to StraitsX and Paxos to issue fiat currency-pegged stablecoins (e.g. USD-backed and SGD-backed).

Area	Jurisdiction	Regulatory development	Permitted stablecoin issuers
Americas	US	<p>June 2022: Released guidance for USD-backed stablecoins highlighting key requirements for stablecoin issuers in New York</p> <p>July 2023: Passed the Clarity for Payment Stablecoins Act of 2023 introducing a federal regulatory framework for stablecoin issuers²⁶</p>	<ul style="list-style-type: none"> • Banks, licensed NBFIs, and any entity that obtains a crypto-specific license in New York <ul style="list-style-type: none"> ○ Banks can engage in stablecoin issuance by obtaining a license or by receiving approval to conduct such activities under their existing charter ○ ‘Non-banks’ can engage in stablecoin issuance by obtaining a license or a limited trust company charter • Federal Regulatory Agencies: Banks and licensed NBFIs <ul style="list-style-type: none"> ○ Banks and all ‘insured depository institutions’ are allowed to issue stablecoins provided they receive supervisory non-objection

Source: HKIMR staff compilation and FSI (2024).

3.4. HONG KONG'S POLICY APPROACH TO THE CRYPTO-ASSET ECOSYSTEM²⁷

Hong Kong has welcomed the VA industry and seeks to support its sustainable and responsible development (FSTB, 2022). As stated in the Financial Services and the Treasury Bureau (FSTB)'s policy statement on the development of VAs in Hong Kong, the HKSAR government (HKSARG) acknowledges the legitimacy of VAs and their role in finance and welcomes VASPs in Hong Kong, with an emphasis on putting in place timely and necessary guardrails (Table 3.6a). The policy statement also mentions considering a future review of property rights for tokenised assets and the legality of smart contracts to provide a solid legal foundation for the ecosystem, including the DeFi market. In addition to the policy statement, the HKSARG

budgeted a substantial amount and established a VA task force to promote Web3 to facilitate a better environment for the evolution of the VA ecosystem.

In conjunction with the HKSARG, Hong Kong's financial authorities are working to create a favourable environment for the promotion of the VA sector based on the guiding principle of ‘same activity, same risk, same regulation’ (HKMA, 2022c; SFC, 2022). In terms of applying or clarifying the current regulatory perimeter, the Securities and Futures Commission (SFC) Statement on Initial Coin Offerings, published in 2017, was the first approach to bringing VAs into Hong Kong's regulatory perimeter by clarifying that digital tokens that fall within the legal definition of ‘securities’ (i.e. security tokens) are subject to Hong Kong's securities laws under the Securities and Futures Ordinance (SFO) (Table 3.6b). Since then, the SFC has continued to clarify the regulatory perimeter and clarify the applicability of

²⁶ In August 2023, an USD stablecoin was jointly launched by Paypal and Paxos Trust and was subject to regulatory oversight by the NYDFS.

²⁷ Hong Kong's current crypto-asset regulatory regime follows international standards set by the FATF. As such, any mention of crypto-assets in the context of Hong Kong will use the term ‘VA’, which is defined by the Anti-Money Laundering and Counter-Terrorist Financing Ordinance (AMLO) as ‘a cryptographically secured digital representation of value’, excluding certain forms such as CBDCs and those within the definitions of securities and futures.

existing regulations (i.e. the SFO) by issuing a series of circulars and statements on various VAs classifiable as ‘securities’ or ‘futures contracts’, covering crypto-related futures contracts, portfolio management, trading platform operations, and VA-related intermediaries. In 2024, the Hong Kong Monetary Authority (HKMA) clarified several key risk management considerations for the banking sector when banks review intermediaries’ interest in applying their DLT.

In terms of extending the regulatory perimeter, the HKSARG brought previously unregulated VAs and VA activities into its regulatory scope by amending existing regulations (Table 3.6c (i)). The SFC (2018) noted that VA trading platforms (VATPs) were able to evade its regulatory framework by arguing that none of the VAs traded on their platforms were ‘securities’ or ‘futures contracts’ as defined by the SFO. Accordingly, the FSTB held a round of consultation to broaden the definition of ‘VAs’ and create licencing requirements for all centralised VATPs trading such VAs (FSTB, 2019) and subsequently amended the Anti-Money Laundering and Counter-Terrorist Financing Ordinance (AMLO) in 2022; these licencing requirements came into effect in June 2023 (with a non-contravention period of one year) with the launch of the SFC’s VATP Licencing Regime.

Looking to the future, the HKSARG is seeking to further extend its regulatory perimeter. This will include the publication of consultation papers for two key initiatives: i) the further amendment of the AMLO to include over-the-counter (OTC) trading of VAs; and ii) the creation of bespoke legislations for fiat-referenced stablecoins.

Apart from these regulatory remits, Hong Kong is also extending the regulatory perimeter to stablecoins (Table 3.6c (ii)). As one of the early movers in the Asia Pacific region, Hong Kong has outlined the proposal of bringing a fiat-referenced stablecoins into the regulatory perimeter in a public consultation in 2023. The HKMA also launched the stablecoin sandbox arrangement to improve communication with stakeholders and parties interested in issuing stablecoins in Hong Kong.

The FSTB’s policy statement also mentioned that the Metaverse’s development is an essential element in supporting a vibrant VA ecosystem. More discussions about the current developments and potential of the Metaverse in Hong Kong’s financial markets can be found in the Applied Research Report published by the Hong Kong Institute for Monetary and Financial Research (HKIMR) titled ‘The Metaverse: Opportunities and Challenges for the Financial Services Industry’.

Table 3.6: Key VA policy positions and related initiatives clarifying and extending the regulatory perimeter

(a) Government’s policies			
Time	Authority	Regulatory initiative	
October 2022	FSTB	Policy statement on the development of VAs in Hong Kong	
February 2023	HKSARG	Allocation of HK\$50M for the 2023-2024 Budget for Web3 market development initiatives	
June 2023	HKSARG	Establishment of the Task Force on Promoting Web3 Development	
(b) Clarifying the regulatory perimeter (for all VAs)			
Time	Authority	Regulatory initiative	Key Points
September 2017	SFC	Statement on Initial Coin Offerings	<ul style="list-style-type: none"> Clarify that digital tokens that fall within the legal definition of ‘securities’ are subject to Hong Kong’s securities laws under the SFO and that certain activities involving such digital assets may also constitute ‘regulated activities’; as such, parties engaging in such regulated activities are required to be licensed or registered with the SFC

(b) Clarifying the regulatory perimeter (for all VAs)			
Time	Authority	Regulatory initiative	Key Points
December 2017	SFC	Circular to Licensed corporations and registered institutions on Bitcoin futures contracts and cryptocurrency-related investment products	<ul style="list-style-type: none"> Clarify that Bitcoin futures have the features of a ‘futures contract’ as defined by the SFO and should therefore be subject to regulation
November 2018	SFC	Statement on the regulatory framework for VA portfolios managers, fund distributors and trading platform operators	<ul style="list-style-type: none"> Bring VA portfolio management activities into the SFC’s regulatory net by stipulating that firms that engage in the distribution of funds invested in VAs are required to be licensed by or registered with the SFC, regardless of whether these assets are ‘securities’ or ‘futures contracts’
March 2019	SFC	Statement on Security Token Offerings	<ul style="list-style-type: none"> Clarify securities tokens are ‘securities’ under the SFO, but they are also ‘complex products’ that require additional investor protection measures and should only be offered to ‘professional investors’ (PIs) defined by the SFO
January 2022; October 2023; December 2023	HKMA & SFC	Joint circular on intermediaries’ VA-related activities	<ul style="list-style-type: none"> Highlight that sections of the SFO and AMLO that regulate intermediaries need to abide by when delivering VA related products and services to clients
November 2023	SFC	Circular on intermediaries engaging in activities related to tokenised securities	<ul style="list-style-type: none"> Classify tokenised securities as ‘securities’ under the SFO and provide further guidance to intermediaries on the regulatory expectations regarding the tokenisation of traditional financial instruments and how to manage risks specific to tokenised securities
		Circular on the tokenisation of SFC- authorised investment products	
April 2024	HKMA	Risk management considerations related to the use of DLT	<ul style="list-style-type: none"> Clarify the HKMA’s key risk management considerations when reviewing intermediaries’ proposed use of DLT-based solutions (e.g. tokenised traditional assets and liabilities), in line with the risk-based and technology-neutral approach

(c) Extending the regulatory perimeter			
Time	Authority	Regulatory initiative	Key Points
(i) for VAs and VATPs			
December 2022	HKSARG	Amendment to the AMLO	<ul style="list-style-type: none"> Establish legal definitions of VAs and 'VA service'. 'VA' is defined as 'a cryptographically secured digital representation of value' and a 'VA Service' is defined as operating a 'VA exchange'²⁸ Stipulate that 'it is an offence for a person to carry on the business of operating a VA exchange in respect of in-scope VAs, unless licensed under the AMLO'
June 2023	SFC	Commencement of VATP Licensing Regime	<ul style="list-style-type: none"> The effective date of the regulatory requirements set out in the AMLO. All centralised VATPs that operate in Hong Kong or actively market to Hong Kong investors must be licensed by the SFC
February 2024	FSTB	Public Consultation on Legislative Proposals to Regulate Over-the-Counter Trading of Virtual Assets	<ul style="list-style-type: none"> Propose a further amendment to the AMLO to include in the regulatory remit any person who provide spot trading services of any VA
May 2024	SFC	Statement on the end of non-contravention period for VATPs	<ul style="list-style-type: none"> Remind the public of the end of the non-contravention period for VATPs operating in Hong Kong under the AMLO on 1 June 2024. As of that date, a VATP operating in Hong Kong must be either licensed by the SFC, or "deemed-to-be-licensed" VATP applicants under the AMLO
(ii) for stablecoins			
January 2022	HKMA	Discussion Paper on Crypto-assets and Stablecoins	<ul style="list-style-type: none"> Outline the key parameters of a stablecoin regulatory regime and the HKMA's commitment to adopting a risk-based, 'same risk, same regulation' approach to regulating relevant entities and activities in line with applicable international standards²⁹ Consider the merits of integrating stablecoins into its regulatory remit from a payment perspective by amending the Payment Systems and Stored Value Facilities Ordinance, or developing new, stand-alone legislation
January 2023	HKMA	Conclusion of the Discussion Paper on Crypto-assets and Stablecoins	
December 2023	FSTB & HKMA	Legislative Proposal to Implement the Regulatory Regime for Stablecoin Issuers in Hong Kong Consultation Paper	<ul style="list-style-type: none"> Outline the intention to introduce new legislation to implement a licensing regime for fiat-referenced stablecoin issuers Announce the introduction of a sandbox arrangement for communication with stablecoin issuers and market participants

Source: HKIMR staff compilation

²⁸ Between the 2018 Statement and the 2022 AMLO Bill, the SFC introduced an opt-in licensing regime for VATPs offering trading services for one or more digital tokens classifiable as 'securities' or 'futures contracts' under the SFO.

²⁹ Of particular importance is the key regulatory principle of the upcoming regime, namely full backing and redemption at par; the value of a stablecoin's reserve assets must meet the value of all outstanding stablecoins, and the reserve assets should be of high quality and liquidity. By ensuring that stablecoin holders are able to redeem their stablecoins in the referenced fiat currency at par within a reasonable period, the proposed key regulatory principle may be able to mitigate the liquidity/maturity mismatches vulnerabilities of DeFi activities.

Chapter 4

Views of Market Participants in Hong Kong

Our survey revealed Hong Kong's growing interest and adoption of VAs, despite challenges.

HIGHLIGHTS:

- In the VA ecosystem, the survey respondents reported increasing VA involvement in their business operations and their strong interest in expanding that involvement over the coming years.
- In the near future, tokenised assets, stablecoins, and cryptocurrencies will be the main types of VA assets in the respondents' business operations, while several closely associated solutions, such as those for tokenisation, payment, custodian, conversion exchange, trading and staking platforms, will be increasingly adopted.

The HKIMR commissioned a survey titled 'Current Landscape and Recent Developments of Virtual Assets/DeFi in Hong Kong's Financial Services Industry' (the Survey), which was conducted from May to July 2023, with an aim to understand the views of Hong Kong's financial institutions and VASPs on the market landscape and regulatory developments in of VAs and DeFi in Hong Kong's financial services industry.

A total of 59 entities participated in the survey, including 40 financial institutions (referred to as TradFi entities) from three main sectors (i.e. banking, insurance, and asset management) and 19 VASPs.³⁰ In addition, the executives of 30 surveyed entities shared their views and suggestions during personal interviews.

Surveyed respondents were asked about their views on: i) the current VA activity in Hong Kong (section 4.1); ii) growth potential in the near future (section 4.2); and iii) challenges faced by market participants (section 4.3).

