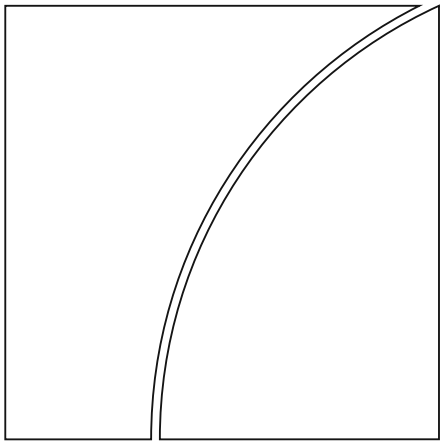

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Foreword

This report discusses the evolving landscape of digital finance and the rapid growth of cryptoassets in depth, focusing on emerging market economies (EMEs). It highlights the risks associated with cryptoassets in traditional financial markets, including market, liquidity, credit and operational risks, bank disintermediation and capital flow risks. The report examines the vulnerabilities in cryptoasset markets that contribute to these risks and explores the transmission channels through which these risks can affect financial stability. It also suggests principles for regulating and supervising cryptoasset markets in EMEs, focusing on clear mandates for authorities, differentiation between activity-based and entity-based regulation, and addressing data gaps. The report provides insights and guidelines for managing the financial stability risks from cryptoassets. The special focus on EMEs is particularly important, given their financial market characteristics such as limited access to investment and savings instruments (insofar as most have bank-based financial systems), relatively low financial literacy and more volatile domestic financial conditions. Overall, these particularities make EMEs more vulnerable to some of the crypto-related financial stability risks than are advanced economies.

The report is the outcome of work conducted by BIS member central banks in the Americas within the Consultative Group of Directors of Financial Stability (CGDFS). The representatives of the central banks of Argentina, Brazil, Canada, Chile, Colombia, Mexico, Peru and the United States set up a task force led by the BIS Americas Office as the secretariat. Two groups, coordinated by two team leaders from Colombia and Mexico, analysed unbacked cryptoassets and so-called stablecoins, respectively, from a financial stability and regulatory perspective. The BIS Americas Office fostered and coordinated discussions among central bank members and engaged in conversations with cryptoasset markets participants and researchers from the ECB, BIS and FSB. These discussions aimed at obtaining insights on the latest developments in crypto markets from industry and policy perspectives. Ultimately, these efforts helped to catalyse central bank work that contributed to the key ideas and results summarised in this report.

The CGDFS was one of the first consultative groups of the BIS Representative Office for the Americas. It was established in April 2014 with three objectives, namely to (i) implement regional central bank consultations in financial stability; (ii) share experiences in identifying and mitigating systemic risks; and (iii) promote the use of key research. In this vein, this report consolidates a multi-country effort to inform the public of novel developments in the cryptoasset space.

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Chair of the Technical Task Force	Chair of the CGDFS	Chief Representative for the Americas
Central Bank of Colombia	Federal Reserve Bank of New York	Bank for International Settlements

Executive summary

Digital finance is evolving rapidly. Technological innovation has opened up new ways to conduct financial activities, promising swift and significant changes to the financial system. One key development is the growth in scale and scope of cryptoassets. In 2021, both public interest and the market value of cryptoassets rose rapidly in both advanced economies (AEs) and emerging market economies (EMEs). Proponents of cryptoassets claim that they offer lower transaction costs, faster payments, no intermediation, anonymity and potentially high returns on investment (BIS (2023)). Whether they deliver on these claims is another matter. The market value of cryptoassets peaked at around $3 trillion in November 2021. However, the bubble burst in early 2022, triggered by the collapse of the then third largest stablecoin TerraUSD. Cryptoassets lost almost two thirds of their value. In November 2022, the bankruptcy of FTX, one of the world's largest crypto exchange platforms, further amplified market stress. Cryptoasset markets entered a "crypto winter".

Although there were no major spillovers to traditional financial markets, policymakers have debated what would happen if cryptoassets and the traditional financial system were to become more integrated in future. In EMEs, cryptoasset adoption was on a steady rise. For some users, cryptoassets provide an alternative to limited investment and savings instruments, while for others they offer a seemingly safe haven against volatile domestic currencies. For EME financial authorities, there were serious concerns about their ability to monitor cryptoasset markets and to assess the channels through which vulnerabilities in cryptoasset markets could give rise to financial stability risks in the traditional financial system.

For this reason, the Consultative Council for the Americas (CCA) Consultative Group of Directors of Financial Stability (CGDFS) agreed to set up a task force to explore the financial stability risks of cryptoassets, with an emphasis on risks in EMEs. The task force had, as an additional objective, to discuss some potential policy guidelines to guard against these financial stability risks.

