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GROUP OF TWENTY

G20 NOTE ON THE MACROFINANCIAL IMPLICATIONS OF CRYPTO ASSETS

2023



Prepared by Staff of the

INTERNATIONAL MONETARY FUND*

*Does not necessarily reflect the views of the IMF Executive Board

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EXECUTIVE SUMMARY

Crypto assets are receiving heightened attention by policymakers. Their growing adoption, especially in emerging markets, has raised concerns. International standard setters are developing legal and regulatory responses. The International Monetary Fund (IMF) has also recently proposed a broad policy framework for crypto assets.

This paper focuses on the macrofinancial implications of crypto assets. It limits the analysis to potential costs and benefits as well as open questions and data needs, with the intention to spur further discussion on policy responses. This paper focuses on unbacked crypto assets, such as bitcoin, and stablecoins, which may have stark implications for macrofinancial stability if widely adopted.

The paper considers three types of implications, to (1) domestic stability, (2) external stability, and (3) the structure of financial systems.

The paper argues that purported benefits of crypto assets include cheaper and faster cross-border payments, more integrated financial markets, and increased financial inclusion, but these are yet to be realized. The underlying technologies could prove useful, including for the public sector.

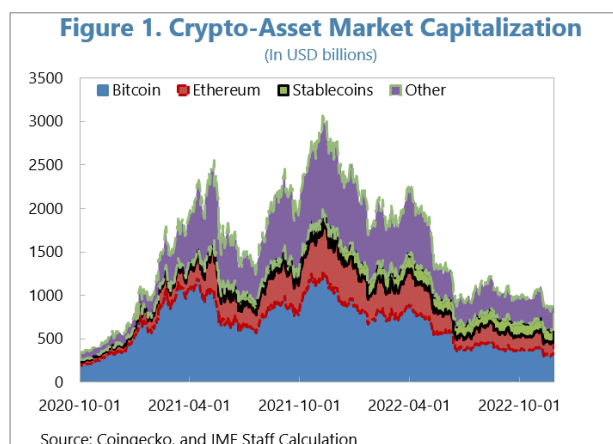
A widespread proliferation of crypto assets comes with substantial risks to the effectiveness of monetary policy, exchange rate management, and capital flow management measures, as well as to fiscal sustainability. Moreover, changes may be required to central bank reserve holdings, and the global financial safety net, yielding potential instability. Finally, banks may lose deposits and have to curtail lending.

The paper ends with a summary of a focus group discussion with selected countries which largely corroborates the above messages. In addition, participants called for more reliable and comparable data to adapt their policies. Beyond today's crypto assets, some participants anticipate that on-chain financial and real assets will require safe, reliable, and trusted forms of digital money such as well-regulated stablecoins, and central bank digital currency.

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INTRODUCTION

1. The crypto asset market has grown in complexity and exhibited significant volatility. A variety of crypto assets has emerged, from unbacked assets such as Bitcoin to “so-called” stablecoins issued by a multitude of new companies. Infrastructure to trade these assets has emerged and an eco-system of service providers including crypto exchanges and crypto wallets has developed. Funds channeling investments to crypto assets have become commonplace, answering a growing client demand. However, regulated financial institutions have mostly contained their exposures. The size of the crypto asset market has fluctuated dramatically, peaking around USD 3 trillion in November 2021, before crashing to below USD 1 trillion today (Figure 1).¹



2. Given clear risks, policymakers are pushing for tighter policies including regulation. While crypto assets are not yet a significant part of the global financial system, they are becoming a source of systemic risk in certain jurisdictions. Crypto asset issuers and exchanges may be interconnected, opaque, and complex, adding to risks.² Policymakers are taking action to protect consumers, limit the exposure of the traditional financial sector, and ensure operational resilience and financial integrity. Standard setting bodies such as the FSB, BCBS, CPMI-IOSCO, and FATF have taken the lead in championing and coordinating the regulatory agenda. The IMF has also recently proposed a broad framework of elements of effective policies for crypto assets (IMF, 2023).

3. This paper focuses on the macrofinancial implications of crypto assets. The paper evaluates the pros and cons of crypto assets for the attainment of macrofinancial objectives ranging from effective monetary policy transmission to innovation, financial stability, public revenue administration, and the stability of the international monetary system (IMS). The paper does not dwell on regulatory or legal frameworks. It assumes these have been properly established by standard setters and country authorities. As such, the paper focuses on macrofinancial implications that stem from the design and technologies of crypto assets assuming they have satisfied legal and regulatory requirements, unless otherwise noted.

4. The objective of this paper is to lay the ground for further discussion of policies to ensure macrofinancial stability. As such, the paper is not normative. It takes as given the existence of crypto assets and does not suggest which crypto asset is better than another, nor whether purported benefits of crypto assets can be provided more efficiently by alternative

¹ The recent large fluctuations in market size is due to revaluations.

² Some exchanges engage in custody, brokerage, lending, market-making, clearing and settlement, issuance, distribution, promotion, and proprietary trading.

products. The paper attempts to draw out potential advantages and disadvantages of selected crypto assets, while leaving the assessment of net benefits to respective authorities. In doing so, this paper advances views in areas that have already been studied, and identifies outstanding questions, many of which require further data.

5. This paper is organized as follows. It begins by setting the scope and defining crypto assets. It follows with a discussion of possible implications for domestic stability, external stability and the structure of financial systems. The paper ends with a review of perspectives expressed by stakeholders from eight countries gathered in a workshop led by the IMF and the Indian Ministry of Finance.