4.1. OVERVIEW OF CURRENT VA ACTIVITY IN HONG KONG

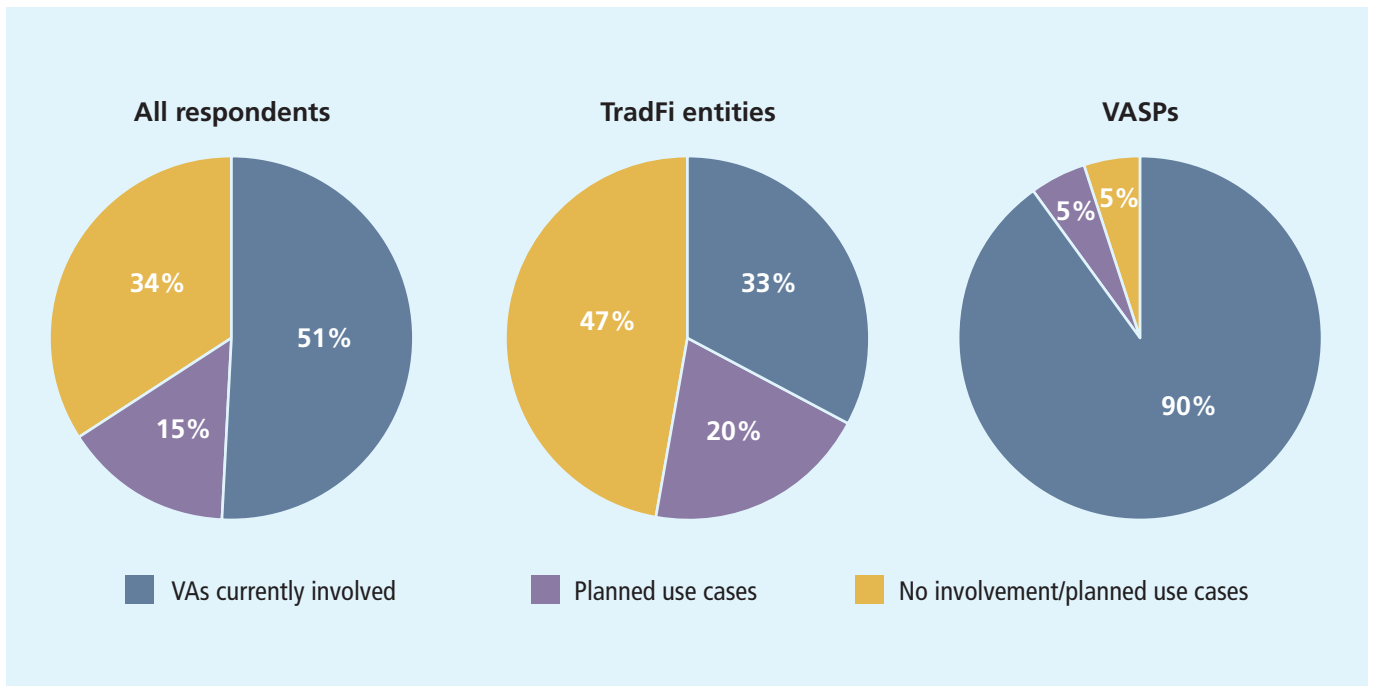
4.1.1. VA involvement

In the current VA ecosystem, two third of the survey respondents were already using VAs in their business operations or had planned use cases (Figure 4.1). 53% of the surveyed TradFi entities were currently using VAs or had planned use cases. Regarding the surveyed VASPs, 95% were currently using VAs or had planned use cases, which was notably higher given the nature of their VA activities. The main reasons for the TradFi entities' involvement in VAs included (i) VA activities can generate a potential new revenue stream; (ii) investing in VAs can provide a channel to diversify their investment portfolios; and (iii) efficiency gains from VA activities (e.g. faster payment) can enhance customers' experience in using their services. For the VASPs, a new revenue stream from VA activities was also one of the main reasons, with other reasons including: reduced costs through efficiency gains from using VA products; and faster processing times as VA transactions are peer-to-peer and do not involve traditional intermediaries (Figure 4.2).

The remaining one-third of respondents, almost all TradFi entities, either did not hold VAs or had no plan to hold VAs in the future. The reasons for not holding VAs were usually related to (i) institutional needs for their business and operations; (ii) availability of a comprehensive framework and guidance; (iii) stability of the VA market; and (iv) issues with understanding the technology.

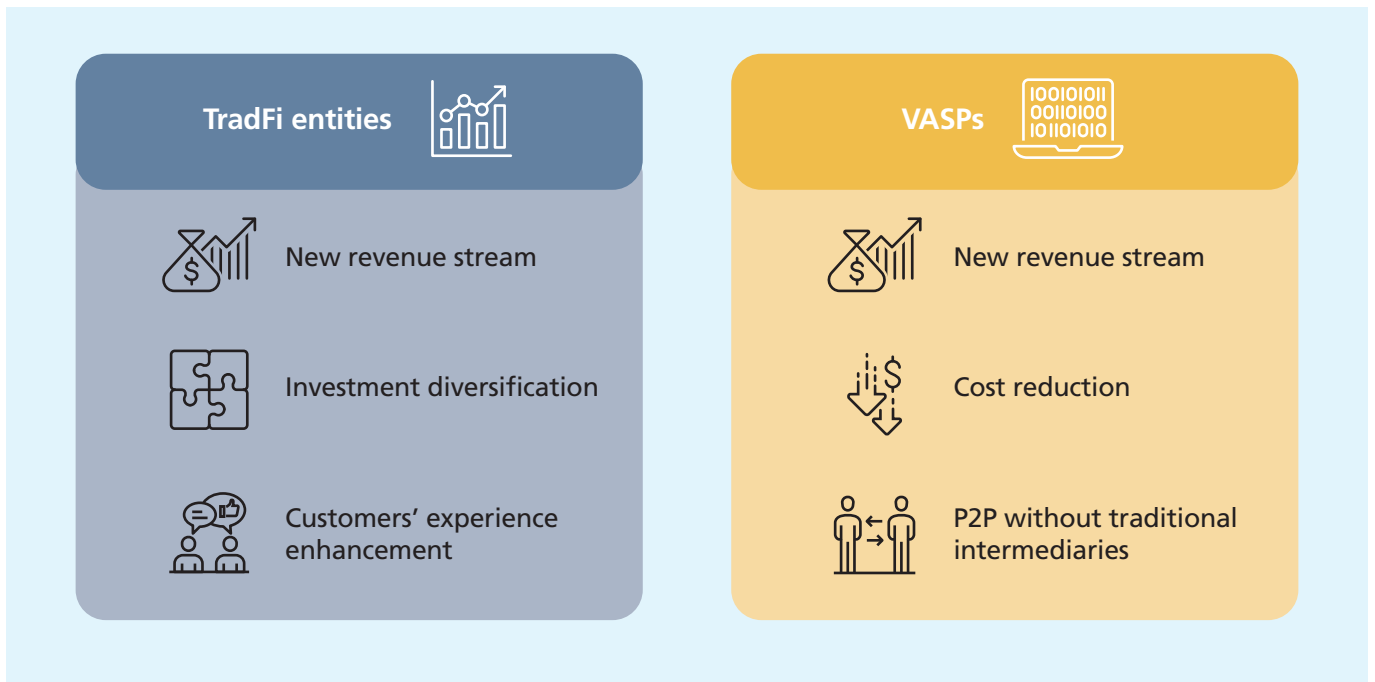
³⁰ Details of the Survey can be found in Appendix A

Figure 4.1: Level of VA involvement in respondents' business operations



Source: HKIMR staff compilation based on the Survey³¹

Figure 4.2: Top 3 perceived benefits of VAs for respondents' business and clients



Source: HKIMR staff compilation based on the Survey

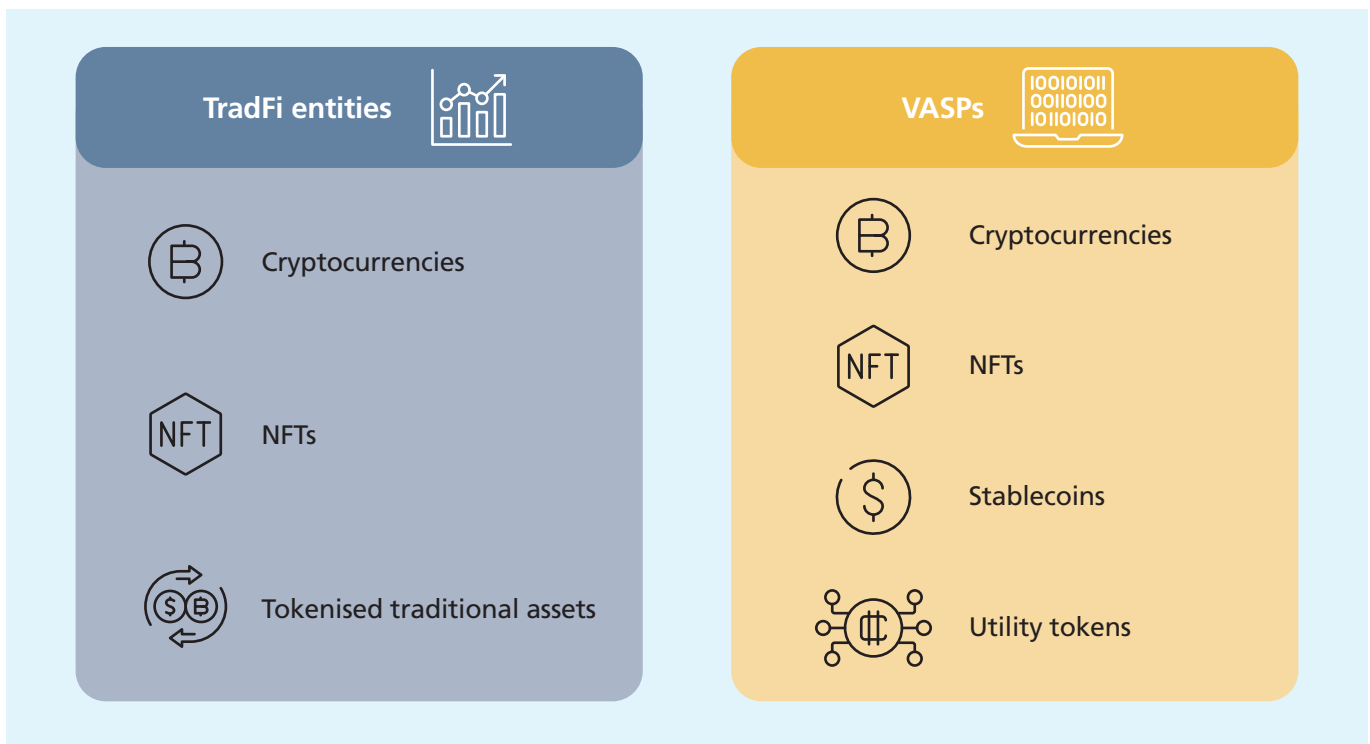
³¹ In the survey, 5% of the surveyed VASPs did not hold any VA because their business nature was purely based on code writing.

In terms of main VA types, some popular crypto-assets, including cryptocurrencies and non-fungible tokens (NFTs), were commonly held by the respondents (Figure 4.3). In addition, tokenised traditional assets and stablecoins were commonly held by the surveyed TradFi entities and VASPs, respectively. The main reasons for holding these types of VAs were closely related to the nature of their business. For the TradFi entities, their reasons for holding VAs included investment, medium of exchange, and blockchain-related payments. These VAs were generally held in the form of third-party custodians, self-custody hot wallets, and on-exchange. For the VASPs, the VA types mentioned were frequently involved in their activities as cryptocurrency exchanges, protocol/technology providers, and crypto investment funds and asset managers.

4.1.2. Products and services

There were a wide range of products and services available in the VA ecosystem, mainly provided by the VASP respondents. Several main VA products and services currently provided by the surveyed VASPs included crypto-conversion services, DLT/blockchain technology solutions, trading platforms, self-custody wallets, OTC trading, and staking platforms (Figure 4.4). The survey results also showed that 68% of these businesses served institutional customers across various industries, such as TradFi entities, technology companies, payment companies, and other VASPs, both locally and globally, while the remaining 32% served retail customers.

Figure 4.3: Major types of VAs currently held by respondents for their business operations in Hong Kong

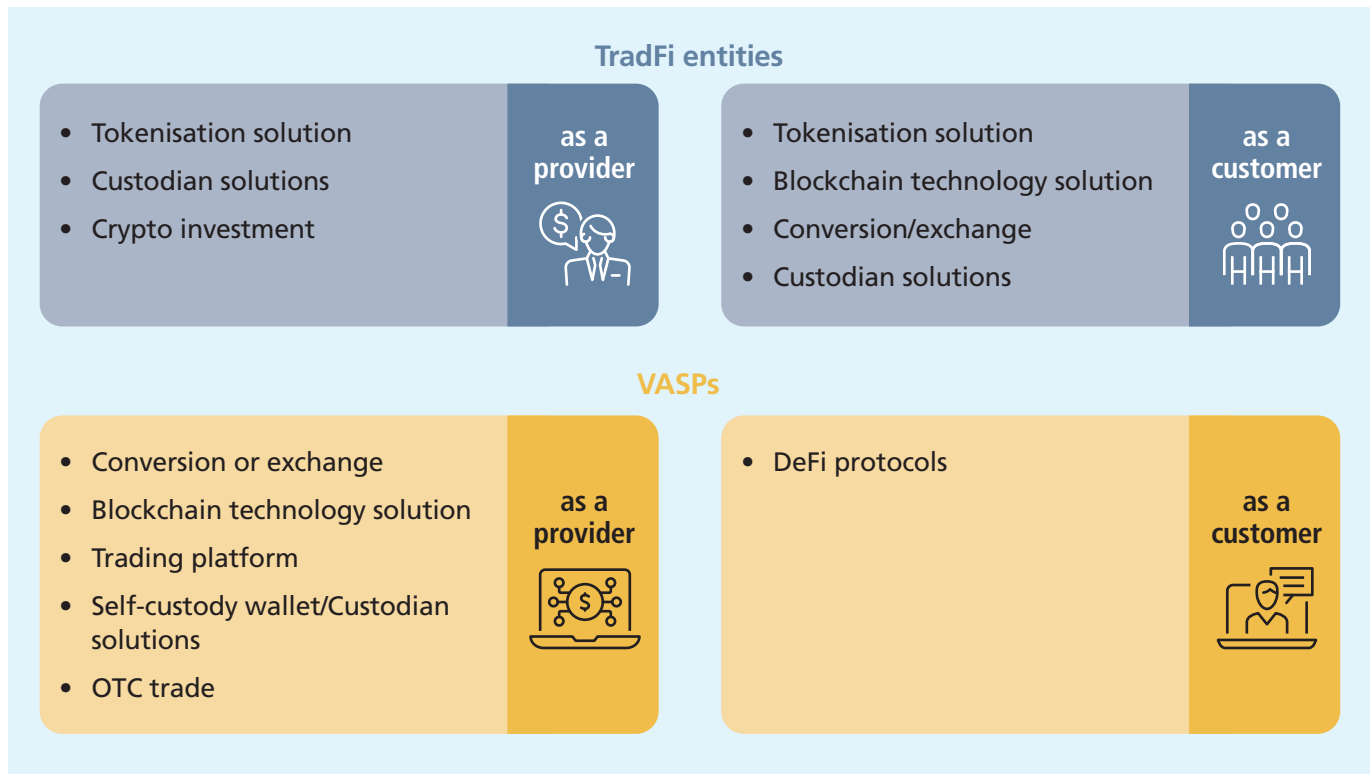


Source: HKIMR staff compilation based on the Survey

The VA products and services provided by the surveyed TradFi entities primarily served the TradFi sector. These products and services included (i) tokenisation solutions for corporate and wholesale banking, developed to address the challenges of settling cross-border transactions; (ii) VA custodian and trading platforms for retail and wealth management, aimed at providing their clients with secure and regulated platforms for interacting with VAs; and (iii) crypto-related tracker funds or hedge funds for investment and management activities, providing investors with the opportunity to purchase and trade investment products with exposure to VAs. To facilitate their role as product and service providers, several of the TradFi interviewees explained that they typically (i) reallocated their internal resources; and (ii) established strategic collaborations with prominent asset servicing providers or leading companies in the VA market.