This report starts by outlining the financial stability risks in traditional financial markets from exposure to cryptoasset markets. The report then traces the sources of each risk to vulnerabilities in the nature, structure, composition and function of cryptoasset markets. First, financial markets can experience market risk, given that the high price volatility of cryptoassets can result in losses for investors exposed directly or indirectly to cryptoasset markets. Second, investors can face liquidity risks due to the lack of transparency in cryptoasset operations and the concentration of trading in just a few large crypto exchanges, among other factors. A third area is credit risk, which can materialise through the lack of accountability or sound governance in cryptoasset markets and through the excessive leverage present in decentralised finance (DeFi) protocols. Fourth, operational risks can emerge as cryptoassets are prone to cyber attacks and system failures, as they depend on the internet and software-coded contracts. Fifth, wide adoption of cryptoassets can lead to risks of currency substitution. Consumers shifting away from deposits to cryptoassets can lead to bank disintermediation. Sixth, their use for cross-border transfer and payments can result in capital flow risks.

The report then sketches the transmission channels through which vulnerabilities in cryptoasset markets might turn into financial stability risks. Transmission channels include direct ownership, use as collateral, confidence effects, wealth effects and indirect effects through connections to participants in cryptoasset markets. Risk catalysts can strengthen or weaken these transmission channels, increasing or

reducing a country's vulnerability to financial stability risks. In general, the report finds three catalysts: economic and financial landscape, technological penetration and regulatory stance.

The last part of the report details some principles for regulating and supervising cryptoasset markets in EMEs. Authorities can consider (selective) bans, containment and regulation. The report focuses on three main principles: establishing clear mandates for authorities and differentiating between activity-based and entity-based regulation. Data gaps are also addressed. The final section concludes.

1. Introduction

Cryptoassets are a type of private sector digital asset that depends primarily on cryptography and distributed ledger (DLT) or similar technology (BIS (2022); FSB (2022)).[1] The original purpose of cryptoassets was to enable transactions between individuals without the need for a trusted third party by aligning incentives within the network participants. Cryptoassets can serve as a means of payment or exchange, as speculative investments, or to access goods or services. The marketplaces for issuing, buying, selling, swapping and storing cryptoassets, along with all their products, instruments, intermediaries, applications and technologies have grown dramatically in the last years, with greater retail (Auer, Cornelli, Doerr, Frost and Gambacorta (2022)) and institutional use (Auer, Farag, Lewrick, Orazem and Zoss (2022)).

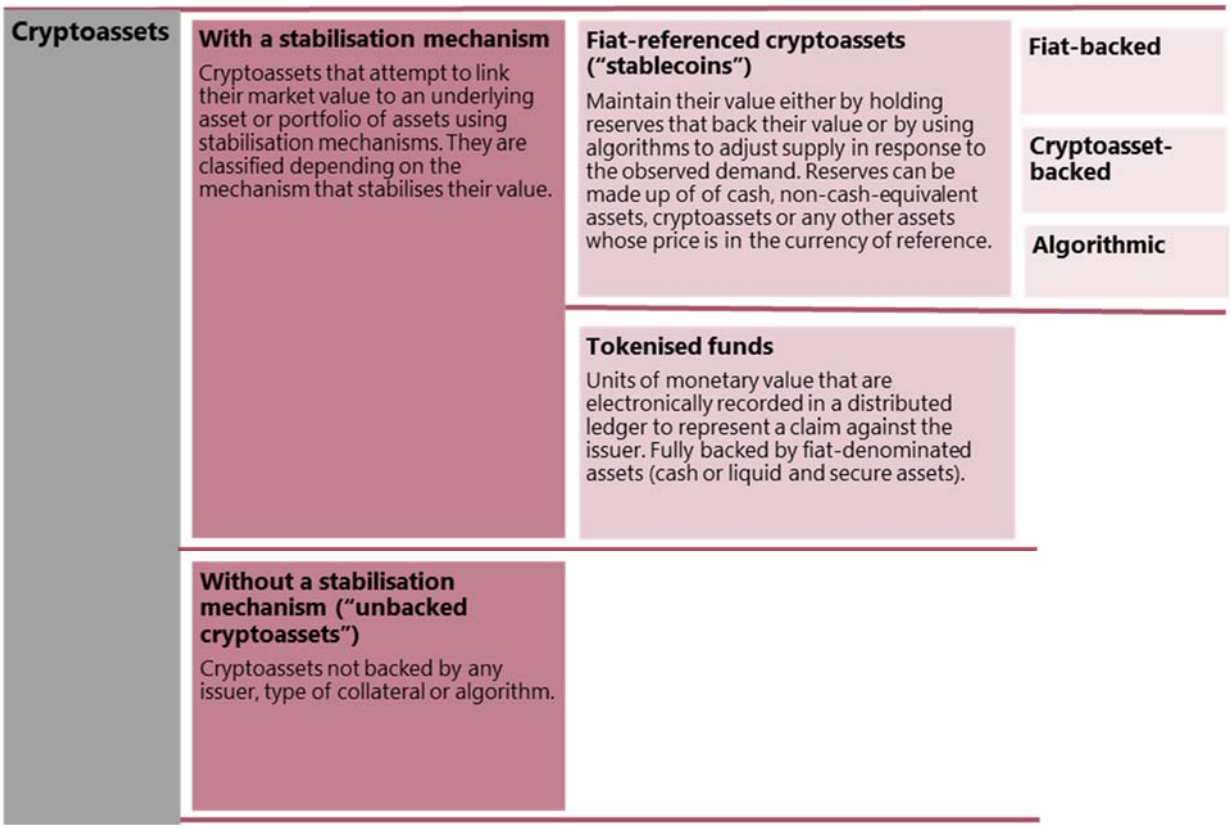
There is no consensus on classifying cryptoassets. This report classifies cryptoassets into two groups, depending on whether their value has a stabilisation mechanism or not (Graph 1).[2] The report will not discuss risks from other types of digital assets or digital instruments that are issued or represented using DLT or similar technology (eg non-fungible tokens or tokenised assets). From this point on, the report will refer to cryptoassets with a stabilisation mechanism as "stablecoins" and cryptoassets without a stabilisation mechanism as "unbacked cryptoassets".