SCOPE AND DEFINITIONS

6. “Crypto assets” is a broad umbrella term. It encompasses a wide variety of products with similar core characteristics: privately issued digital representations of value that are cryptographically secured and deployed using distributed ledger technology (DLT) or similar technologies.³

7. Two main classes of crypto assets have emerged: backed and unbacked. The first have value that depends on reserve assets, while the second are not linked to any asset. The value of unbacked crypto assets, such as Bitcoin, fluctuates relative to a monetary unit of account depending on supply and demand.⁴ These assets do not have a fundamental value as they are not tied to a future stream of profits or coupon payments.

8. Some backed crypto assets are denominated in a monetary unit of account, such as the dollar or euro, and pledge to redeem into the underlying currency at par in any state of the world. These are referred to as stablecoins in this paper. The term is imperfect, however, since in practice many so-called stablecoins available on the market do not satisfy the above characteristics. Pitfalls include insufficient, illiquid, or risky reserves; uncertain claims on reserves; poor transparency and governance; opaque legal rights and obligations; unsafe operations; and unregulated, unsupervised or risky entities in the ecosystem such as wallet providers or exchanges. See Bains and others (2022) for more details.

9. This paper focuses on unbacked crypto assets and stablecoins, as these have the starkest potential implications for macrofinancial stability. Adoption of unbacked crypto assets may be contained to speculation given inherent risks. However, we entertain the possibility of more widespread use as in IMF (2020) to allow implications of macro relevance. Stablecoins could extend the reach of existing currencies to new sectors, users, and countries, and if tightly regulated could

³ Central bank digital currencies are publicly issued liabilities of central banks and not classified as crypto assets.

⁴ Prices can also be manipulated due to concentrated ownership and manipulative practices including wash trading, the practice of simultaneously selling and buying the same financial instrument to artificially inflate perceived market activity.

reach high adoption, at least in some countries or regions. The paper does not cover other crypto assets such as tokens pegged to, and backed with, financial assets including equities and bonds.⁵

IMPLICATIONS FOR MACROFINANCIAL STABILITY

10. This section considers the pros and cons of selected crypto assets for macrofinancial stability. We discuss implications in three areas:

- **Internal stability** covers monetary policy effectiveness and sovereignty, financial stability, and fiscal policy effectiveness and sustainability.
- **External stability and the IMS** include capital flow stability, the credibility of the global financial safety net (GFSN), as well as access to an efficient and integrated cross-border payment system.
- **The structure of financial systems** encompasses intermediation and market functioning, financial inclusion, innovation, and environmental sustainability.

11. Four potential channels underpin the macrofinancial implications of crypto assets: technology, design, policy choice, and rules. Technology relates to the inherent architecture of crypto assets, for instance whether they rely on permissioned or permissionless DLT. Design captures features established by the coin issuer, including degree of anonymity, accessibility, access, and costs, assuming these have been set in line with regulation. Policy choice covers government-sponsored use cases, such as categorizing crypto assets as legal tender. And rules cover the regulation, legal, supervision, and oversight arrangements related to crypto assets. Given this paper's scope, the emphasis is on the first three channels of transmission.

12. Macrofinancial implications of crypto assets may vary considerably depending on country characteristics. As discussed in IMF (2020), domestic adoption of crypto assets is likely to depend on country factors, including the credibility of the central bank and the development of the financial system. However, even for countries with sound and credible institutions, other "pull" and "push" factors may apply [IMF, 2021](#).⁶ Even given rates of adoption, effects will vary by country. For instance, more bank-based financial systems—such as in Europe and Asia—may face financial stability risks following widespread substitution from bank deposits to crypto assets. And authorities

⁵ Several new pieces of legislation and international guidance offer more details on crypto asset definitions and taxonomies. These generally fit the discussion above. The European Union's Market for Crypto Assets' (MiCA) proposed regulation, for instance, distinguishes between e-Money tokens exhibiting a fixed nominal value expressed in an existing monetary unit of account and asset referenced tokens linked to financial assets. Similarly, the Basel Committee on Banking Supervision's (BCBS) recent guidance on the prudential treatment of crypto asset exposures distinguishes between tokenized traditional assets and stablecoins, then elucidates a set of criteria ensuring safety and stability of value.

⁶ Pull factors include returns from speculative investment, relative transaction costs and speed, financial products, reduced AML/CFT standards, and convenience of "on-chain" custody. Push factors include unsound domestic macro policies, FX restrictions, vulnerable banking sector, exclusion from other financial services.

that rely on capital flow management measures (CFMs) will be more concerned with leakages due to crypto asset adoption.

A. Internal Stability

Monetary Policy Transmission and Sovereignty

13. The widespread adoption of crypto assets could threaten the effectiveness of monetary policy. Monetary policy transmission would weaken if firms and households prefer to save and invest in crypto assets that are not pegged to the domestic fiat currency (IMF 2020).⁷ The risk of currency substitution (“cryptoization”) is particularly pertinent for countries with unstable currencies and weak monetary frameworks. Crypto assets could offer the ability to hold, and transact in, a foreign currency at lower cost relative to today’s options of holding a foreign currency bank account or cash under the mattress.⁸ Cryptoization is more likely to involve the adoption of stablecoins denominated in foreign currencies which offer lower volatility relative to unbacked crypto assets. However, decentralized and anonymous unbacked tokens could attract users seeking to circumvent capital flow management measures or lured by prospective gains from speculation.⁹ The adoption of crypto assets as legal tender may further incentivize adoption and undermine monetary policy effectiveness.¹⁰

Financial Stability

14. Unbacked crypto assets and stablecoins without credible backing may pose financial stability risks due to their volatile prices. Stablecoins could also disintermediate banks. Sharp declines in crypto asset prices undermine balance sheets of investors. Traditional financial institutions could be exposed directly through trading, custodial, or market-making activities.¹¹ Indirect links are also possible if institutions provide credit or other financial services to crypto asset service providers or if they accept crypto assets as collateral for lending. Moreover, runs on stablecoins can materialize especially if these are poorly regulated, leading to large scale liquidations of reserves and knock-on effects on asset prices more generally. Risks are amplified by leverage, concentration, and interlinkages among crypto asset holders. Finally, the widespread adoption of crypto assets—most likely of stablecoins—could disintermediate bank deposits,

⁷ Monetary transmission refers to the extent to which policy-induced changes in monetary instruments (e.g., the nominal money stock or the short-term nominal interest rate) can affect macroeconomic variables.