The VA products and services that the survey respondents sought to procure were limited to several technology solutions. As institutional customers, the surveyed TradFi entities required some technology solutions for tokenisation, DLT/blockchain technology, fiat currency–VA conversion services, and third-party custodian services. Considered essential by some of the interviewees, such adoption could help reduce their associated transaction costs and enhance the efficiency of their business operations. In addition to their role as providers of VA services, a small number of VASPs considered themselves customers of VA services. Based on the limited information available in the survey, these VASPs were currently purchasing DeFi protocols while providing VA-related activities in the VA market with the aim of generating revenue.

Figure 4.4: Major VA products and services demanded/supplied by respondents in the VA ecosystem



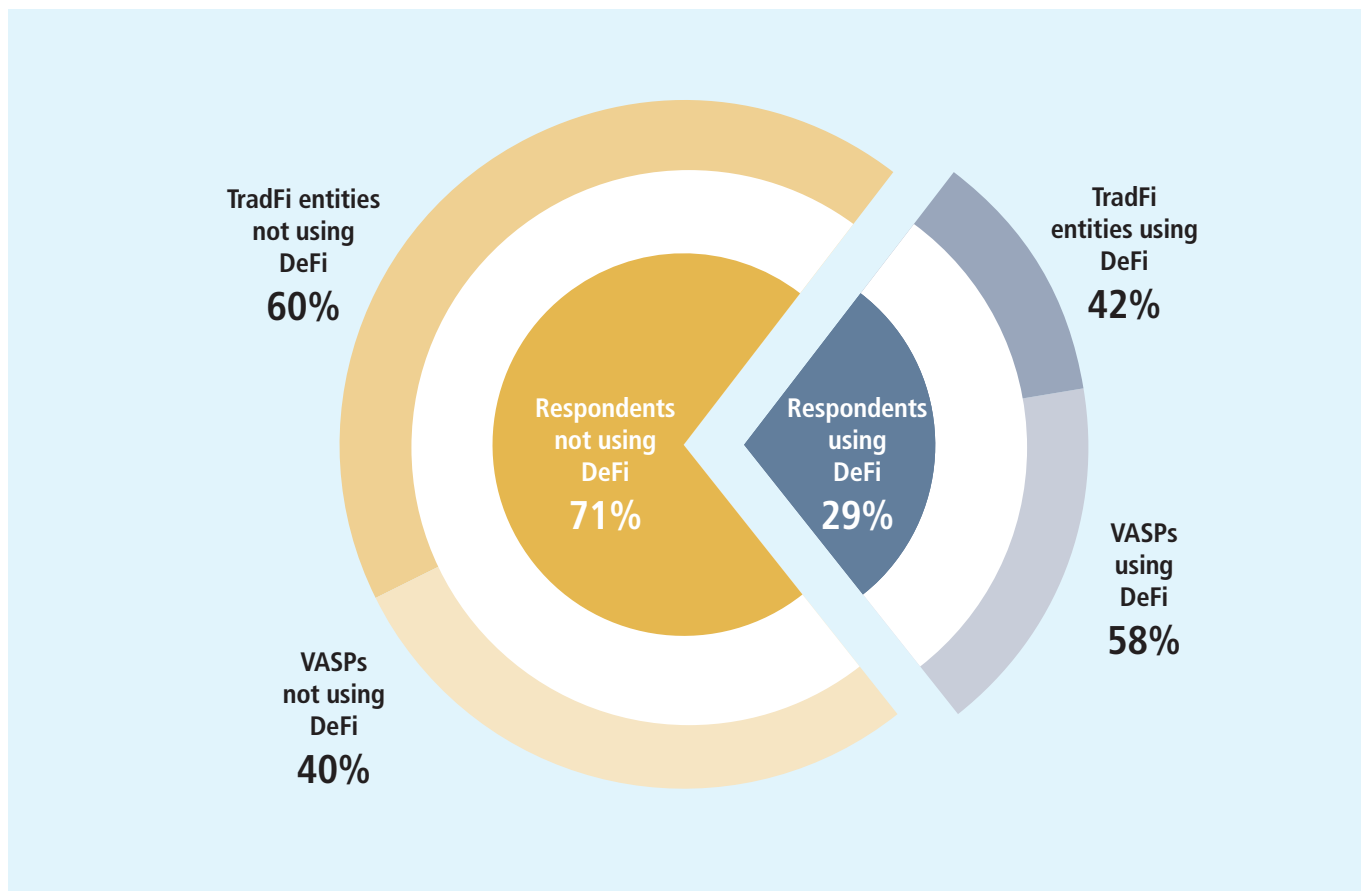
Source: HKIMR staff compilation based on the Survey

4.1.3. DeFi-specific activities

The DeFi-specific activities undertaken by the survey respondents were noticeable but needed to be further developed. Specifically, 29% of the respondents indicated that they had developed or operated DeFi protocols (Figure 4.5). The survey responses showed that these protocols included mining-/staking-related businesses, yield aggregators, liquidity pooling activities, and decentralised exchange/trading. The main perceived benefit of

using DeFi protocols highlighted by several interviewees was their ability to facilitate the exchange of small amounts of assets without the need for intermediaries or minimum limits, thereby offering greater flexibility. Commenting on the low adoption rate of DeFi, the interviewees stated that CeFi remains more popular than DeFi for traditional investors and businesses because CeFi offers higher liquidity, has a user-friendly interface, and is more readily accessible to clients of all types.

Figure 4.5: Development and/or operation of DeFi protocols by respondents



Source: HKIMR staff compilation based on the Survey

4.2. GROWTH POTENTIAL IN THE NEAR FUTURE

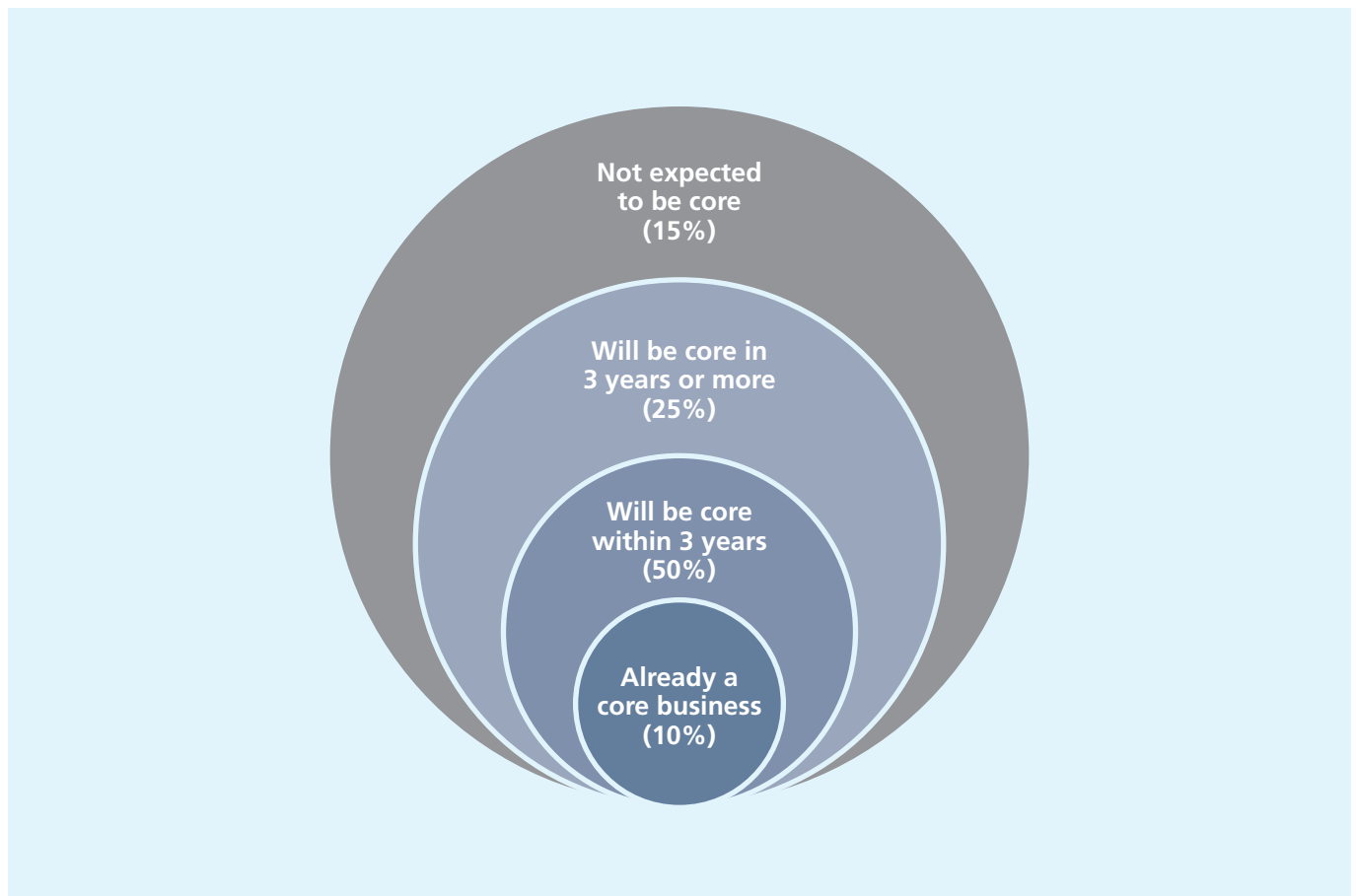
4.2.1. VA involvement

The surveyed respondents showed strong interest in increasing their use of VA assets and related activities in the near future. In particular, the majority of TradFi respondents (85%) had plans to incorporate VAs into a core part of their business and operations in the short-to-medium term (Figure 4.6), with one tenth of the surveyed TradFi entities integrating VAs already and three quarters having plans to do so in the next

3 years (50%) or more than 3 years (25%). This considerable integration suggests that many TradFi entities would be substantially exposed to VAs over the coming years.

The surveyed respondents further indicated that their future VA involvement would likely be tokenised traditional assets, stablecoins, NFTs, and cryptocurrencies (Figure 4.7). In particular, the respondents expected the use of tokenised traditional assets in TradFi activities to increase considerably over the next 3 years, with the proportion of interested TradFi respondents increasing from 22% to 79%. In the VASP sector, some currently

Figure 4.6: Integration of VAs into the business operations of TradFi entities



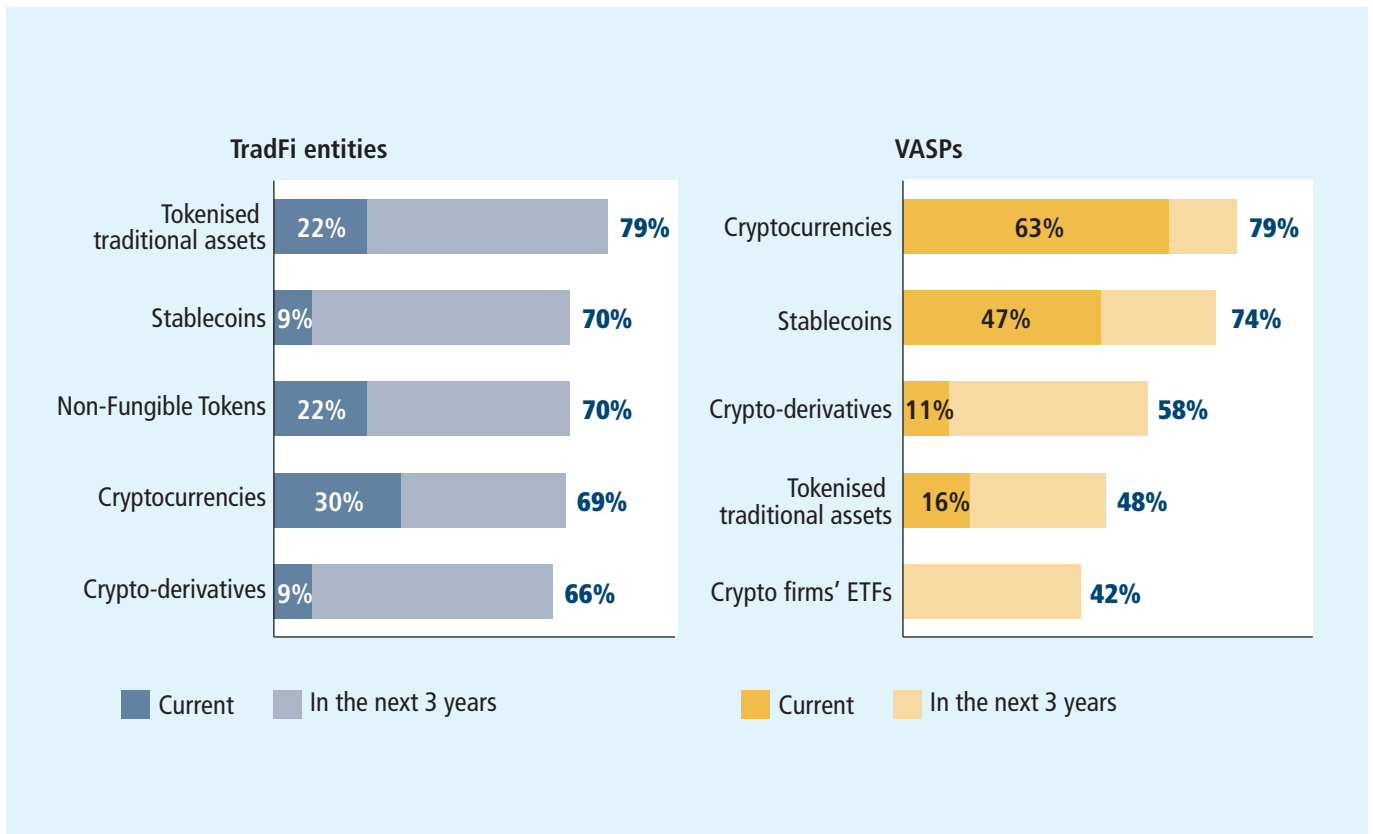
Source: HKIMR staff compilation based on the Survey

little-used VAs, such as crypto-derivatives and crypto-firm themed ETFs (i.e. ETFs investing in VASPs), were expected to become increasingly popular. This reflects the potential cross-market development of VAs being explored by the VASPs.