[1] Annex A contains a glossary of terms.

[2] Annex B contains an explanation of the detailed taxonomy.

Taxonomy of cryptoassets in the report

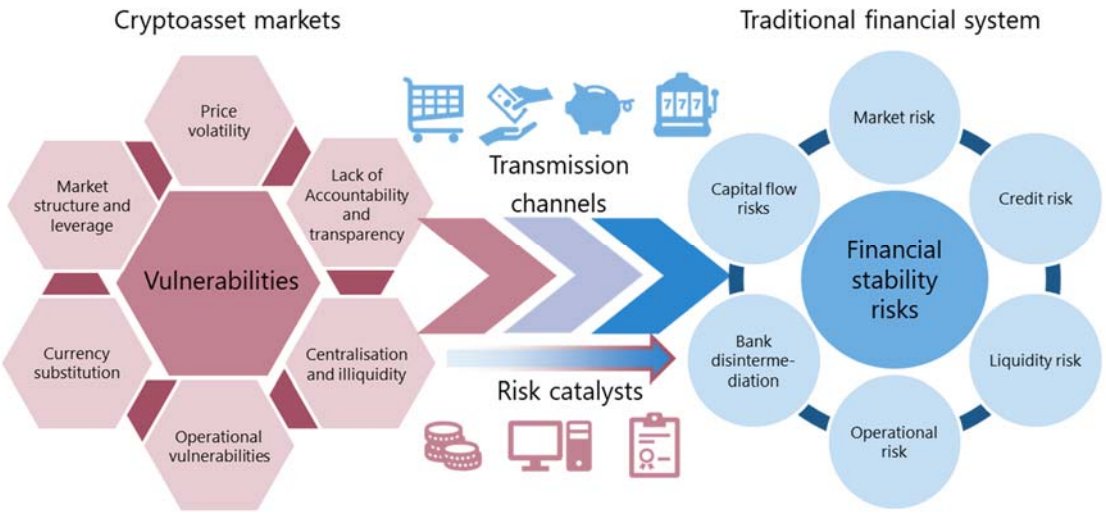
Graph 1



Sources: FSB (2018), Bullmann (2019); Bank of England (2022); Macharov and Schoar (2022); Task force's elaboration.

The report builds on the Financial Stability Surveillance Framework of the Financial Stability Board (FSB) to assess how crypto can affect financial stability at the global level (FSB (2018); FSB (2021)). The framework traces financial stability risks in the traditional financial system from vulnerabilities in cryptoasset markets (Graph 2). How these vulnerabilities affect the traditional financial system depends on the strength of the transmission channels between the two environments. In addition, in EMEs, there are specific risk catalysts that can amplify financial stability risks.

How crypto market vulnerabilities propagate into financial stability risks Graph 2



Source: Task force's elaboration.