⁸ Clear evidence of the comparative cost advantages is still lacking.

⁹ Other reasons may include their use for illicit activity. A recent Chainalysis report estimates that \$22 billion globally in 2022 is involved in illicit activity including money laundering.

¹⁰ The unilateral adoption of crypto assets as a legal tender in a single country within a monetary union can undermine the stability of the monetary union.

¹¹ While exposure of traditional financial institutions to crypto assets is currently very small and should remain small with proper regulation in the future, it grew rapidly over 2020 and 2021 in response to consumer demand amid rising prices, and could do so again in the absence of regulation (Che and others, forthcoming).

especially in countries with weak banking systems. This could divert savings and undermine credit intermediation. Implications for banking are discussed in more details later.

Fiscal Policy Effectiveness and Sustainability

15. Declaring a crypto asset legal tender may create fiscal risks. Government revenues would be exposed to exchange rate risk if taxes are quoted in advance in a crypto asset while expenditures remained mostly in the local currency.¹² Moreover, contingent liabilities arise if convertibility of the crypto asset to fiat currency is guaranteed by the government, as in the case of El Salvador, or if the financial sector becomes exposed. In addition, the adoption of a backed crypto asset as legal tender could affect the government's social policy objectives, as high price volatility could affect poor households more. Public finances too could be at risk if tax proceeds and/or spending were denominated in a volatile crypto asset. Likewise, bond issuance in crypto assets could put a country's debt dynamics at risk.

16. Crypto asset adoption can increase risks to public finances even without changing legal tender laws. Pseudonymous crypto assets can undermine tax revenue collection and compliance. Withholding taxes and third-party information could be challenging to collect. Decentralized peer-to-peer activities rely on voluntary compliance and self-reporting. And not all supervised institutions may be required to report crypto-related activities to tax authorities (such as those residing abroad). Finally, differences in cross-border tax treatment of crypto assets may open loopholes for tax avoidance.

B. External Stability and the IMS

17. The IMS comprises rules and conventions, mechanisms, and institutions to ensure that countries can pursue their domestic macrofinancial policy objectives given cross-border feedback loops, spillovers, and linkages (IMF 2021). Rules and conventions cover monetary and exchange rate arrangements, cross-border payment systems, capital flow management measures (CFMs), international reserve holdings, and bilateral swap lines. Mechanisms allow effective and timely balance-of-payments adjustments, including with access to a GFSN, which encompasses IMF financing. Robust institutions ensure the rules and mechanisms are enforced so the IMS remains stable and efficient.

Capital Flow Stability

18. Crypto assets could drive higher gross foreign capital positions, and more volatile capital flows. On the positive side, stablecoins that fully satisfy legal and regulatory requirements could improve access to foreign exchange and assets, as well as more tightly integrate markets, thereby facilitating risk sharing. But risks of heightened contagion also arise. Moreover, larger gross foreign asset positions imply higher leverage and greater valuation effects, increasing risks of

¹² The adoption of a crypto asset as a legal tender could also have a relevant impact on public financial management, including the functioning of the treasury single account (TSA), government cash practices and fiscal reporting.

balance of payments problems (Obstfeld 2004 and 2012). Possible asymmetries in the evolution of gross foreign asset positions could be driven by the different regulatory treatment of crypto assets. In addition, capital flow volatility could increase due to herd effects from less informed investors, or simply due to price volatility. And rapid capital flight (or reversals) could materialize if foreign currency stablecoins were easier and cheaper to hold in large quantities relative to foreign currency bank accounts.

19. The pattern of net capital flows is more difficult to forecast, and would need further analysis and better data. The topic is important, however, as it relates to countries' savings and investment behavior. The question is whether crypto assets would increase capital outflows at the expense of domestic savings or divert foreign capital which would otherwise be invested domestically in productive resources.

20. Relatedly, the adoption of crypto assets could erode the effectiveness of CFMs. Crypto trading volumes are robustly higher in countries with tighter capital controls, as are Bitcoin price premia, consistent CFM circumvention (Furceri and others, forthcoming). First, CFM laws and regulations will need time to be upgraded to cover crypto assets.¹³ Second, in the case of pseudonymous crypto assets, prosecution and sanctioning may be difficult. Third, unbacked tokens often do not involve any intermediaries or service providers which can be held responsible to comply with CFMs. He and others (2022) offer more details.

21. With higher gross capital flows and potentially less effective capital flow management measures, countries may find it harder to manage their financial conditions and freely choose their exchange rate regime. Global financial conditions could be transmitted more readily around the world, complicating policy tradeoffs.¹⁴ And today's large share of countries managing their exchange rates could be pushed towards more open capital accounts and flexible exchange rates, without necessarily having the full capacity to trade off exchange rate stability for greater monetary policy independence and tighter financial supervision and regulation.