The significant increase in VA involvement among the TradFi respondents may be largely due to the positive stance of financial authorities on the sustainable and responsible development of the VA industry. Moreover, some related initiatives and regulatory developments recently launched by the HKMA have increased market confidence in the

development of VA market, such as the issuance of the world’s first tokenised government green bond in 2023, the world’s first multi-currency digital green bond in 2024, the public consultation on the regulation of stablecoins, the launch of the e-HKD Pilot Programme, the commencement of a new wholesale CBDC project (Project Ensemble), the participation in the cross-border payments using a common DLT platform (Project mBridge, initiated by BIS Innovation Hub). These advancements represent an important milestone for the development of blockchain technology and efficient cross-border payment transactions in the VA ecosystem.

Figure 4.7: Major types of VAs to be used in respondents’ business operations in the near future in Hong Kong



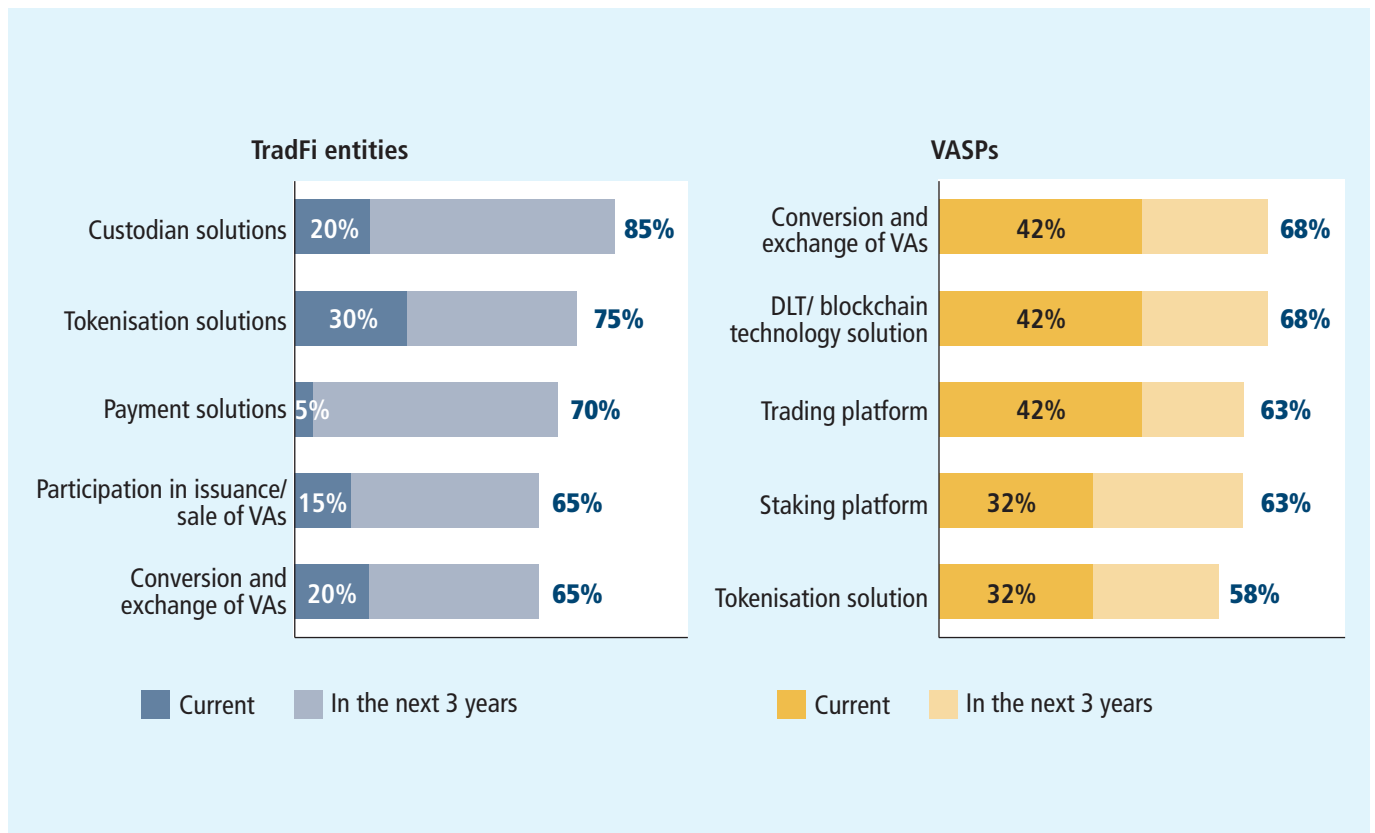
Source: HKIMR staff compilation based on the Survey

4.2.2. Products and services

In line with these changes in VA use, several related VA products and services will become increasingly popular over the coming years (Figure 4.8). On the demand side, the TradFi entities indicated that they would procure custodian solutions (85%), tokenisation solutions, and payment solutions (75% and 70%, respectively) in the next 3 years. According to the TradFi entities, these solutions would serve their needs to (i) manage their VAs, such as tokenised traditional assets and stablecoins; (ii) tokenise traditional assets,

like bond and equity offerings, Treasury securities, and investment funds; and (iii) provide payment services for various financial transactions, such as Treasury securities, intra-organisational transactions, consumer products, inter-bank payments, and VA settlements. On the supply side, the VASPs stated that they will continue to provide a wide range of VA solutions such as conversion and exchange services (68%), DLT/blockchain technology solutions (68%), trading platforms (63%), staking platforms (63%), and asset tokenisation (58%), as these solutions are crucial for further developments of CeFi and DeFi.

Figure 4.8: Major VA products and services to be adopted from the VA ecosystem by respondents



Source: HKIMR staff compilation based on the Survey

4.3. CHALLENGES FACED BY MARKET PARTICIPANTS

4.3.1. Regulatory challenges

The survey respondents were asked about the challenges of procuring and providing related VA services in Hong Kong. Combining the views gathered from the survey and interviews, the regulatory challenges can be grouped in three areas (Figure 4.9).

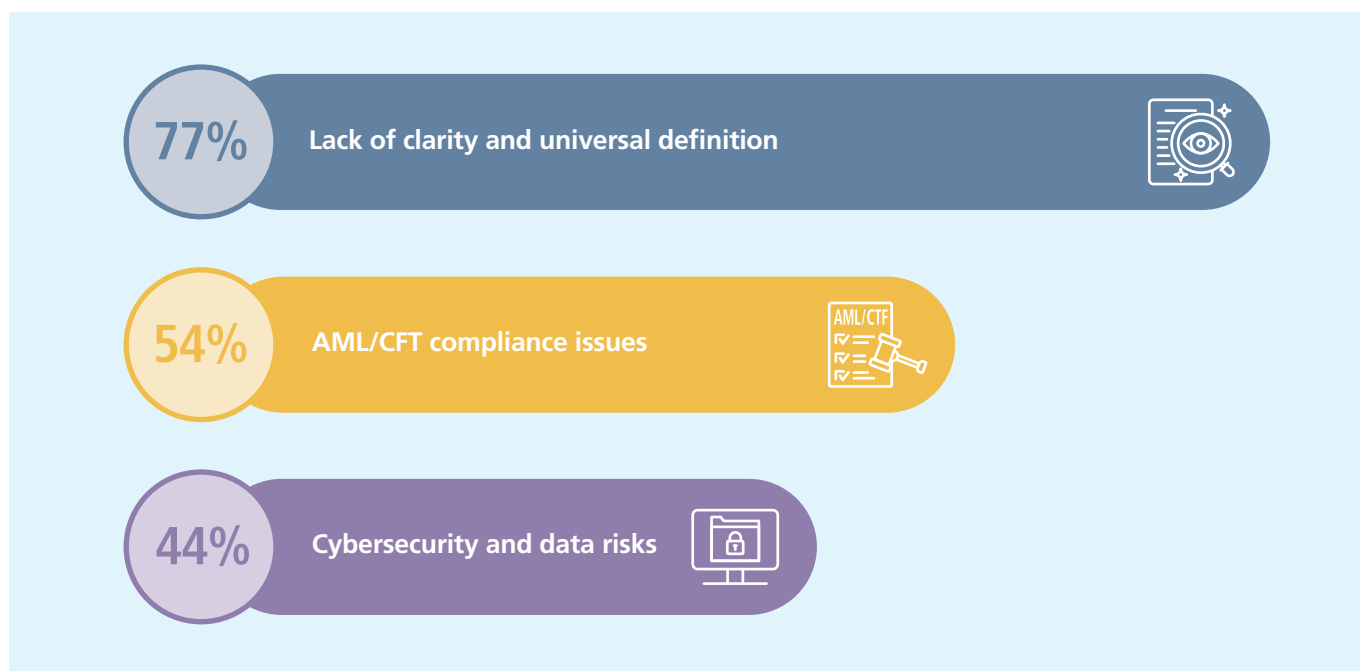
(i) Overall uncertainty regarding permitted activities

More than 70% of the survey respondents mentioned that a clear and universal definition of how VAs are classified and regulated was of utmost importance for them to adopt VA strategies. Several of the interviewees said that more clarity could be provided on the range of permissible activities to alleviate uncertainty for businesses seeking to operate in the

VA and DeFi markets. Some interviewees indicated that the current regulatory regime was modest in scope, providing regulatory guidance only on a specific sector of the VA industry, namely VA exchanges. Other sectors, such as broker-dealers and custodians, currently remained uncertain as to whether their activities fell within the current regulatory scope.

Additional clarification should be provided to encourage greater participation from institutional and professional investors. Some interviewees noted that the regime's focus on VATPs had resulted in regulations geared towards retail investors, which could leave institutional and professional investors without clear guidance and considerably reduce their desire to explore the DeFi market. Some interviewees also highlighted the importance of derivatives in expanding the range of financial and investment activities that could be carried out in the VA ecosystem, and considered that clearer guidance could encourage more participation from institutional

Figure 4.9: Top 3 regulatory concerns and challenges noted by respondents that could prevent adoption of VA strategy or offer of VA solutions



Source: HKIMR staff compilation based on the Survey

and professional investors as they were some of the major participants in the derivatives market.

The interviewees also mentioned that standards for defining related assets and activities and associated regulations were often inconsistent across jurisdictions. Specifically, the interviewees from the TradFi and VASP sectors were concerned about regulatory fragmentation, particularly inconsistencies in regulatory requirements across jurisdictions. Currently, multinational businesses operating in or attempting to venture into the VA ecosystem must navigate the complex and evolving regulatory landscape and ensure compliance across territories, presenting significant legal risks and high upfront costs. This creates a major barrier to entry for businesses seeking to use VAs in their business operations.

(ii) Difficulty of complying with AML/CFT requirements

More than half of the survey respondents considered compliance with AML/CFT requirements as another challenge. Due to the pseudonymous nature of public blockchain participants, both TradFi entities and VASPs may have difficulty identifying and verifying the identities of the parties involved in a transaction and the source of funds. This difficulty is exacerbated by the presence of VA-related entities such as DAOs, which fall outside the scope of current regulations, making it difficult to comply with the rigorous AML and CFT procedures required by

regulated financial entities. Some of the interviewees mentioned that the process for obtaining a licence could be lengthy and complex and involve strict requirements to be met, increasing the cost of compliance and capital requirements for early-stage VASPs.

(iii) Regulatory concerns about cybersecurity and data risks

Among the survey respondents, 44% were concerned about cybersecurity and data risks. In addition, some of the interviewees raised concerns about the considerable risks of data breaches and cyber-attacks given the decentralised and pseudonymous nature of VAs and the lack of standardised protocols for user data privacy and data management. As a result, the TradFi and VASP respondents were sceptical about the potential financial and reputational consequences after venturing into this area.

(iv) Others – Economic policy, taxation framework, and consumer protection

More than 30% of the survey respondents mentioned economic policy, taxation framework, and consumer protection as important factors when adopting a VA strategy or offering VA solutions. This is likely because these factors are associated with the economic benefits and taxable income of VA activities, the cost of introducing cyber-security measures, and the costs of legal disputes and liabilities.