Table 1 consolidates the task force's main findings and summarises the first part of the report. The first column identifies the main financial stability risks due to exposures to cryptoasset markets. The second column identifies, for each financial stability risk, the vulnerabilities in cryptoasset markets that are the source of the risks. The third column shows the transmission channels that connect the cryptoasset space with the traditional financial system. It is through these channels that the vulnerabilities propagate into the traditional financial system. Finally, the last column gives examples of a recent development in EMEs where each risk has materialised.

The table thus reads from left to right, starting with the type of financial stability risk. For example, exposure to cryptoasset markets can lead to market risk in traditional financial markets (first row, first column). The vulnerabilities in cryptoasset markets that generate this risk are those related to high price volatility. For instance, cryptoassets have no intrinsic value and lack a backing authority or trustworthy counterparty, which leads to sharp and sudden changes in their prices (second column). One way in which price volatility propagates into market risk is through direct holdings of cryptoassets by institutions or households. As the price of the cryptoasset fluctuates, holders risk incurring losses (third column). The rows for other risks are laid out in comparable fashion and discussed in more depth below.

The report, first, outlines the financial stability risks in traditional financial markets. Then it lays out vulnerabilities in cryptoasset markets that are the sources of those risks. The report then explores different components of the cryptoasset ecosystem and the transmission channels to users and financial institutions in the traditional financial market. The strength of transmission depends on specific catalysts, which are more prevalent in EMEs. The second part of the report outlines a process to establish regulation with the aim of monitoring and reducing financial stability risks from cryptoassets. It concludes with some considerations on potential paths for regulation in EMEs.

Financial stability risks from exposure to cryptoassets

Table 1

Financial stability risks	Vulnerabilities in cryptoasset markets	Transmission channels	Recent Developments
Market risk risk of losses arising from movements in market prices due to events in cryptoasset markets.	*Price volatility* • No intrinsic value, lack of backing authority or trustworthy counterparty (unbacked cryptoassets). • Lack of clarity on reserves (stablecoins). • Token ownership concentration. • Shallow markets. *Lack of accountability and transparency* • Lack of transparency and information. • Prone to fraud and scams. • Lack of consumer/ investor protections. • Can operate (virtually) outside regulatory oversight of any authority.	• Direct institutional or user exposure. • Spillover to broader cryptoasset markets. • Spillover to other assets classes (eg assets in the reserve pool backing the stablecoin). • Indirect exposure to cryptoassets. • Confidence effects.	Bitcoin exchange-traded funds (ETFs).
Liquidity risk the risk of incurring losses resulting from the inability to meet payment obligations in a timely manner when they become due or without incurring unacceptable losses.	*Centralisation and illiquidity* • Centralisation in large exchanges. • Liquidity mismatch in reserves (stablecoins). • Susceptible to investor runs (stablecoins). *Operational vulnerabilities* • Scalability trilemma.	• Direct institutional or user exposure. • Indirect exposure to cryptoassets. • Confidence effects. • Issuance of stablecoins.	Mixed-collateral stablecoins.
Credit risk potential that a counterparty in cryptoasset markets or directly exposed to cryptoassets will fail to meet its obligations in accordance with agreed terms.	*Market structure* • Related party transactions. • Financial connections with affiliated entities. *Lack of accountability and transparency* • Lack of sound governance. • Lack of disclosure requirements. *Leverage in cryptoasset markets* • Excessive leverage.	• Direct institutional or user exposure. • Indirect exposure to cryptoassets. • Confidence effects. • Margin and leverage trading. • Use as collateral.	Crypto exchange accounts in traditional financial institutions.
Operational risk the risk of loss resulting from inadequate or failed internal processes and systems, human errors or from external events.	*Operational vulnerabilities* • High technological dependency. • Pitfalls of blockchain infrastructure. • Cyber security risks. • Operation of digital wallets and exchanges.	• System's interconnections and infrastructure. • Network connections.	Crypto exchange pilot in a regulatory sandbox.
Bank disintermediation the risk that individuals and firms withdraw their deposit funds from traditional financial institutions and transfer them to other institutions.	*Currency substitution* • Domestic currency substitution – alternative means of payment, use as a store of value. • Reserve currency substitution – use as global safe asset or cross-border payments.	• Direct institutional or user exposure. • Confidence effects. • Use for payments. • Use as a store of value.	Cryptoassets as legal tender and cryptoasset payment cards.
Capital flows risks the potential for large and sudden changes in the flow of capital between countries due to the buying and selling of cryptoassets.	*Lack of accountability and transparency* • Anonymity and opacity – lack of clarity on participants and activities. • Offshore operations. *Operational vulnerabilities* • Speed and ease to move funds.	• Direct institutional or user exposure. • Use for cross-border payments. • Use for illicit activities.	Cryptoassets for remittances.