Credibility of the GFSN

22. Rapid and widespread crypto asset adoption could require changes to central banks' reserve holdings, as well as to the GFSN, with potential instability along the transition. The strong correlation between the currencies used for payments and those held as reserves suggests that widespread crypto asset adoption could induce central banks to hold crypto asset reserves (see IMF 2022 for illustrative analysis). Moreover, with higher risks of sudden capital outflows, central banks may find it prudent to hold more international reserves. If so, the macroeconomic policy mix

¹³ Crypto markets are likely to respond quickly to such measures, with announcements of regulatory tightening leading to significant declines in crypto trading volumes ([Copestake and others, 2022](#)).

¹⁴ Crypto asset prices are already correlated with the global financial cycle, and are more responsive to changes in financial conditions than equities (Adrian, Iyer, and Qureshi 2022; Iyer 2022; Che and others, forthcoming).

may require adjustments such as tighter monetary and/or fiscal policies, with negative implications for growth and unemployment.

Payment System Efficiency and Integration

23. While some crypto assets are purported to reduce the cost of cross-border payments, costs may be higher than immediately visible. Transactions in unbacked tokens that rely on permissionless DLT require validators that may introduce notable fees. Scalability constraints associated with these networks may cause congestion, leading to high transaction costs ([BIS 2022](#)).¹⁵ Some market participants argue that centralized stablecoins relying on permissioned networks should contain these costs. However, onboarding and exchange costs may still be high in part due to further intermediaries (purchasing the crypto asset with fiat currency in the payer's country and selling it for currency in the payee's country). Finally, price volatility – especially in the case of unbacked tokens – introduces substantial additional risk and cost.

24. Crypto assets risk fragmenting global payments. The G20 agenda to enhance cross-border payments calls for a reflection on how stablecoins that at fully satisfy legal and regulatory requirements can lower costs and improve access and transparency of payments. However, crypto asset networks are not easily compatible with one another. In many cases, users must go through an exchange which introduces additional costs. Or they may use close-loop networks which fragment liquidity. Furthermore, countries may leverage crypto asset networks to reinforce payment links among themselves, while excluding others. This would undermine risk sharing opportunities, as well as financial and trade links.

C. The Structure of Financial Systems

Intermediation and Market Functioning

25. DLT systems with multiple copies of the ledger of transactions and nodes performing validation activities may provide higher operational resilience than centralized entities. Even if several nodes become non-operational, others would keep the system running. However, resilience may come at the cost of efficiency and transaction costs.

26. Cyber risks may be high, especially for crypto assets with an open architecture to which anyone can contribute. Even when the code is publicly available, malicious or unstable applications can run for extended periods before they are discovered. Also, accessing pseudonymous crypto assets through hosted wallets exposes users to password theft, without possible recourse, while users could lose private keys of self-custodied wallets.¹⁶

¹⁵ Scalability constraints make it difficult to withdraw and transfer funds during runs, while transaction fees skyrocket. On April 21st, 2021, Bitcoin transaction fees peaked at \$62.79 (Statista).

¹⁶ For example, [one estimate](#) puts the share of Bitcoin lost in wallets at 17 to 23 percent of all mined Bitcoin, [and individual investor losses](#) worth hundreds of millions of US dollars have also been documented.

27. Crypto assets are also prone to fraud and market integrity risks. In permissionless DLT, users can set the fees of their own transactions to rank higher or lower in the settlement queue.¹⁷ Large validators ([Bains 2022](#)) could congest the blockchain with artificial trades to raise the fees they are able to reap ([Aramonte and others 2021](#)). Moreover, illiquidity of certain exchanges or crypto assets may facilitate price manipulations ([Werner and others 2021](#)).¹⁸

28. Crypto assets could facilitate but also undermine financial integrity. On the positive side, some crypto assets could facilitate transparency and traceability of transactions, though not necessarily of users. Blockchain analytics could be used to identify illicit transactions based on automated triggers. Regtech and suptech can be deployed to enhance regulation and supervision. However, challenges include geo-blockers, off-chain transactions, and privacy enhancing mechanisms (He and others 2022). In addition, as exchanges interconnect and offer off-chain transactions to curb costs, transparency and traceability may deteriorate (Makarov and others, 2021). Crypto assets – especially those designed to be anonymous – remain a vehicle for illicit transactions including ransomware attacks. Finally, correspondent banks could withdraw from countries with widespread adoption of unbacked crypto assets if these undermined effective know-your-customer (KYC) procedures.

29. Stablecoins could instill greater competition for bank funding, with some potential benefits for households and firms.¹⁹ Currently, bank deposits offer payment services as well as safe-keeping services. Stablecoins could do the same, but only if they fully comply with legal and regulatory requirements and are able to ensure a fixed nominal value. To the extent that payment services are perceived as superior – lower cost or better integrated with other digital services, for instance – banks would face competition for their deposit funding. This would push them to offer better services, and potentially higher returns on deposits. Alternatively, banks could switch to wholesale funding which may require closer monitoring of risks.

30. However, a rapid shift away from bank deposits could be destabilizing. Banks would need some time to adapt their business models and find alternative funding sources. Paying higher rates on deposits could erode profits. And wholesale funding tends to be more expensive and less stable. As a result, banks might respond by taking on greater risks.

31. Finally, crypto assets could undermine market contestability due to limited interoperability. Stablecoins running on permissioned DLTs are prone to concentration risks and market power. These assets, especially if issued by BigTechs with large existing user bases,

¹⁷ Permissioned DLT (also known as “closed DLT”) uses a ledger in which the consensus protocol requires participants to be certified by an entity, or a consortium, prior to connecting to the network to read, write, or validate transactions. Permissionless DLT (also known as “open DLT” or “public DLT”) uses a ledger in which anyone may participate in the consensus protocol, as no central authority can approve or deny participation. Permissionless DLT applications usually rely on monetary incentives.