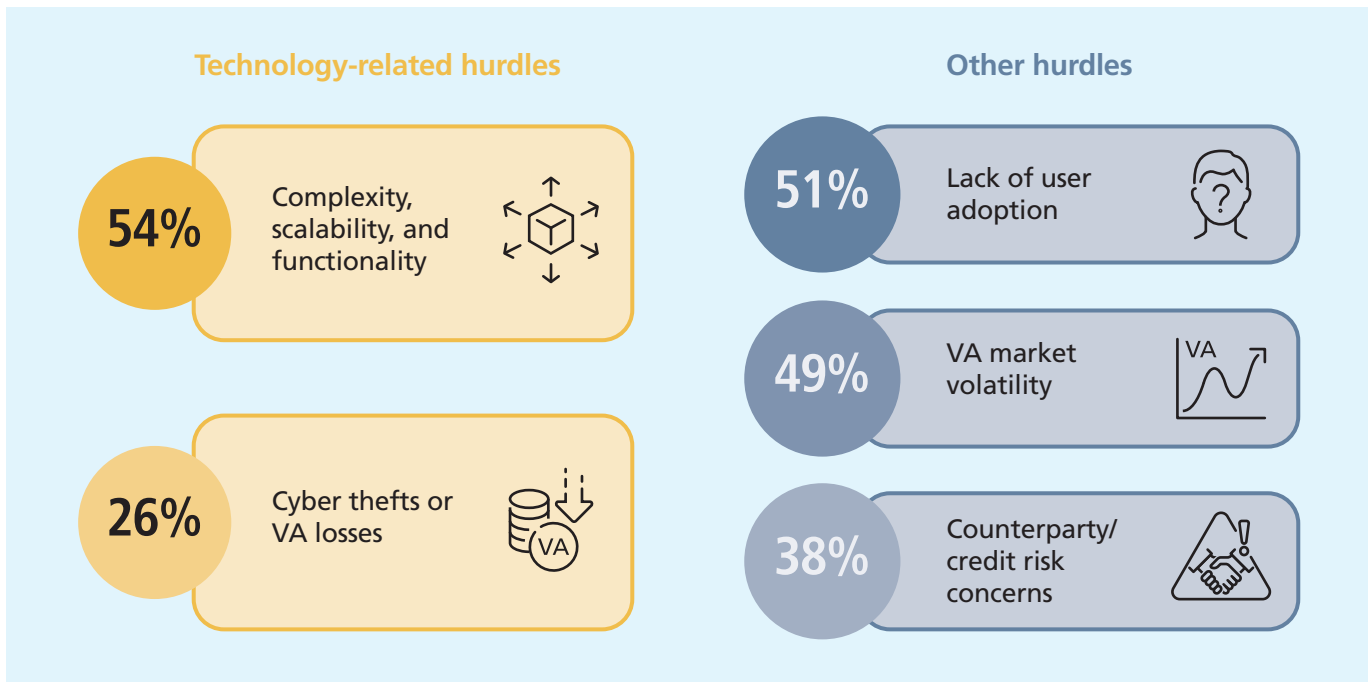
4.3.2. Technological and other challenges

In terms of technological challenges, more than half of the survey respondents considered that current VA solutions had limited functionality and scalability due to their technological complexity, hindering their large-scale adoption by large corporations looking for ready-to-use solutions with the necessary features for their VA and DeFi activities (Figure 4.10). Some of the interviewees also highlighted several issues that added complexity, such as some key infrastructure elements (e.g. cybersecurity and the overall infrastructure of Web3 technologies) still in the development stage and more complex technical requirements for leveraging VA and DeFi protocols than those for traditional financial instruments (e.g. use of smart contracts).³² In addition, they mentioned barriers to VA–fiat currency conversion (such as USD and EUR),

which could be complex and intimidating for those unfamiliar with VAs.

Other challenges mentioned by the survey respondents included a lack of user adoption (51%) and high volatility in the VA market (49%). Some of the interviewees were concerned about the lack of knowledge about VAs, DeFi, and Web3 in large corporations at all levels. This issue was particularly prevalent among the TradFi entities; for instance, their legal or IT department did not have sufficient understanding of the ecosystem and standard procedures to effectively provide guidance, approve, execute, or maintain related initiatives. Another concern raised by the interviewees was the high volatility of the VA and DeFi markets, which discouraged them from using or holding VAs due to the perceived financial risks.

Figure 4.10: Top non-regulatory concerns and challenges noted by respondents that could prevent adoption of VA strategy or offer of VA solutions



Source: HKIMR staff compilation based on the Survey

³² For instance, smart contracts can contain code defects that can be exploited by hackers and have 'backdoors' that allow developers to modify the behaviour of a protocol or access customer deposits (see Chapter 2 for details).

4.3.3. DeFi-specific challenges

According to the survey and interviews, there was a general consensus among the respondents that DeFi, although a nascent ecosystem, has the potential to offer enormous opportunities and benefits to the current financial landscape. However, according to the TradFi entities interviewed, a number of DeFi vulnerabilities prevented them from participating in this ecosystem.

(i) Insufficient user demand for DeFi: Given the complexity of DeFi protocols, the current ecosystem primarily caters to retail investors who are crypto/tech savvy and have a high risk appetite. In contrast, professional and institutional investors who rely on the investment and wealth management services of TradFi institutions are less interested in DeFi and may be more risk averse when it comes to highly volatile assets. Hence, as mentioned by the interviewees from the asset wealth management sector, DeFi currently caters only to a niche customer segment, with low user demand from TradFi entities

(ii) Difficulty in enforcing AML and Know Your Customer (KYC) procedures: The decentralised nature of DeFi makes it difficult to enforce AML and KYC procedures due to the pseudonymity of DeFi users and the lack of centralised oversight, affecting the detection and prevention of illicit activities. In the event of an exploit, it becomes difficult to track the attack and recover the funds lost. This can have serious repercussions for users, who may suffer financial losses without recourse.

(iii) Potential vulnerability of smart contracts: As suggested by an interviewee from a data analytics firm, smart contracts can contain code defects that can be exploited by attackers. In addition, not all DeFi protocols are fully decentralised, and some may have ‘backdoors’ coded into their smart contracts that allow developers to modify their behaviour or access customer deposits. This lack of transparency and control can be unsettling from an investor protection standpoint.

(iv) Legal liability in the DeFi ecosystem: The legal status of DAOs varies across jurisdictions. In general, DAOs are not recognised as legal or regulated entities and, therefore, individuals involved in a DAO may be held personally responsible for any legal or financial issues that arise. TradFi entities are therefore reluctant to engage with DAOs given the lack of clarity around their legal status and liability. This hesitation, in turns, creates major obstacles for DAOs to access and interact with TradFi entities.

Chapter 5

Views and Considerations for Fostering a Healthy DeFi Ecosystem

Effective regulation and deep-dive research can facilitate the development of a healthy and vibrant DeFi ecosystem.

HIGHLIGHTS:

- The respondents involved in the VA ecosystem discussed several key issues that could facilitate the development of the VA and DeFi markets, including a well-defined regulatory framework, robust financial infrastructure, and cultivating local talent with blockchain-related skills.
- In response to the risks and challenges associated with DeFi activities, a prudent regulatory approach to DeFi should continue to be the first line of defence, supported by deep-dive research to understand the risk implications of emerging technologies.
- A hybrid system of centralised and decentralised models may help mitigate the challenges associated with DeFi innovations.
- Promoting blockchain-related talent development and strengthening dialogue between the public and private sectors could also address industry concerns and support further market development.

After providing an overview of DeFi in previous chapters, this chapter explores the current and future development of DeFi in Hong Kong based on the views of the survey respondents and interviewees on promoting the development of the VA and DeFi markets and their regulatory considerations to foster a healthy and vibrant DeFi ecosystem in the future.

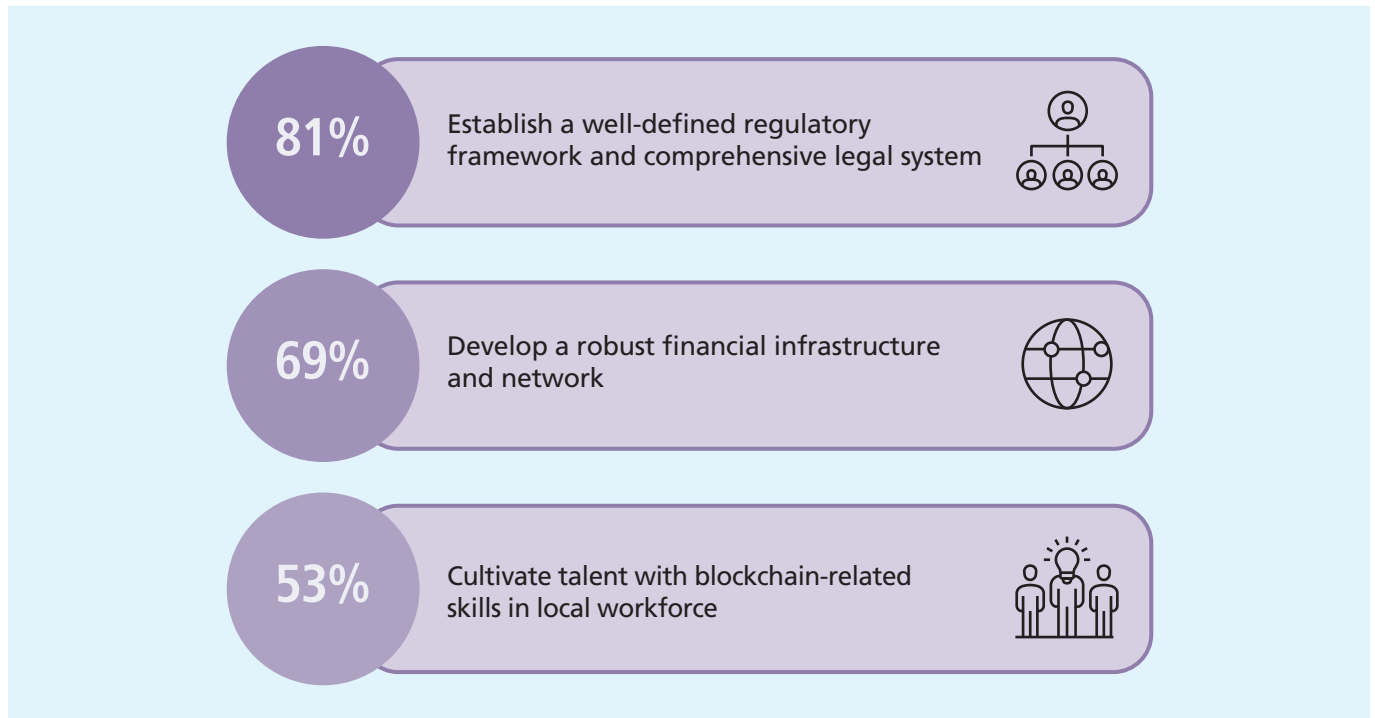
5.1. MARKET VIEWS ON FURTHER DEVELOPMENT

The survey respondents were asked about the factors promoting the development of the VA market. Given the challenges they encountered, the TradFi entities and VASPs consistently identified the following as key factors: (i) creating a well-defined regulatory framework and comprehensive legal system; (ii) developing a robust financial infrastructure and network; and (iii) cultivating or recruiting more talent with blockchain-related skills among the local workforce (Figure 5.1).

Well-defined regulatory framework and comprehensive legal system

Among the survey respondents, 81% highlighted the importance of having a comprehensive regulatory framework and legal system for ecosystem development. Specifically, they identified a few areas to prioritise for effective VA or DeFi regulation, echoing many of the overall uncertainties around permissible activities mentioned in section 4.3.1, such as (i) AML/CFT requirements; (ii) securities regulations addressing user protection and disclosure; (iii) VA custody; and (iv) issuance of tokens and stablecoins, to address the governance challenges they faced (e.g. AML/CFT compliance, regulatory regimes for third-party custodians) and support the development of their planned VA or DeFi activities (e.g. custodian services, tokenisation).

Figure 5.1: Top 3 key factors noted by respondents that could promote the development of the VA market in Hong Kong



Source: HKIMR staff compilation based on the Survey

Furthermore, some of the interviewees suggested that financial authorities should continue to collaborate closely with international organisations and industry players to establish a global and standardised framework given the cross-border nature of VA or DeFi activities. Additionally, some best practices developed with reference to other mature regulatory frameworks and dedicated regulatory bodies established specifically for the VA and DeFi activities (e.g. EU's European Banking Authority, etc.) could provide a useful reference for Hong Kong in developing its VA ecosystem.

Development of a robust financial infrastructure

Among the survey respondents, 69% considered a robust financial infrastructure essential for the development of the VA market. Some of the interviewees emphasised that a secure, efficient, and liquid platform for VA transfer is key to building trust and confidence in the market. They highlighted several areas to prioritise in the development of this financial infrastructure (referring to the institutions, information, technologies, and rules and standards that enable financial intermediation):

- (i) [Tokenisation] Hong Kong is in a pioneering position to further develop tokenisation solutions. The recent issuance of the tokenised government green bonds arranged by the HKMA represents an important milestone for the development of blockchain technology in the VA ecosystem. While these green bonds and most tokenised bonds issued in other jurisdictions were built on private blockchain, some respondents viewed that pioneering tokenisation on a public blockchain

with greater transparency, scalability, and accessibility than that on a private network would provide an important use case for the VA ecosystem, which could potentially help unlock new opportunities for various sectors (e.g., highly liquid assets, such as government-issued Treasury bills; larger, less liquid assets, such as real estate; and even smaller purchases) and expand the pool of potential investors and access to new markets.

Hong Kong is the first government issuing tokenised green bond, demonstrating Hong Kong's strengths in combining bond market, green and sustainable finance as well as fintech

- (ii) [CBDCs and stablecoins] The development of CBDC and stablecoin regulations is key to boosting payment and settlement of trading activities in the VA market. With the HKMA's launch of the e-HKD Pilot Programme, the commencement of Project Ensemble, the involvement in the BIS Innovation Hub's Project mBridge, and, market participants generally believe that these instruments have the potential to enable users to conduct local and cross-border payment transactions efficiently and in near real-time, potentially increasing the adoption of such instruments for a wide range of applications.

The e-HKD pilot programme takes deep dives into potential use cases in various categories, ranging from payments, deposits, to tokenised assets' settlement

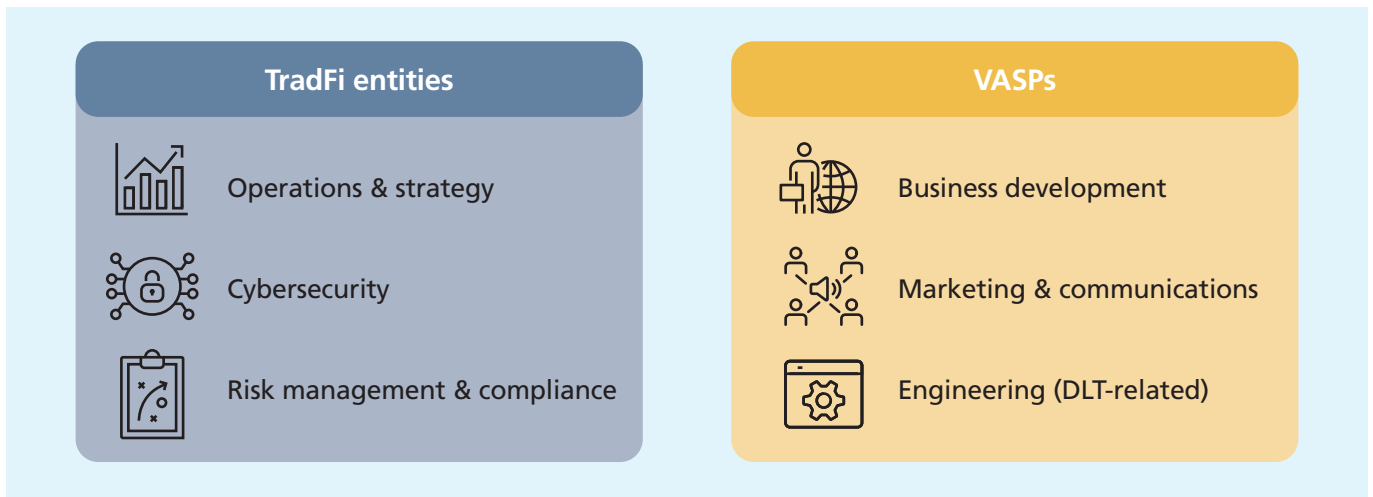
Project Ensemble is a new wholesale CBDC project to support the development of the tokenisation market in Hong Kong

(iii) [Digital ID] Digital identity verification could effectively help address concerns regarding the KYC process. Regulated service providers could leverage digital identity verification to validate user identities and monitor transactions for illegal activities, such as fraud or money laundering. This tool could help service providers comply with the requirements of the FATF’s Travel Rule, which represents a key to promoting its mass adoption.