Source: Task force's elaboration.

2. Risks in traditional financial markets and vulnerabilities in cryptoasset markets

The crypto universe was built on the promise of an efficient, decentralised, low-cost, inclusive, safe and open monetary system. But structural vulnerabilities in the design and operation of cryptoasset markets make them unsuitable as the basis for a monetary system (BIS (2022)). These flaws not only affect how cryptoasset markets function, they can in principle also spill over to the traditional financial system (FSB (2022a)). As the tendrils of cryptoasset markets multiply and strengthen their grip into the real world, vulnerabilities in cryptoassets can affect market prices, liquidity, credit and the operational integrity of traditional financial systems (FSB (2022b)).

The report identifies six financial stability risks in traditional financial markets from exposure to cryptoasset markets: market risk, liquidity risk, credit risk, operational risk, bank disintermediation risk and capital flow risk. It then traces each risk to a set of vulnerabilities in cryptoasset markets. The list is not exhaustive. Other policy papers and research documents compile similar lists that complement this report.[3]

2.1 Market risk

Market risk refers to losses arising from movements in market prices due to events in cryptoasset markets. Cryptoassets can transmit market risk to financial markets directly or indirectly. Direct market risk involves the direct exposure through holdings of cryptoassets: eg an investor holding Bitcoin in an electronic wallet. Indirect market risk involves the ripple effects of market movements caused by changes in prices of cryptoassets: eg an investor holding shares of a Bitcoin mining company. If the price of Bitcoin falls this would affect the value of the stock and incur a loss for the investor. Two sources of market risk are the high price volatility of cryptoassets and the lack of accountability and transparency in cryptoasset markets.

2.1.1 Price volatility

Cryptoasset prices are more volatile than prices of other financial assets. For unbacked cryptoassets, they have been used mainly for speculative purposes. As no fundamental value is associated with the tokens, their valuation depends mainly on highly volatile speculative demand.[4]

Stablecoins are also subject to price volatility. On the one hand, their price on secondary markets is not always one-to-one pegged to the reference currency; on the other hand, they suffer from the risk of runs, which could result in significant deviations from their peg. Many factors can contribute to this run risk, depending on the type of stablecoin. For example, for fiat-backed stablecoins, the quality of the reserve assets, the issuers' commitment to redeem at the peg, the reliability of the underlying technology etc could all trigger a run.[5] For algorithmic stablecoins, with

[3] BIS (2023), ECB (2018), FSB (2022a), IMF (2021a), among others.

[4] By contrast, central bank fiat money has a perfectly elastic supply. Thus, central banks can adapt the quantity of money to compensate for seasonal changes or disorderly fluctuations in the demand for money.

[5] See MacDonald and Zhao (2022) for a detailed discussion of stablecoin run risk

no reserve backing or only partial reserve backing, they are highly susceptible to runs caused by speculative attacks, sudden changes in market sentiment, or due to errors in the design of their stabilisation algorithms. A notable example of a stablecoin failure was the collapse of the algorithmic stablecoin TerraUSD (UST). At its peak value it was the third most important stablecoin. On 9 May 2022, the price of UST, which was supposed to maintain parity with the US dollar, fell to 35 cents. Its companion token, LUNA, which was meant to stabilise UST's price, fell from 80 US dollars to a few cents by 12 May 2022 (BIS (2022)).[6] The collapse of this stablecoin rippled through cryptoasset markets, resulting in a 26% loss in total market capitalisation.

For secondary market price volatility, token ownership concentration may also contribute to it. When a small group of individuals control a sizeable portion of the total supply of a particular cryptoasset, they can influence the market and move prices through coordinated buying and selling. This can result in significant price swings. In addition, concentration of ownership creates incentives to manipulate the market. This can lead to artificially inflated prices and stoke price volatility.

Despite the decentralisation promised by distributed ledger technology (DLT), token ownership concentration is high in cryptoasset markets. For example, in 2020 an estimated 10,000 individuals owned about a quarter of all outstanding Bitcoin (Makarov and Schoar (2021)). Satoshi Nakamoto, the anonymous creator of Bitcoin, is the largest holder with more than 1 million stored in different wallets (around 5% of the total). Other tokens show similar concentration. For example, fewer than 100 participants control over 51% of the value in Dogecoin, ZCash and Ethereum Classic (Sai et al (2021)).