¹⁸ Other examples include matching orders, that is, the buying and selling of the same asset to increase trading volume and interest in the asset. DeFi allows for other forms of attacks, which include attacks exploiting smart contract vulnerabilities, and attacks executed within a single transaction ([Werner and others 2021](#)).

¹⁹ Banks may respond to increased competition by innovating further.

could use their networks to shut out competitors and monetize information on customer transactions.²⁰

Financial Inclusion

32. To the extent crypto assets reduce access and transaction costs, they may benefit financial inclusion. DLT could lower prices and fees associated with payments, though more data is required. The evidence so far suggests that this might be the case for small value cross-border transactions.²¹ However, the need for some degree of digital literacy and internet connectivity (including mobile phones) likely reduce benefits. Also, the lack of digital national identity schemes in many countries would limit the ability to onboard households to regulated wallets able to trade crypto assets.

Innovation

33. Crypto assets may spur private sector innovation by diffusing technological improvements (Wharton 2021). The transfer of knowledge from open, programmable, and composable architecture could promote innovation and increase market competition. Moreover, the developer community around crypto assets have introduced and evolved key technological innovations considered in other sectors. If crypto assets had been banned from the start, much of this technology would not have emerged.

34. The public sector can also benefit from the technology inherent in crypto assets. For example, the public sector can build, operate, or supervise digital infrastructure to facilitate cross-border payments. New platforms leveraging tokenization, encryption, and programmability could improve the efficiency of transactions especially across borders (Adrian and others, 2022). Finally, the public sector might also incorporate these new technologies into central bank digital currency (CBDC), digital identification systems, and trusted data sharing schemes.

Environmental Sustainability

35. The energy consumption of crypto assets can vary greatly depending on two design elements of the supporting DLT network. The first element is the consensus mechanism used to achieve agreement about the present state of the network. Resulting energy needs range from very intensive, as in the case of proof-of-work (PoW) algorithms, such as the one used in Bitcoin, to orders of magnitude lower energy consumption when non-PoW mechanisms are used. The second

²⁰ In permissionless blockchains, consensus mechanisms may favor concentration. For instance, under proof-of-stake, richer individuals or entities with more crypto assets to stake are more likely to be selected to validate and thus to receive compensation in newly minted crypto assets ([Bains 2022](#)).

²¹ Evidence is not unanimous, however. A World Economic Forum (WEF) study finds a limited impact on inclusion. See: [WEF Value Proposition of Stablecoins for Financial Inclusion 2021.pdf \(weforum.org\)](#). More than the crypto asset itself, technology can help lower servicing and transaction costs for the underbanked population. Alternative means of digital payments—such as e-money (sometimes called mobile money)—could also enhance financial inclusion. For example, e-money supported remote financial service provision during the COVID pandemic ([see IMF COVID note 2021](#)).

element is the level of control that can be exercised on the underlying architecture (for example, control over the number of nodes, ability to assign roles to participants, location of the nodes, and ease of updating code). Compared to permissionless systems that allow anyone to join as a validator, permissioned networks allow for stronger controls on parameters that influence the energy consumption of the core processing infrastructure.

36. Some design options implemented by crypto assets can allow for higher energy efficiency compared to the current payment system. Academic and industry estimates indicate that non-PoW permissioned networks are significantly more energy efficient than current credit card processing centers, in part because the latter involve energy-inefficient legacy systems. Moreover, these crypto assets can further improve on the traditional payment system in terms of energy consumption because they employ purely digital solutions rather than physical means of payments (such as cash or cards and terminals).

37. Potential environmental impact will also depend on additional factors. Regulation and compliance costs, for instance, can be an important source of energy spending. It will also depend on whether and how additional features are developed, such as increased resilience measures or offline capabilities. Methodologies and data for the full assessment of the payment chain are work in progress.

D. Data Gaps

38. The availability of data, and its widespread access, must be improved to facilitate policymaking. Data is essential to better understand adoption and use patterns, as well as implications, and to prioritize and design policies. Also, data should be collected across countries, and in a consistent manner, to evaluate for instance spillover effects, policy leakage, and currency substitution. Some data of special interest on both unbacked crypto assets and stablecoins would include:

- a. Volume of crypto asset holdings and type of holding (such as domestic or foreign registered wallets and hosted or self-custodied wallets).
- b. Number, median value, and type of transactions associated with crypto assets (including a breakdown between domestic and cross-border transactions, remittances, on-chain and off-chain transactions, as well as wash transactions).
- c. Currency denomination of crypto asset holdings and transactions.
- d. Crypto asset usage (for instance, separating investment and payment usage).
- e. Entities involved in crypto asset transactions and costs associated with each type of entity and of transaction, including a breakdown among various cost drivers.
- f. Liquidity and transaction costs on crypto exchange platforms.
- g. Market concentration for the various services involved in the crypto asset ecosystem.
- h. Rate and cost of mining crypto assets, including energy consumption.

39. International data definitions and standards, as well as the creation of efficient data sharing mechanisms are critical to address data gaps. Domestic data compilers have access to resident financial institutions data through regulation which requires data reporting to meet analytical and policy needs. However, the global nature of crypto assets poses limitations to national data compilers when their residents transact through foreign wallets or exchanges. To close the data gap, international cooperation is required around data standards and sharing mechanisms. A global database of crypto asset holdings and transactions by the private nonfinancial sector would be ideal.

COUNTRY PERSPECTIVES

40. This section provides the perspective of selected countries on the themes covered above. Its purpose is to introduce further depth and specificity to the paper, and to ascertain the relevance of some of the more conceptual discussions. This section first covers background information on crypto asset adoption and usage, then touches on domestic as well as international implications.