A local workforce equipped with blockchain-related skills

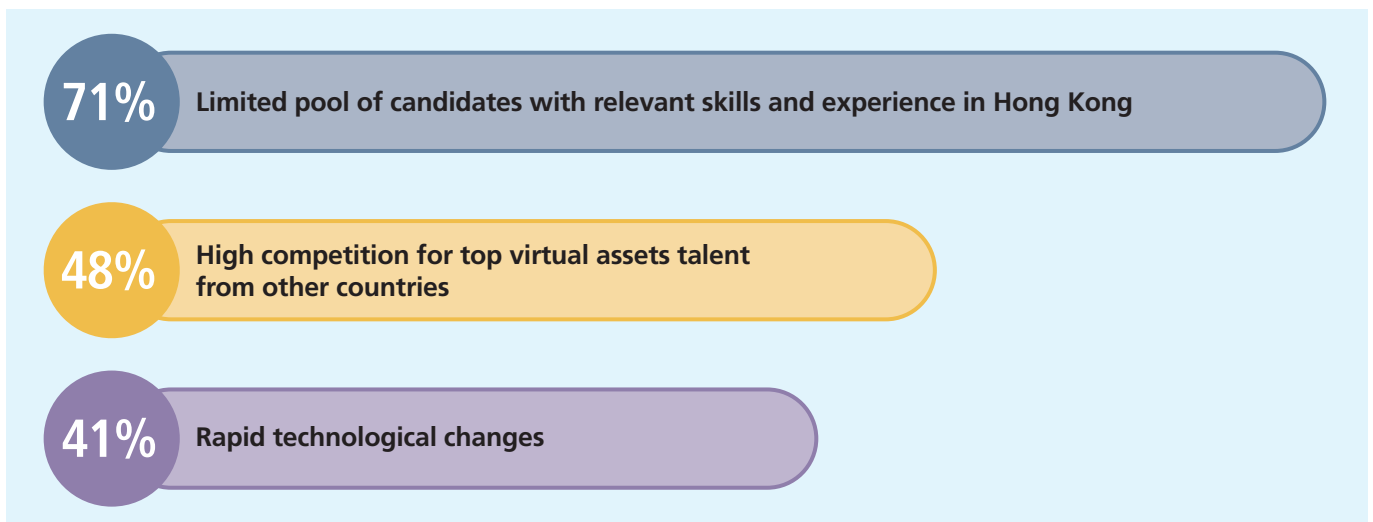
More than half of the survey respondents suggested that an adequate supply of talent is paramount to driving the development of the VA market. The TradFi respondents preferred those with a background in strategy and operations, cybersecurity, and risk management, while the VASPs surveyed preferred candidates with a background in business development, marketing and communication, and engineering (Figure 5.2).

Figure 5.2: Types of VA talent currently employed or intended to be employed by respondents in Hong Kong



Source: HKIMR staff compilation based on the Survey

Figure 5.3: Top challenges in VA talent acquisition



Source: HKIMR staff compilation based on the Survey

Overall, the survey respondents felt that limited experienced candidates and fierce competition for top VA talent as well as rapid technological changes were the top 3 challenges for the talent acquisition (Figure 5.3). In addition, the respondents also considered that increasing general awareness about the VA industry, clearer career paths, and more access to government funding were highly relevant factors for attracting interested candidates to the VA industry. These results suggest a strong need to cultivate more talent with the required background and experience to promote the growth of the VA and DeFi ecosystem.

5.2. CONSIDERATIONS FOR THE FUTURE DEVELOPMENT OF DEFI IN HONG KONG

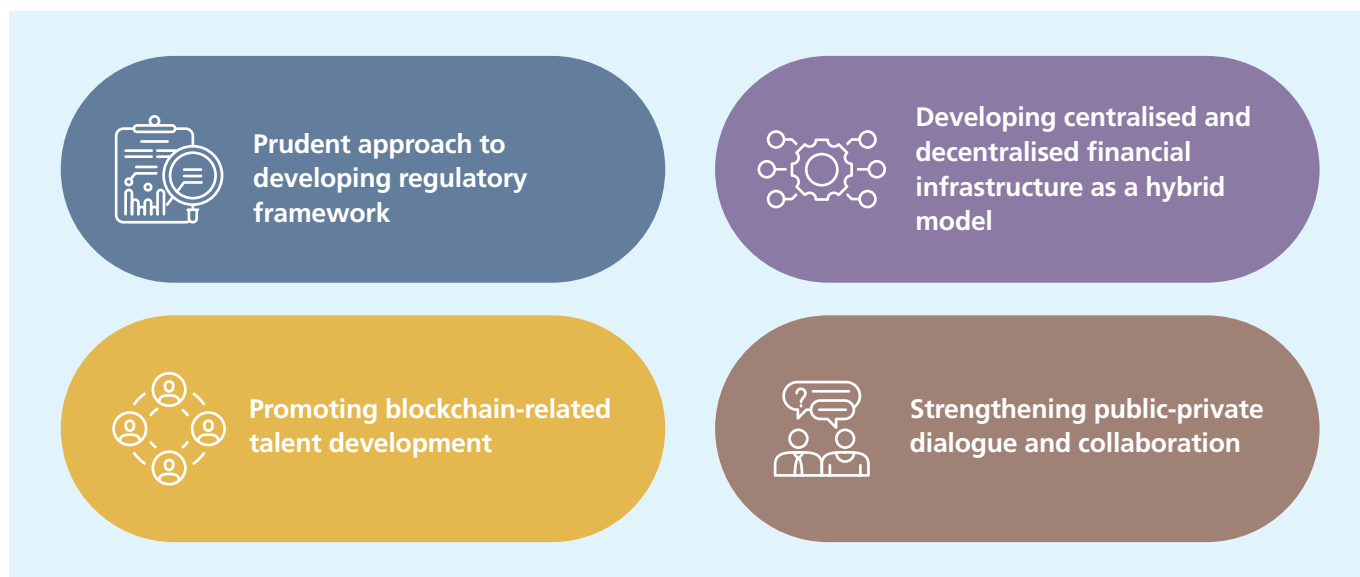
In response to the views of the VA and DeFi survey respondents on important factors for the development of the VA market in Hong Kong, this section presents several considerations for promoting the healthy development of the DeFi market in the long term.

These considerations are divided into four areas, namely (i) a prudent approach with deep-dive research to mitigate the challenges of the DeFi market in Hong Kong; (ii) exploring and facilitating the development of CeFi and DeFi financial infrastructures as a hybrid model; (iii) promoting blockchain-related talent development; and (iv) strengthening public-private dialogue and collaboration (Figure 5.4).

5.2.1. Prudent approach to developing regulatory frameworks

In establishing a well-defined regulatory framework and comprehensive legal system for VAs and DeFi, the principle of ‘same activity, same risk, same regulation’ should continue to be the first line of defence in response to emerging risks and challenges related to VA and DeFi activities. This principle not only provides financial authorities with a reference to balance their regulatory treatment between traditional and VA activities but also aligns Hong Kong’s regulatory framework for the VA market with international practices and standards.

Figure 5.4: Considerations for the future development of DeFi in Hong Kong



Source: HKIMR staff compilation

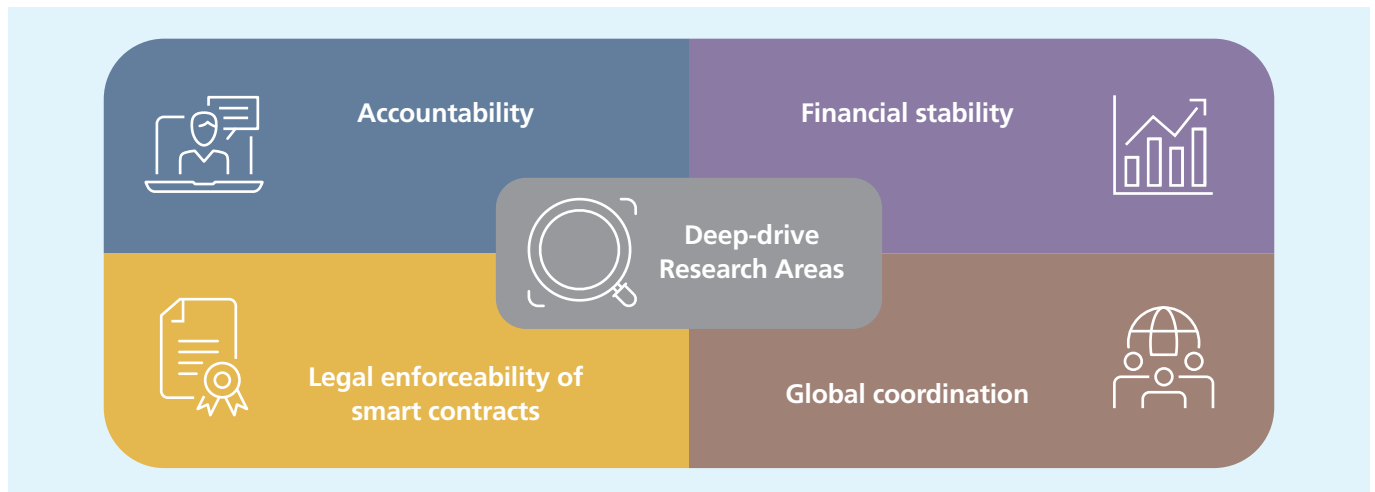
Furthermore, the regulatory approach for these technologies should continue to align with ‘proportionality’ as a fundamental rule of risk-based regulation to help balance innovation and risk management. Proportionality stipulates that the intensity and level of scrutiny are calibrated according to the size of the potential risk.³³ This principle encourages financial authorities to periodically reassess risks and base any future regulatory developments on empirical evidence, and to avoid excessive regulatory responses that could result in ineffective policies introducing market inefficiencies or higher costs than benefits, stifling growth and innovation.

As DeFi remains a key moving part of the VA ecosystem, there is a need for close collaboration with international organisations to develop relevant international standards and share data and information. Specifically, when expanding the regulatory framework to mitigate emerging risks posed by the DeFi market, it would be beneficial to scrutinise the risk implications of DeFi technologies, rather than developing premature regulatory responses to DeFi. This will ensure a more informed and balanced strategy in response to the

evolving DeFi landscape. Taking into account the considerations formulated by major international organisations and other jurisdictions, the following four areas of research are considered essential to provide a well-defined and comprehensive regulatory framework of the DeFi ecosystem in Hong Kong (Figure 5.5):

- [Accountability] Introducing or amending legal frameworks to recognise and define entities and actors operating DeFi protocols: Assigning a specific legal characterisation to technology-mediated organisational structures (such as DAOs) would provide greater clarity on the legal treatment and respective liabilities of an organisation’s stakeholders (FSI, 2023; WEF, 2023a). This would also reduce the number of unregulated entities, which was identified by the survey respondents as a challenge preventing them from complying with AML/CFT requirements and adopting VAs. In line with this consideration, the ADGM RA has already established the ‘DLT Foundations’ entity structure for DAOs, while the UK Law Commission is currently exploring the legal characterisation of DAOs.³⁴

Figure 5.5: Four potential areas for deep-dive research



Source: HKIMR staff compilation

³³ Globally, the principle has generally been welcomed by market participants, such as the Global Financial Markets Association (GFMA), the Securities Industry and Financial Markets Association (SIFMA), and the Association for Financial Markets in Europe (AFME). Details can be found on the GFMA, AFME, and SIFMA websites.

³⁴ In addition to assigning specific legal characterisations, BIS (2022) proposed considering blockchain miners and validators as intermediaries to be regulated to mitigate market manipulation and front-running risks in DeFi activities. Furthermore, BIS (2023b) highlighted that introducing a legal framework for oracles could help determine the liability of oracle operators and address risks of information asymmetry or market manipulation that might otherwise arise without appropriate regulatory safeguards.

- [Legal enforceability of smart contracts] Developing appropriate safeguards for the automated nature of DeFi protocols: Possible approaches include (i) ‘whitelisting’ of DeFi protocols: the ADGM Financial Services Regulatory Authority has proposed that DeFi protocols be required to go through an approval process before launching; (ii) introducing ‘institutional grade DeFi protocols’: the MAS is exploring a technical design that would allow regulatory safeguards and controls to be embedded in DeFi protocols with the aim of preventing market manipulation and mitigating operational risk; and (iii) establishing public–private collaboration for code regulation through ex ante guidelines or ex post code reviews and audits (IMF, 2022). Ensuring the security and integrity of DeFi protocols could mitigate the surveyed financial institutions’ concerns about the financial and reputational consequences of data breaches or cyber-attacks.
- [Global coordination] Addressing regulatory arbitrage and data gaps in the crypto-asset and DeFi markets: Regulators around the world are recommended to (i) use current cooperation and information sharing arrangements or establish new arrangements to ensure timely and effective information sharing (e.g. on regulations, emerging trends, market participant information at the request of other regulators), on-going supervision, and enforcement (FSB, 2023b; IOSCO, 2023c); (ii) share current data and market intelligence and use ad hoc information collection methods (e.g. surveys) in the short run, and explore approaches to measure and monitor the interconnectedness of DeFi with TradFi (i.e. the crypto-asset ecosystem and the real economy) in the long run (FSB, 2023a); and (iii) develop international data definitions and standards, create data sharing mechanisms, establish a global database, and collaborate with industry players and statistical agencies (IMF, 2023a; IMF-FSB, 2023).
- [Financial stability] Ascertaining the interconnections between centralised intermediaries and DeFi entities: One possible research area is investigating a framework of ‘embedded supervision’, which lets compliance with regulatory goals be automatically monitored by reading the market’s ledger, thus reducing the need for firms to collect, verify and deliver data (BIS, 2019). Another research area is introducing some regulatory requirements on centralised intermediaries that facilitate access to the DeFi market to uncover DeFi’s financial linkages, given that many retail investors access the DeFi market through centralised intermediaries (such as CeFi service providers and TradFi entities).³⁵ In line with this consideration, the MAS establishes new regulated financial institutions as ‘trust anchors’, ensuring that all participants trade only with verified counterparties, issuers, and protocol developers (OECD, 2022).³⁶

5.2.2. Developing centralised and decentralised financial infrastructures as a hybrid model

According to the views of the survey respondents on the importance of a robust financial infrastructure to support the development of the VA market, it may be beneficial to facilitate market development by exploring the potential development of centralised DeFi (CeDeFi), envisioned as a hybrid model combining centralised and decentralised financial infrastructure that could realise the benefits of both worlds. CeDeFi is a developing concept that commonly refers to DeFi protocols integrated with centralised governance, the inclusion of tokenised real world-assets, or both. For example, by using centralised entities as a regulatory

³⁵ Similar to this theme, the HKMA and SFC have already taken action by issuing joint circulars outlining key regulatory requirements such as selling restrictions, knowledge testing, and licencing and AML/KYC requirements for all regulated intermediaries conducting several types of business activities. However, for unregulated intermediaries, a comprehensive regulatory framework has yet to be fully available.