Shallow markets are also a source of secondary market price volatility of cryptoassets. In a shallow market, there is a limited number of market participants and trading volumes are low. This means that a small number of trades or changes in demand can amplify price movements (Bohme et al (2015)). Furthermore, shallow markets can result in illiquidity and difficulties in executing trades, particularly during periods of high volatility. The difficulty in executing trades at desired prices can exacerbate price swings and increase overall volatility.

The high price volatility of cryptoassets complicates their use as a unit of account or means of payment, two primary functions of money, and hence they are unlikely to serve as money in their current form.

2.1.2 Lack of transparency and accountability

Another source of market risk in traditional financial markets stems from the lack of transparency and information in cryptoasset markets. Information on the ownership, legal structure, governance and management of the key operating entities is sparse. Data on the players and trading activity of cryptoassets can be difficult to obtain. Holders of cryptoassets might not have access to information on how the protocol that rules the cryptoasset works or other essential information. The reason is that cryptoassets are not subject to the same disclosure requirements as traditional financial assets. For example, stablecoin issuers in most cases do not report the composition of the reserves that back the value of their token or which financial institution holds the reserves. As participants make decisions based on an incomplete information set, there is a greater risk of losses.

[6] Box B in Annex B describes the episode in more detail.

Lack of accountability and transparency in cryptoasset markets creates an ecosystem prone to fraud and scams. Even worse, clear and direct lines of responsibility and accountability are not evident (FSB (2022c)). Most crypto scams take the form of fake investment opportunities that promise large returns for investors. The Federal Trade Commission reported that, in 2021, scammers had stolen over $1 billion in cryptoassets from 46,000 people (Cruz (2022)). In the case of initial coin offerings, initiators were able to quickly raise funds by selling tokens to a pool of investors. They would crowdfund a project with minimal effort, avoiding compliance and intermediaries' costs. In most cases, initiators would drive up the price of the token and then quickly dump it for profit (Bian et al (2018)). People who bought the token would lose all their invested money.

The lack of consumer and investor protection in cryptoasset markets also raises market risk. Consumers and investors may be more susceptible to losing their funds due to fraudulent activities in the absence of legal recourse. When participants in cryptoasset markets suffer a fraud, have their accounts hacked or fall victim to a scam, there is often nowhere to turn for help. Without a clear regulatory framework and consumer protection measures, it can be challenging for market participants to hold entities accountable for their actions in the event of market misconduct or unethical practices. Even if participants denounce the scam or fraud, authorities might not have legal powers to enforce any restitution.

Finally, one additional source of market risk is that cryptoasset products and services and their respective providers can operate (virtually) outside the regulatory oversight of any authority. This vulnerability compounds the lack of transparency and the propensity to fraud and scams. For example, traditional financial institutions must comply with know-your-customer (KYC) checks that verify the identity of their clients and the legal source of their funds. A crypto exchange that operates in the same jurisdiction but is based offshore would not be subject to the same requirements. This allows malicious players to infiltrate the system. The lack of oversight leads to a higher risk of market abuses and losses.

2.1.3 Recent developments: Bitcoin ETFs

Bitcoin exchange-traded funds (ETFs) could potentially pose market risk in EMEs by lowering the barriers to entry for less sophisticated investors and increasing investors' direct and indirect exposure to cryptoassets. In general, traders buy and sell ETFs directly on a stock exchange, just like any other shares. They use the proceeds from selling ETF shares to investors to create a portfolio of assets based on market indices, stock market sectors, or other asset classes such as cryptoassets. In this case, Bitcoin ETFs aim to track the price of Bitcoin, albeit imperfectly. Some proposed ETFs are based on Bitcoin futures and other derivative products, while some others use "physical" Bitcoin. In February 2021, Canada approved the world's first two Bitcoin ETFs[7] and in March 2021, Brazil became the second country in the Americas to approve a Bitcoin ETF.[8] As of end-March 2023, ETFs owned a combined 819,125 BTC, 3.9% of the total bitcoins to be issued (21 million). The largest Bitcoin ETF is Grayscale Bitcoin Trust (GBTC), which owns 643,572 BTC, or nearly 3% of the total supply. In

[7] The Purpose Bitcoin ETF (BTCC) and the Evolve Bitcoin ETF (EBIT), which are some of the first ETFs to hold solely Bitcoin and to keep all their assets in cold storage, ie in wallets not actively connected to the internet, generating and storing their private keys offline to avoid online security incidents.