41. Views stem from a focus group benefiting from representatives from eight countries.²² The focus group was jointly organized by the Indian Ministry of Finance and the IMF and was held in Delhi in January 2023. Participants attended from central banks, ministries of finance, and financial regulators. Countries invited to participate exhibited different levels of crypto asset adoption. Discussions were held under Chatham house rules, and do not necessarily represent the official views of any authority or government.

A. Background: Crypto Asset Adoption and Usage

42. Adoption levels are not systemic but substantive for many emerging market and developing economies (EMDEs), even post Covid. The rate of crypto asset adoption is generally higher in EMDEs relative to advanced economies (AEs). Adoption rates were high even in some EMDEs with stronger macro fundamentals. Although transaction values seem to have fallen during the “crypto winter,” exchanges in several countries are large and still growing.²³

43. Unbacked crypto assets are mostly adopted for speculative reasons, while stablecoins seem to be driven by transaction motives. Unbacked crypto assets are predominantly adopted for speculation, and in some countries used to circumvent capital controls and taxes, but use cases such

²² Focus group participants were from India, Indonesia, Japan, Philippines, Republic of Korea, Singapore, South Africa, and Sri Lanka.

²³ Data on adoption is scarce, though some countries helpfully rely on private providers such as Chainalysis. However, methodologies to obtain data must still be refined and standardized. For instance, transactions over virtual private networks (VPNs) are typically excluded, and off-chain transactions are difficult to track.

as gaming are becoming more prevalent.²⁴ During Covid, many users viewed crypto assets as an alternative income stream, which in some cases was difficult to tax initially. Crypto assets do not seem to be widely used for payments, though merchant acceptance is relatively high in some countries. In several jurisdictions, crypto assets generated through gaming have become a source of income. Gaming tokens are converted into more mainstream tokens (such as Ether) that are easily convertible to fiat via regulated crypto asset exchanges. Stablecoins may find stronger demand to purchase on-chain assets. Authorities are closely monitoring these developments.

44. Participants suggested that many traditional financial institutions are not very exposed to crypto assets, but are interested in the technology. Some financial institutions are interested in providing custodial services and are developing wallet services, but will not hold crypto assets unless permitted through clear regulation. Numerous financial institutions are exploring the benefits of the underlying technology such as to reconcile foreign exchange transactions between subsidiaries.

45. Policy approaches vary across jurisdictions. Some focus more on protecting end-users such as households, while others also prioritize financial stability and AML/CFT. Most jurisdictions are working towards clarifying their legal and regulatory frameworks. Some are considering banning certain forms of crypto assets, though all participants recognized that doing so requires capacity, almost as much as regulating the industry. Concerns were expressed on activities moving “underground,” off-shore, and towards peer-to-peer modalities.

46. A consensus emerged on leveraging technologies to offer more stable and productive services, including by the public sector. Most participants saw CBDC as a safer solution to end-users’ evolving payment needs, offering legal certainty, promoting competition, enhancing interoperability, and safeguarding consumer rights. Nearly all central banks represented in the focus group are considering introducing CBDC. Some participants highlighted that a design with greater anonymity increases competition with cash and crypto assets, while a positive interest rate may increase competition with bank deposits.

47. Significant interest was also evident in other forms of private crypto assets, especially on-chain financial and real assets. Several authorities expected the “crypto winter” to pass and to bring new forms of innovation. Digital assets may eventually drive the adoption of digital forms of money, including well-regulated stablecoins, but probably also digital commercial bank deposits and CBDC. All agreed that so far too much attention has been given to unbacked crypto assets, probably because of their striking price increase, despite their lack of visible productive use cases and stability.

²⁴ Some participants noted that although gaming has been around for years, it's the play-to-earn phenomenon, the emergence of NFTs and even the metaverse that allows for new avenues for crypto assets to find relevance and user adoption.

B. Domestic Implications

48. Financial stability risks were not seen as primordial for now given the lower exposure of banks and traditional financial institutions to crypto assets. However, crypto-asset markets could reach a point where they represent a systemic risk to financial stability.

49. Fiscal implications are still subdued and many countries are successfully taxing crypto assets. Taxation is a means of controlling adoption, and a source of revenue for several countries. For some countries, it is also a means to signal the riskiness of certain crypto assets, especially of unbacked tokens. Compliance with tax policies seems good, though some participants reported circumvention through foreign exchanges and wallets.

50. Bank disintermediation could be a real risk and could undermine credit provision if rapid. Many participants recognized potential risks stemming from foreign currency-denominated stablecoins. Users could benefit if banks improve services, offer digital deposits of comparable convenience, and accelerate open banking. However, banks were generally perceived to move slowly and could be caught off-guard if stablecoins were rapidly adopted.

51. Financial inclusion could benefit from digitalization of money and assets if it lowered servicing costs. However, other conditions are also necessary, including, improved access to infrastructure, higher financial literacy, and effective identification schemes. Several participants insisted that financial inclusion goes beyond access to payments to also encompasses access to other financial services. In that case, the digitalization of assets could help develop markets and offer opportunities to hedge risks and invest.

52. Financial integrity relies on collecting and analyzing data, which remains challenging. Intra-firm and off-chain transactions by unregulated crypto exchanges remain obscure. Leveraging data from financial institutions, crypto asset service providers, and analytics firms may help build a view of ongoing activities. Some participants expressed interest in automating transactions monitoring, as in “sup-tech” solutions.