³⁶ ‘Trust anchors’ is one of the focus areas in ‘Project Guardian’ launched by the MAS to explore the benefits of tokenisation and DeFi. By design, a group of regulated financial institutions are assigned to take the role of trust anchors to screen, verify and issue credentials, enabling participants to only trade with verified parties (MAS, 2023).

hook with majority governance of DeFi protocols, financial authorities can authorise DeFi activities while simultaneously maintaining a regulatory handle on it; when necessary, financial requirements and risk mitigation measures may be imposed on centralised entities that facilitate access to the DeFi market to build future resilience (FSI, 2023). Alternatively, the tokenisation of real-world assets such as bonds with smart contract functionality could unlock further possibilities.³⁷

Currently, there are several market advancements favourable to the development of CeDeFi. For example, tokenisation solutions for bonds, spearheaded by Hong Kong with the issuance of tokenised green bonds, could further apply to various asset classes, such as customer deposits and government-issued Treasury bills and notes, to unlock new opportunities for trading VAs and offering VA-related services in the financial sector. Another example is the application of CBDCs or stablecoins, which can help address on- and off-ramp barriers to VA–fiat currency conversion,

inefficiency in cross-border payment transactions, and difficulties in exchanging USD-denominated stablecoins. These market advancements represent an important milestone for the development of tokenised securities and crypto-assets with centralised institutions as regulatory hooks. In addition, some financial institutions have developed their use cases incorporating DeFi functionalities, such as atomic settlement, smart contract composability, and blockchain programmability, which helps improve their business efficiency and maintains centralised governance with trust between customers and the incumbent TradFi system (i.e. becoming a ‘better bank’).

Although CeDeFi remains a developing concept, the BIS Innovation Hub has already adopted relevant CeDeFi initiatives using these technologies. As such, these projects can be referenced to explore further approaches in the long-run to adopt the centralised/decentralised hybrid model and advance the development of a robust financial infrastructure. Details can be found in Box 5.1.

Box 5.1: CeDeFi and the BIS’ initiative

CeDeFi is a hybrid CeFi–DeFi model of decentralised applications with varying degrees of centralisation through centralised governance or by the inclusion of ‘centralised assets’ such as fiat currencies or tokenised real-world assets. It is considered as a viable alternative to delivering smart contract-enabled financial services without the opacity of CeFi entities and the governance risks of DeFi, while benefiting from decentralised application’s features of disintermediation, programmability, and atomic settlement.

The BIS Innovation Hub undertook a project to investigate technical feasibility of AMMs, an innovation of DeFi, for cross-border trading and settlement of wholesale CBDCs (BISIH, 2023). The project called ‘Project Mariana’ is a proof of concept that looks to the future and envisions a world in which central banks have issued CBDCs and explores how foreign exchange trading and settlement might look. It borrows ideas and concepts from DeFi and studies whether AMMs can simplify FX trading and settlement with a view to enhancing market efficiency and reducing settlement risk. As a proof of concept, the project was developed jointly by the Hub, together with the Bank of France, MAS and Swiss National Bank.

³⁷ This idea was presented by the BIS and FSI (2024) as the ‘unified ledger’, which entailed allowing stablecoins and other tokenised assets to coexist on the same programmable platform to improve inclusivity, efficiency, and resilience in financial systems.

5.2.3. Promoting blockchain-related talent development

In view of the need for more talents to drive the development of the VA market, several strategies are considered important to promote talent development in Hong Kong. First, more specific initiatives targeting talent with skills related to blockchain technology can help support the VA market. The Hong Kong authorities have launched several initiatives to provide market practitioners with a favourable long-term learning environment, such as developing qualification frameworks (e.g. Enhanced Competency Framework), providing training subsidies for professional qualification for current practitioners at different levels (e.g. Pilot Scheme on Training Subsidy for FinTech Practitioners), and developing a sustainable talent pipeline through internship, placement, and apprenticeship programmes for recent graduates and students (e.g. Apprenticeship Programme for Private Wealth Management). These initiatives have been well received by local talent in terms of reskilling and upskilling, thereby enhancing the talent supply for the entire financial services industry. More initiatives could be developed specifically for blockchain-related talent to reskill and upskill these practitioners to support the long-term development of the VA market.

Furthermore, a collaborative effort between industry and academia is imperative for developing a sustainable local talent pipeline. Financial institutions and VASPs are encouraged to strengthen their partnerships with educational institutions to develop practical and up-to-date curricula to ensure that students have the skills and knowledge needed to thrive in the VA industry. According to our survey results, several subjects are crucial for the development of the VA market, such as cybersecurity, blockchain architecture engineering, and risk

management and compliance (technology subjects), and operations and strategy, business development, and marketing and communication (strategic subjects).

Given the survey respondents' concerns about increased competition for VA talent externally, it is crucial to effectively communicate Hong Kong's unique positioning and value proposition, highlighting its distinctive advantages to attract talent from outside the city. Hong Kong has numerous distinctive advantages to promote, including its status as an international city and gateway to Mainland China, coupled with its robust legal and regulatory systems and world-class social infrastructure. In particular, Hong Kong's openness to innovative technologies and Web3 development provides a strong incentive for external talent with relevant technical skills to join the labour force in Hong Kong. These positive qualities should be strongly encouraged.

Hong Kong's openness to Web3 development provides a strong incentive for external talent to join the labour force

In addition, some corporate human resources policies are important to foster overall talent development in Hong Kong's financial services industry, such as those aimed at meeting the diverse needs of employees; ways to foster a shared sense of purpose; and open communication between employers and employees. More discussions are documented in the HKIMR's 2023 Applied Research Report 'Advancing Talent Development in Financial Services: Emerging Global Trends and Their Impact on Hong Kong'.

5.2.4. Strengthening public–private dialogue and collaboration

While the considerations discussed above can address fundamental issues in the VA market, it is also essential to maintain ongoing communication with stakeholders regarding emerging technologies and regulatory developments. To this end, increased public–private dialogue and collaboration could come hand-in-hand in allaying concerns about blockchain technology and the latest developments in international regulatory standards. Communication could be established through official channels, such as consultative documents and regulatory sandboxes, to solicit the views of market participants to ensure that financial authorities and stakeholders are on the same page and that decision-making processes are transparent. In addition to official channels, knowledge exchange activities, such as workshops, seminars, and conferences, could be organised to provide financial authorities with the opportunity to clarify regulatory expectations and allow market participants to share their views and concerns regarding VA applications.

Increased public–private dialogue and collaboration could allay concerns about blockchain technology and the latest regulatory standards

It is essential to involve prominent VA and FinTech industry associations in such dialogue and collaboration. By pooling the collective knowledge, resources, and influence of their members, these associations are the de facto representatives of their members and the industry, enabling them to advocate for key market needs, such as infrastructure, research, or information dissemination. Furthermore, this engagement platform could serve as an avenue for VA experts to network, exchange ideas, and collaborate on initiatives to improve compliance, transparency, and help build confidence and trust in the industry. In some countries such as Japan and Switzerland, VA industry representatives come together to formulate voluntary standards or codes of conduct that effectively support further market development (WEF, 2023b).

Conclusion

The DeFi market has experienced a significant increase in scale in recent years and shown potential for further growth. Despite only accounting for around 4% of the overall crypto-asset market, the DeFi market has shown considerable growth potential, given its various benefits to the financial services industry. Hong Kong has welcomed the development of the VA market and seeks to support its sustainable and responsible development. Amid the authorities' open-mindedness to DLT and VA applications, local market participants have already started their journey towards VA-related business activities and have shown strong interest in expanding these activities in the coming years, according to our survey results.

The peer-to-peer nature of DeFi offers potential to improve operational efficiency and reduce counterparty risk in the absence of traditional intermediaries. However, DeFi also creates new risks and vulnerabilities, leading to challenges for policymakers and financial authorities in formulating relevant policies and regulations. **It is therefore appropriate to adopt a prudent approach by continuing to advocate the guiding principle of 'same activity, same risk, same regulation',** in line with the recommendations of international organisations. This principle advocates treating all financial activities, regardless of the technology used, with equivalent regulatory oversight, thereby providing regulatory consistency across the board and a yardstick for balancing risk management with innovation.

Furthermore, **deep-dive research should be encouraged to understand the technologies and risks associated with DeFi and approaches for**

effective oversight of DeFi service providers to facilitate the long-term development of the DeFi market in Hong Kong. Areas of research can include, but are not limited to, defining the legal characterisation of DeFi actors, developing appropriate safeguards for the automated nature of DeFi, and dealing with regulatory arbitrage and data gaps, and introducing regulatory requirements on centralised intermediaries that facilitate access to the DeFi market. In addition, **CeDeFi, as a hybrid of centralised and decentralised infrastructures, is considered a middle ground option that can realise the benefits of both worlds.** This line of research can shed light on definitions of VA activities, AML/CFT compliance issues, and legal liability in the DeFi ecosystem, which the survey respondents identified as key factors for further VA applications.

Promoting blockchain-related talent development and strengthening public-private dialogue and collaboration would be beneficial for market growth. Cultivating local talent with blockchain-related skills can meet market demand for personnel with backgrounds in strategy and operations, cybersecurity, and risk management and compliance, filling existing knowledge gaps. **Increased public-private dialogue and collaboration could be undertaken to resolve regulatory uncertainty and improve representation and advocacy for key needs for future growth.**

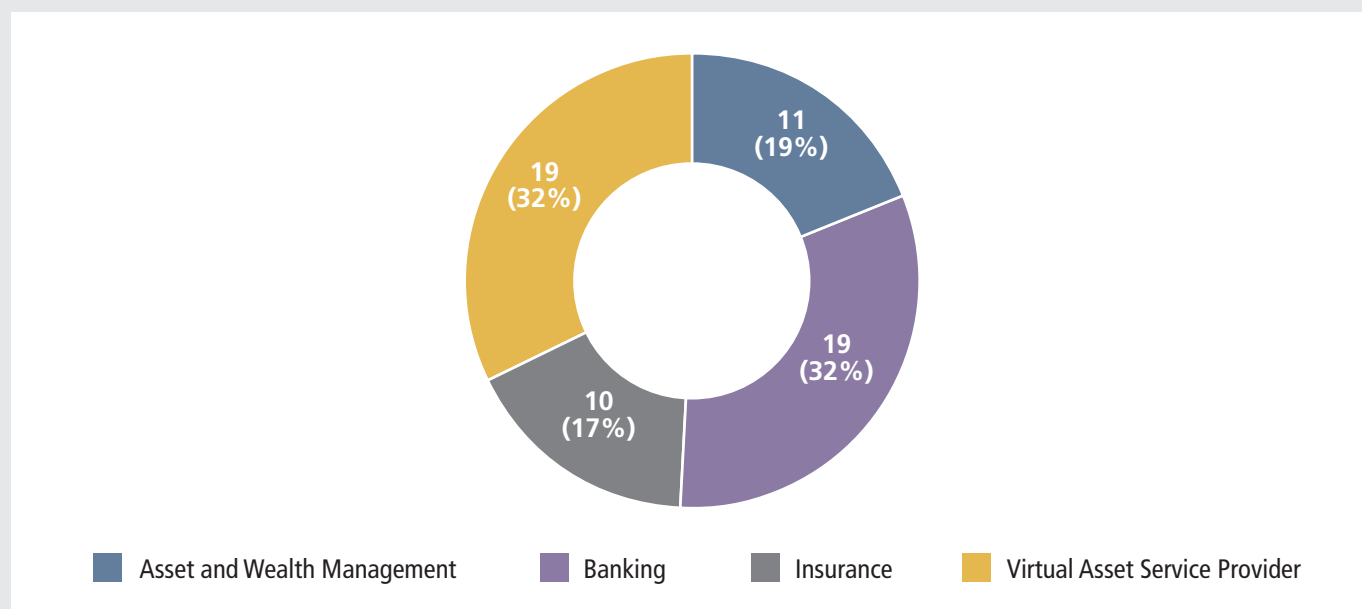
In addition to DeFi, other blockchain-relevant products and services, such as tokenisation, CBDCs, and stablecoins, are also rapidly developing in Hong Kong and around the world. They are expected to play a more important role in the digital finance ecosystem in the future.

Appendix A: Background of the Virtual Assets/DeFi Survey

The Virtual Assets/DeFi survey (the Survey) was designed to collect information about the current adoption and planned use-cases of virtual assets and DeFi in Hong Kong's financial services industry. It also aimed to analyse the opportunities and challenges encountered by financial institutions from the banking, insurance, and asset wealth management sectors ('TradFi entities'), and virtual asset service providers ('VASPs'). Lastly the survey sought to explore the prospects that these entities envision for their continued involvement in the industry. The survey was conducted in collaboration with PricewaterhouseCoopers Limited from May to July 2023.