[8] The QR Capital's Bitcoin ETF (QBTC11).

total, ETFs, governments and public and private companies own more than 1.6 million BTC, approximately 7.8% of the total supply.[9]

Among the risks, investors in Bitcoin ETFs own no cryptoassets but still face large losses when the price of Bitcoin drops. Additionally, futures-based ETFs may increase price volatility and amplify risks if they hold a significant portion of the futures market. Experience shows that futures-based ETFs with significant exposure to the underlying asset might exacerbate price changes and increase volatility.[10]

2.2 Liquidity risk

Liquidity risk entails losses resulting from the inability to meet payment obligations in a timely manner when they become due or without incurring in significant losses. The vulnerabilities in cryptoasset markets that raise liquidity risks are the centralisation of trading on large exchanges, the mismatch in stablecoin reserves, the propensity to investor runs and operational vulnerabilities related to the scalability trilemma.

2.2.1 Centralisation and illiquidity

First, centralisation of trading on large exchanges is a key factor that affects the liquidity of cryptoasset markets. In terms of the number of transactions, the largest crypto exchanges are Binance, Huobi Global and OKEx.[11] These exchanges process a large volume of trades every day, making them critical to the functioning of the cryptoasset markets and the availability of liquidity. Centralisation of trading on crypto exchanges isn't necessarily bad for liquidity. In fact, investors who choose to trade on these markets do so mainly because centralised exchanges can give traders/investors better liquidity (eg a smaller bid-ask spread). Yet, the centralisation of trading on these large exchanges also means that they are a key source of risks, as the failure of a single exchange could trigger a chain reaction across the entire market. In addition, during episodes of high volatility, these exchanges could also decide unilaterally to suspend withdrawals and trading, locking up liquidity on their platform.[12]

For stablecoins, a liquidity mismatch between stablecoins and the assets that maintain their peg is another source of liquidity risk. Often stablecoin reserves are not fully liquid but consist of a mix of commercial paper, short-term securities and cash. This limits the amount that can be redeemed at par on short notice. Tether, the most widely used stablecoin, presents a higher degree of liquidity mismatch than other major stablecoins. Its reserves consist of cash, fiduciary deposits, reverse repo notes and government securities, most of which have medium liquidity. In other cases, there are stablecoins backed only by cryptoassets. In these cases, reserves are generally over-collateralised to protect against a sharp drop in value of the underlying

[9] Data from Buy Bitcoin Worldwide (Bitcoin Treasuries | Buy Bitcoin Worldwide) as of end-March 2023.

[10] Todorov (2021).

[11] According to CCData, in May 2023 Binance's share of spot crypto trading was 46%.

[12] On 10 November 2022, FTX suspended onboarding of new clients as well as withdrawals as hopes of a rescue for the cryptocurrency exchange faded after rival Binance walked away from a deal to bail out the company.

cryptoasset. Therefore, issuers of cryptoasset-backed stablecoins often require extra capital to trade the asset.[13]

The liquidity mismatch problem of stablecoin reserves also gives rise to the risk of a run on stablecoins. The backing structures of stablecoins resemble those of money market funds, which were a source of financial instability both in 2008 and in 2020. This is an inherent incentive problem, where the pressure to invest in riskier assets and achieve higher returns could lead the issuer to deviate from a prudent composition of reserve assets. In a scenario where investors lose confidence in the value of a stablecoin, they would want to redeem their holdings. If the assets backing the stablecoin cannot be sold quickly, the pressure to redeem the tokens would increase and the run would worsen. A spiral would ensue where doubts about the composition of reserve assets would lead to further deviations of the stablecoin from its supposed fixed value. In addition, the sale of reserve assets would put pressure on liquidity in the reserve asset markets (eg treasuries, commercial paper).

2.2.2 Scalability trilemma

The scalability trilemma could limit the ability of blockchain networks to fulfil increasing transaction and related liquidity demand. The scalability trilemma refers to the idea that blockchain networks can only achieve two out of three properties: security, scalability or decentralisation. In other words, it is difficult to achieve all three properties simultaneously in a blockchain network. The scalability trilemma can affect liquidity in cryptoasset markets in several ways. First, if a blockchain network is unable to scale effectively, it can lead to slow transaction processing times and high transaction fees. This can discourage market participants from using the network, which can lead to reduced liquidity. Second, if a blockchain network is not sufficiently decentralised, it can be more vulnerable to manipulation by a few large market participants. This can lead to reduced trust in the network and lower liquidity. Finally, if a blockchain network sacrifices security for scalability or decentralisation, it can be more vulnerable to hacking, fraud and other forms of operational risk. This can lead to sudden and severe price declines, which can also reduce liquidity.