53. Concerns about the environmental impact of crypto assets were largely seen as subdued, as the costly “proof of work” validation technology employed by Bitcoin is currently surpassed. Other validation mechanisms, such as proof of stake, require less computing power, and permissioned ledgers require even less.

54. All participants expressed concern at building sufficient capacity among policymakers (including at the supervisory and enforcement levels) to deal with developments in the crypto asset space. The IMF was widely called upon to help. Both human and technological capacity is required to deal with an environment in constant flux. For instance, understanding the complexity of some of the emerging business models within the crypto domain including opaque conglomerate structures is a growing concern.

C. International Implications

55. Monetary policy transmission could weaken through currency substitution, many participants argued. Some participants suggested that adoption of foreign currency denominated stablecoins and unbacked crypto assets represented capital outflows that drew down central banks' FX reserves in the case of managed FX regimes or pegs.

56. The availability of stablecoins could facilitate capital outflows, both in steady state and during episodes of capital flight. Some participants suggested that ironically, the concern arises if and once stablecoins are properly regulated and thus represent a more trustworthy store of value. However, many participants emphasized that effective regulation for crypto assets facilitates tracing and monitoring of stablecoin-related activities. However, all countries decried the lack of good data on cross-border transactions in crypto assets.

57. Implementing CFMs has become harder, though the channels for circumvention still need to be elucidated through better data, participants said. Purchasing a foreign currency denominated stablecoin involves a fiat bank-to-bank transaction to first obtain the foreign currency in most cases. That transaction should be captured by CFM regimes. However, subsequent peer-to-peer transactions are harder to track (though in aggregate would not involve further capital outflows). Some countries pointed to firms offering shell accounts, into which residents could deposit domestic currency for the transfer of foreign currency stablecoins to a foreign wallet. The structure is risky, however, and can be implemented even without stablecoins. Again, though, data is largely missing.

58. Most participants thought that CBDC, regulated stablecoins, and tokenized commercial bank deposits could improve cross-border payments by decreasing costs and increasing speed and transparency. Data on the breakdown of costs among FX, compliance, and clearing and settlement services would be useful. However, participants thought that new forms of money leveraging some crypto asset technologies could lead to more efficient settlement, and fewer instances of costly recourse and reconciliation. Various models of payment platforms are possible and elicited significant interest and discussion.

59. Another important role for multilateral organizations is to ensure payment system integration. Instead, participants saw risks that different payment networks within and between countries could lead to fragmentation. Participants saw more assertive international cooperation based on a joint vision as necessary. But participants emphasized the need for clear and inclusive governance. The role of the IMF is important in this space, to facilitate a consistent approach and globally acceptable solutions to governance.

CONCLUSION AND NEXT STEPS

60. There are many risks associated with crypto assets, although the significance and relevance of specific risks differ by country circumstances. Globally their adoption is generally

low. However, in some countries, adoption is already widespread, and the digitalization of financial and real assets may spur demand for crypto assets. Today already, we must carefully consider the macrofinancial implications of higher global adoption of crypto assets. Benefits are theoretical, while risks have already begun materializing. This paper dwells on implications including for monetary and fiscal policy, capital flows, and market structure. The goal is to inform a future debate on adequate policy responses. One important interim objective should be to develop more granular, relevant, and consistent data across countries to inform policymaking. Moreover, despite their notable risks, crypto assets have developed technologies which the public sector can leverage in pursuit of its own policy objectives.

References

- Adrian, T., C. J. Erceg, S. T. Gray, and R. Sahay. 2021. "Asset Purchases and Direct Financing: Guiding Principles for Emerging Markets and Developing Economies during COVID-19 and Beyond." Departmental Paper 2021/023, International Monetary Fund, Washington, DC.
- Adrian, T., F. Grinberg, T. Mancini-Griffoli, R. M. Townsend, and N. Zhang. 2022. "A Multi-Currency Exchange and Contracting Platform." IMF Working Paper 22/217, International Monetary Fund, Washington, DC.
- Adrian, T., Iyer, T., Qureshi, M. 2022. "Crypto Prices Move More in Sync with Stocks, Posing New Risks." IMF Blog, International Monetary Fund, Washington DC.
- Aramonte, S., W. Huang, and A. Schrimpf. 2021. "DeFi Risks and the Decentralisation Illusion." BIS Quarterly Review (December): 21-36.
- Bains, P. 2022. "Blockchain Consensus Mechanisms: A Primer for Supervisors." Fintech Note 2022/003, International Monetary Fund, Washington, DC.
- Bains, P., A. Ismail, F. Melo, and N. Sugimoto. 2022a. "Regulating the Crypto Ecosystem: The Case of Unbacked Crypto Assets." Fintech Note 2022/007, International Monetary Fund, Washington, DC.
- Bains, P., A. Ismail, F. Melo, and N. Sugimoto. 2022b. "Regulating the Crypto Ecosystem: The Case of Stablecoins and Arrangements." Fintech Note 2022/008, International Monetary Fund, Washington, DC.
- BIS (Bank for International Settlements). 2022. "The Future Monetary System." Chapter 3, Annual Economic Report, Bank for International Settlements, Basel, Switzerland.
- Chainalysis. 2022. "The Chainalysis 2022 Geography of Cryptocurrency Report: Everything You Need to Know About Crypto Adoption around the Globe." Chainalysis, New York, NY.
- Che, N., Copestake, A., and Terraciano, T. 2023. Forthcoming IMF Working Paper.
- Copestake, A., Furceri, D., and Gonzalez-Dominguez, P. 2023. "Crypto Market Responses to Digital Asset Policies." Forthcoming IMF Working Paper.
- FSB (Financial Stability Board). 2018. "Crypto-asset Markets: Potential Channels for Future Financial Stability Implications." Financial Stability Board, Basel, Switzerland.
- FSB (Financial Stability Board). 2020. "Enhancing Cross-border Payments: Stage 3 Roadmap." Financial Stability Board, Basel, Switzerland.
- FSB (Financial Stability Board). 2022. "Assessment of Risks to Financial Stability from Crypto-assets." Financial Stability Board, Basel, Switzerland.
- Furceri, D., Gonzalez-Dominguez, P., Tawk, N., 2023. Forthcoming IMF Working Paper.
- Goldstein, A. 2021. "Stablecoins: How Do They Work, How Are They Used, and What Are Their Risks?" Written Testimony of Director of Financial Policy, Open Markets Institute before the Committee on Banking, Housing, and Urban Affairs, United States Senate, December 14.