In total, 59 entities participated in the survey, with 40 TradFi entities, and 19 VASPs (Figure A.1). Out of the 40 TradFi responses, 18 stayed anonymous. The 8 identifiable sampled banks account for 82% of the total market deposit volume (as of December 2022). The 6 identifiable sampled insurers account for 38% of the technical reserve in general and net assets in long-term insurance markets. The 8 identifiable entities from the asset wealth management industry cover the traditional wealth/fund management, venture capital, private equity, and brokerage sub-sectors.

Figure A.1: Representation of sectors



Source: HKIMR staff compilation based on the Survey

In addition, interviews were conducted between May and July 2023 with the executives of 30 TradFi entities and VASPs in the VA ecosystem. These interviews yielded more in-depth insights to the survey responses. The interviewees consist of 13 representatives from TradFi entities and 17 representatives from VASPs which carried out different crypto-asset businesses such as crypto-asset exchanges, crypto-asset custodians, communication platforms, blockchain data analytics platforms, DeFi protocol operators, GameFi and digital entertainment operators, industry associations, law firms, and technology infrastructure providers.

Appendix B:

List of Abbreviations

ADGM RA	Abu Dhabi Global Market Registration Authority
AML/CFT	Anti-Money Laundering and Counter-Financing of Terrorism
AMLO	Anti-Money Laundering and Counter-Terrorist Financing Ordinance
AMM	Automated Market Maker
CASP	Crypto-Asset Service Provider
CBDC	Central Bank Digital Currency
CeDeFi	Centralised DeFi
CeFi	Centralised Crypto-Asset Finance
CEX	Centralised Crypto-Asset Exchange
DAO	Decentralised Autonomous Organisation
DeFi	Decentralised Finance
DEX	Decentralised Crypto-Asset Exchange
DLT	Distributed Ledger Technology
Japan PSA	Japan Payment Services Act
KYC	Know Your Customer
LP Token	Liquidity Provider Token
MiCAR	Markets in Crypto-Assets Regulation
NBFI	Non-bank Financial Intermediary
NFT	Non-Fungible Token
OTC	Over-the-Counter
SFO	Securities and Futures Ordinance
Swiss DLT Act	Federal Act on the Adaptation of Federal Law to Developments in Distributed Electronic Register Technology
TradFi	Traditional Finance
TVL	Total Value Locked
VA	Virtual Asset
VASP	Virtual Asset Service Provider
VATP	Virtual Asset Trading Platform

Appendix C:

Glossary of Technical Terms³⁸

Term	Meaning
Atomic Settlement	The instant and simultaneous transfer of two crypto-assets if all conditions of a smart contract are fulfilled. If any of the smart contract conditions are not met, the contract terms revert as if the tokens were never moved.
Aggregator	A category of DeFi protocols that provide a form of asset management or advisory service by scanning across the DeFi ecosystem for favourable investment opportunities.
Blockchain	A category of distributed ledger technology with a block structure, a sequential form of record keeping, a validation mechanism, and the use of tokens.
Centralised Crypto-asset Finance (CeFi)	The provision of financial products and services related to crypto-assets, which are facilitated and managed by a central authority or intermediary.
Central Bank Digital Currencies (CBDCs)	A country's fiat currency represented in the form of a digital token, issued by its central bank. It is most often managed on a DLT platform.
Centralised Exchange (CEX)	A category of CeFi services that facilitate the trading of crypto-assets.
Cross-chain Bridge	A third-party entity or smart contract that allows for the transfer of tokens between two different blockchains.
Crypto-Asset	A cryptographically secured digital representation of value in the form of a token.
Decentralised Autonomous Organisation (DAO)	A novel organisational form that uses blockchain technology and smart contracts to achieve decentralised governance.
Decentralised Finance (DeFi)	The provision of financial services and products related to crypto-assets, which are facilitated and managed by blockchain and smart contracts without any central authority or intermediary.
DeFi Protocol	A decentralised application implemented by a set of smart contracts, utilising crypto-assets and providing some financial service functionality
Decentralised Exchange (DEX)	A category of DeFi protocols that facilitate the trading of crypto-assets.

³⁸ The glossary is sourced from various publicly available information and should not be considered as official definitions.

Term	Meaning
Distributed Ledger Technology (DLT)	A database system where all system participants maintain their own copy of the database, thereby allowing information or records to be transferred and updated by participants in a secure, tamper-proof manner.
Layer 2 Solution	A third party service that facilitates the scalability of blockchain transactions.
Oracle	A third party service that provides off-chain data inputs to smart contracts.
Programmability	The ability for developers to create and execute custom applications on a blockchain via smart contracts.
Smart Contract	Computer code deployed on a blockchain that automatically executes transactions based on pre-defined events.
Stablecoin	A type of crypto-asset that aims to maintain a stable value relative to a specified asset, or pool of assets.
Staking	The consensus mechanism of proof-of stake blockchains where users lock up (i.e. stake) their crypto-assets as collateral for validating transactions; if the transactions are validated correctly, the user earns a reward – otherwise, the staked crypto-assets are confiscated or deducted as punishment.
Tokenisation	The process of taking an asset and creating a digital representation of it on the blockchain known as a 'token'.
Traditional Finance (TradFi)	The established non-blockchain financial system.
Virtual Asset	A subset of crypto-assets; defined under the Hong Kong Anti-Money Laundering and Counter-Terrorist Financing Ordinance as a cryptographically secured digital representation of value, excluding central bank digital currencies and securities tokens.
Web3	A developing concept envisioned as the third generation of the internet, leveraging blockchain technology to empower users with enhanced control and ownership over their data and online interactions.

Appendix D: References

Abu Dhabi Global Markets Registration Authority (2023). Distributed Ledger Technology Foundations Regulations 2023. October 2, 2023.

Bank of France (2023). 'Decentralised' or 'disintermediated' finance: what regulatory response?. Discussion Paper publication. Autorité de contrôle prudentiel et de résolution. March 4, 2023.

Bank for International Settlements (2019). Embedded supervision: how to build regulation into decentralised finance. BIS Working Papers No 811. September 16, 2019.

Bank for International Settlements (2021). DeFi risks and the decentralisation illusion. BIS Quarterly Review, December 2021. 6 December, 2021.

Bank for International Settlements (2022). Miners as intermediaries: extractable value and market manipulation in crypto and DeFi. BIS Bulletin No 58. June 16, 2022.

Bank for International Settlements (2023a). Addressing the risks in crypto: laying out the options. BIS Bulletin No 66. January 12, 2023.

Bank for International Settlements (2023b). The oracle problem and the future of DeFi. BIS Bulletin No 76. September 7, 2023.

Bank of International Settlements Innovation Hub (2023). Project Mariana: Cross-border exchange of wholesale CBDCs using automated market makers (Final report). September 28, 2023.

Basel Committee on Banking Supervision (2022). Prudential treatment of cryptoasset exposures. BCBS publication. December 16, 2022.

Blandin, A., Cloots, A.S., Hussain, H., Rauchs, M., Saleuddin, R., Allen, J.G., Zhang, B., & Cloud, K. (2019). Global Cryptoasset Regulatory Landscape Study. University of Cambridge Faculty of Law Research. April, 2019.

Committee on Payments and Market Infrastructures and the International Organization of Securities Commissions (2022). Application of the Principles for Financial Market Infrastructures to stablecoin arrangements. July 13, 2022.

DiMatteo, L.A., Cannarsa, M., & Poncibo, C. (2019). The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms. Cambridge University Press. October, 2019.

European Parliamentary Research Service (2023). Markets in crypto-assets (MiCA). Briefing PE 739.221 September, 2023.

European Systemic Risk Board (2023). Crypto-assets and decentralised finance Systemic implications and policy options. May 25, 2023.

Federal Reserve Bank of St. Louis (2021). Decentralized Finance: On Blockchain- and Smart Contract-Based Financial Markets. FRBSL Review. Vol 103 (2). Second Quarter. April 15, 2021.

Feichtinger, R., Fritsch, R., Vonlanthen, Y., & Wattenhofer, R. (2023). The Hidden Shortcomings of (D)AOs—An Empirical Study of On-Chain Governance. Financial Cryptography and Data Security. FC 2023 International Workshops. Lecture Notes in Computer Science, Vol 13953. December 4, 2023.

Financial Action Task Force (2021). Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers. October 2021.

Financial Action Task Force (2022, 2023). Targeted update on implementation of the FATF standard on virtual assets and virtual asset service providers. June, 2022, 2023.

Financial Services and the Treasury Bureau (2019). Public Consultation on Legislative Proposals to Enhance Anti-Money Laundering and Counter-Terrorist Financing Regulation in Hong Kong Consultation Conclusions. May, 2019.

Financial Services and the Treasury Bureau (2022). 'Policy Statement on Development of Virtual Assets in Hong Kong'. October 31, 2022.

Financial Stability Board (2019). Decentralised financial technologies: Report on financial stability, regulatory and governance implications. June 6, 2019.

Financial Stability Board (2023a). The Financial Stability Risks of Decentralised Finance. February 16, 2023.

Financial Stability Board (2023b). High-level Recommendations for the Regulation, Supervision and Oversight of Crypto-Asset Activities and Markets: Final report. July 17, 2023.

Financial Stability Board (2023c). High-level Recommendations for the Regulation, Supervision and Oversight of Global Stablecoin Arrangements: Final report. July 17, 2023.

Financial Stability Institute (2023). Crypto, tokens and DeFi: navigating the regulatory landscape. FSI Insights on policy implementation No 49. May 17, 2023.

Financial Stability Institute (2024). Stablecoins: regulatory responses to their promise of stability. FSI Insights on policy implementation No 57. April 9, 2024.

Harvey, C. R., Ramachandran A., Santoro, J. (2021). DeFi and the Future of Finance. John Wiley & Sons. August, 2021.

Hong Kong Monetary Authority (2022a). An Assessment of the Volatility Spillover from Crypto to Traditional Financial Assets: The Role of Asset-Backed Stablecoins. Research Memorandum 07/2022. November 21, 2022.

Hong Kong Monetary Authority (2022b). An Event Study on the May 2022 Stablecoin Market Crash. Research Memorandum 09/2022. November 24, 2022.

Hong Kong Monetary Authority (2022c). CE's opening keynote at the Hong Kong Fintech Week 2022. October 31, 2022.

Hong Kong Monetary Authority (2023). The Role of Monetary Conditions in DeFi. Research Memorandum 07/2023. December 27, 2023.

Institute of International Finance (2022). Decentralized Finance: Use cases, challenges and opportunities. November 15, 2022.

International Monetary Fund (2022). Keeping Pace with Change: Fintech and the Evolution of Commercial Law. Fintech Note 2022/001. January 27, 2022.

International Monetary Fund (2023a). G20 Note on the Macroeconomic Implications of Crypto Assets. February, 2023.

International Monetary Fund (2023b). Elements of Effective Policies for Crypto Assets. Policy Paper No. 2023/004. February 23, 2023.

International Monetary Fund-Financial Stability Board (2023). IMF-FSB Synthesis Paper: Policies for Crypto-Assets. September 7, 2023.

International Organization of Securities Commissions (2022). IOSCO Decentralized Finance Report. Public Report. OR01/2022. March, 2022.

International Organization of Securities Commissions (2023a). Policy Recommendations for Decentralized Finance (DeFi) Consultation Report. CR/04/2023. September 7, 2023.

International Organization of Securities Commissions (2023b). Policy Recommendations for Crypto and Digital Asset Markets Final Report. FR11/2023. November 16, 2023.

International Organization of Securities Commissions (2023c). Final Report with Policy Recommendations for Decentralized Finance (DeFi). FR/14/2023. December 19, 2023.

Makarov, I., Schoar, A. (2022). Cryptocurrencies and Decentralized Finance (DeFi). NBER Working Paper No. 30006. April, 2022.

Monetary Authority of Singapore (2023). Project Guardian Enabling Open and Interoperable Networks. June 26, 2023.

Organisation for Economic Co-operation and Development (2022). Why Decentralised Finance (DeFi) Matters and the Policy Implications. January 19, 2022.

Organisation for Economic Co-operation and Development & Korea Development Institute (2021). Case Studies on the Regulatory Challenges Raised by Innovation and the Regulatory Responses. OECD Publishing. December 14, 2021.

Securities and Futures Commission (2018). Circular to intermediaries - Distribution of virtual asset funds. November 1, 2018.

Securities and Futures Commission (2022). Keynote address at the Hong Kong Fintech Week 2022 entitled 'Embracing Innovation, Regulation and the Future of Finance'. October 31, 2022.

Schuler, K., Cloots A.S., & Schär, F. (2024). On DeFi and On-Chain CeFi: How (Not) to Regulate Decentralized Finance. Journal of Financial Regulation. February 13, 2024.

U.S. Department of the Treasury (2023). Illicit Finance Risk Assessment of Decentralized Finance. April 6, 2023.

World Economic Forum (2021). Decentralized Finance (DeFi) Policy-Maker Toolkit. June 8, 2021.

World Economic Forum (2023a). Decentralized Autonomous Organization Toolkit. January 17, 2023.

World Economic Forum (2023b). Pathways to the Regulation of Crypto-Assets: A Global Approach. May 25, 2023.

ABOUT THE HONG KONG ACADEMY OF FINANCE (AOF)

The AoF is set up with full collaboration amongst the Hong Kong Monetary Authority, the Securities and Futures Commission, the Insurance Authority and the Mandatory Provident Fund Schemes Authority. By bringing together the strengths of the industry, the regulatory community, professional bodies and the academia, it aims to serve as (i) a centre of excellence for developing financial leadership; and (ii) a repository of knowledge in monetary and financial research, including applied research.

ABOUT THE HONG KONG INSTITUTE FOR MONETARY AND FINANCIAL RESEARCH (HKIMR)

The HKIMR is the research arm of the AoF. Its main remit is to conduct research in the fields of monetary policy, banking and finance that are of strategic importance to Hong Kong and the Asia region. The Applied Research studies undertaken by the HKIMR are on topics that are highly relevant to the financial industry and regulators in Hong Kong, and they aim to provide insights on the long-term development strategy and direction of Hong Kong's financial industry.

CONTACT US

Email: hkimr@hkma.gov.hk

Tel: +852 2878 1706

Website: <https://www.aof.org.hk/research/HKIMR>

 This is printed on environmentally friendly paper