- Guesmi, K., S. Saadi, I. Abid, and Z. Ftiti. 2019. "Portfolio diversification with virtual currency: evidence from Bitcoin." *International Review of Financial Analysis* 63 (May): 431-437.
- He, D., A. Kokenyne, X. Lavayssière, I. Lukonga, N. Schwarz, N. Sugimoto, and J. Verrier. 2022. "Capital Flow Management Measures in the Digital Age: Challenges of Crypto Assets." *Fintech Note 2022/005*, International Monetary Fund, Washington, DC. [Link]
- IMF (International Monetary Fund). 2015. "Monetary Policy and Financial Stability." *Staff Report*, International Monetary Fund, Washington, DC.
- IMF (International Monetary Fund). 2018. "The Bali Fintech Agenda: A Blueprint for Successfully Harnessing." *IMF Policy Paper*, International Monetary Fund, Washington, DC.
- IMF (International Monetary Fund). 2019. "The Fiscal Transparency Code." *International Monetary Fund*, Washington, DC.
- IMF (International Monetary Fund). 2020. "Digital Money Across Borders: Macro-Financial Implications." *Staff Report*, International Monetary Fund, Washington, DC.
- IMF (International Monetary Fund). 2021. "The Crypto Ecosystem and Financial Stability Challenges." In *Global Financial Stability Report*, Chapter 2. Washington, DC: International Monetary Fund.
- IMF (International Monetary Fund). 2021. "The Rise of Digital Money: A Strategic Plan to Continue Delivering on the IMF's Mandate." *Staff Report*, International Monetary Fund, Washington, DC.
- IMF (International Monetary Fund). 2023. "Elements of Effective Policies for Crypto Assets." *Staff Report*, International Monetary Fund, Washington, DC.
- Iyer, T. 2022. "Cryptic Connections: Spillovers Between Crypto and Equity Markets." *Global Financial Stability Note 2022/001*, International Monetary Fund, Washington, DC.
- Kaloudis, G., and S. D. Young. 2022. "A Brief Overview of Crypto Payments in 5 Charts." *Coindesk's Payments Week* series.
- Landi, V.N., and Schiavone, A. 2021. "The Effectiveness of Capital Controls." *Open Economies Review*, 32 (June): 183-211.
- Obstfeld, M. 2004. "External adjustment," *Review of World Economics (Weltwirtschaftliches Archiv)*, Springer; Institut für Weltwirtschaft (Kiel Institute for the World Economy), 140(4): 541-568 (December).
- Obstfeld, M. 2012. "Does the Current Account Still Matter?" *NBER Working Paper 17877*.
- OECD (Organisation for Economic Co-operation and Development). 2022. "Public Consultation on the Crypto-Asset Reporting Framework and Amendments to the Common Reporting Standard: Comments by B. Michel and T. Falcao." *OECD*, Paris.
- Schwarz, N., K. Chen, K. Poh, G. Jackson, K. Kao, F. Fernando, and M. Markevych. 2021. "Virtual Assets and Anti-Money Laundering and Combating the Financing of Terrorism (1): Some Legal and Practical Considerations." *Fintech Note 2021/002*, International Monetary Fund, Washington, DC.

- Schwarz, N., K. Chen, K. Poh, G. Jackson, K. Kao, F. Fernando, and M. Markevych. 2021. "Virtual Assets and Anti-Money Laundering and Combating the Financing of Terrorism (2): Effective Anti-Money Laundering and Combating the Financing of Terrorism and Supervisory Framework—Some Legal and Practical Considerations." Fintech Note 2021/003, International Monetary Fund, Washington, DC.
- Terrones, M. and Catão, L. 2001. "Fiscal Deficits and Inflation: A New Look at the Emerging Market Evidence." Working Paper 2001/074, International Monetary Fund, Washington, DC.
- Unsal, F. D., C. Papageorgiou, and H. Garbers. 2022. "Monetary Policy Frameworks: An Index and New Evidence." IMF Working Paper 22/022, International Monetary Fund, Washington, DC.
- Shy, O. 2021. "Digital Currency, Digital Payments, and the 'Last Mile' to the Unbanked." Federal Reserve Bank of Atlanta Policy Hub.
- Vieira, Fabrício A.C., Holland, Márcio, Resende, Marco F. 2012. "Financial Dollarization and Systemic Risks: New Empirical Evidence." *Journal of International Money and Finance*, Volume 31, Issue 6 (October) 1695-1714. [Link]
- Werner, S. M., D. Perez, L. Gudgeon, A. Klages-Mundt, D. Harz, and W. J. Knottenbelt. 2021. "SoK: Decentralized Finance (DeFi)."
- Wharton (Wharton Blockchain and Digital Asset Project). 2021. "DeFi Beyond the Hype: The Emerging World of Decentralized Finance." Produced by the Wharton Blockchain and Digital Asset Project, in collaboration with the World Economic Forum.