2.2.3 Recent developments: mixed-collateral stablecoins

An example of potential liquidity risk in EMEs is the case of some private companies issuing stablecoins aiming to track, or be "pegged", to their currencies by using mixed collateralisation as their stabilisation mechanism.[14] These stablecoins are designed to facilitate transactions in the domestic currency but their stabilisation mechanism can give rise to risks given its mixed collateralisation, which employs both crypto and fiat assets as reserve assets.

Basically, an entity requests a loan from the issuing entity and transfers the corresponding collateral at market value and against the national currency in question. This means that the "assets" backing the stablecoins are not even in the target currency and the "peg" exists only because it was initially priced in that currency. The entities issuing these types of stablecoin could face a high liquidity risk

[13] It is worth stressing that this stabilisation mechanism shares the risk of its collateral. Thus, besides its risks, the depreciation of collateral may lead to a collapse of the stablecoin.

[14] For example, the stablecoins nuARS and nuPEN, issued by Num Finance, aim to track the Argentinian peso and the Peruvian sol, by having a combined collateralisation with a cryptoasset (USDC or DAI) and fiat assets. Both cryptoassets are private ventures and are not backed by the central banks of Argentina or the central bank of Peru.

if the currency appreciates, preventing them from meeting their obligations if customers want to redeem their tokens.[15] In addition, these types of entity have not been transparent regarding the exact and periodic composition of their reserves, which may experience a rapid change in their value as the reserves comprise other cryptoassets.

2.3 Credit risk

Credit risk is the potential that a counterparty in cryptoasset markets or directly exposed to cryptoassets could fail to meet its obligations in accordance with agreed terms. The vulnerabilities in cryptoasset markets that increase credit risk are market structure issues such as related party transactions and financial connections of affiliated entities, the lack of sound governance, the lack of consumer/investor protections and the excessive leverage of players within the system.

2.3.1 Related party transactions

First, related party transactions can create complex networks of interconnected entities and increase the risk of counterparty failures. Spillovers from one entity to another can lead to credit risks that are not apparent to investors. One example in 2022 was the fall of Alameda Research – a cryptoasset trading firm – and FTX – then the second largest crypto exchange. Both companies had the same owner (Sam Bankman-Fried) and their relationship centred around a token issued by FTX (FTT). FTX's customers could use FTT to trade their cryptoassets while Alameda served as FTT's main market-maker and used the token as collateral for loans from FTX. When the news broke that the majority of Alameda's balance sheet consisted of FTT tokens, confidence in the token faltered and its price crashed, taking down both companies. The relationship between FTX and Alameda meant that FTX investors were exposed to Alameda's credit risk. They had their deposits misappropriated to finance bad loans to the trading firm. In traditional financial markets, related party transactions are often disbarred. For example, investment banks, capital market operations and trading activities are strictly walled off from each other.

2.3.2 Lack of governance and disclosure requirements

The opaque nature of cryptoassets leads to a lack of governance (FSB (2022)). In some cases, the individuals or entities who are responsible for the functioning, rules and activities related to cryptoassets are unknown. In other cases, governance is dispersed among multiple entities that have control or influence only over certain aspects or activities. In a decentralised network, governance is shared among all participants. This is designed to work through a consensus mechanism or community voting that allows network participants to make decisions and manage the network's operations. The weight of each participant's vote depends on their stake in the network (eg share of total tokens owned). Decentralised governance provides greater democratic participation but can also result in challenges in reaching consensus and managing the network. For example, one entity could hold enough power to drive all network

[15] Num Finance FAQs (FAQS - Num Finance), https://num.finance/assets/pdf/extended-documentation-2023-04.pdf.

decisions.[16] Then there is a higher risk of market manipulation and insider trading, which can increase the likelihood of counterparty failures and defaults. Or, in the case of total decentralisation, it becomes challenging to hold anyone accountable for failures and errors.

Entities in cryptoasset market are not subject to statutes and regulations that create a robust disclosure regime. Without effective disclosure and reporting requirements, lenders would find it difficult to monitor and assess borrower creditworthiness. Without this information, users have only a limited understanding of the risks of participating in cryptoasset markets or the financial health of their business counterparties.

2.3.3 Leverage in cryptoasset markets

Excessive leverage in cryptoasset markets weakens borrower's balance sheet positions and raises counterparty risks. Overcollateralisation mechanisms are insufficient to mitigate market and credit risks. Overcollateralised positions mean that investors provide collateral that is worth more than enough to cover potential losses in case of default. While DeFi loans are typically overcollateralised, funds borrowed in one instance can be re-used to serve as collateral in other transactions, allowing investors to build increasingly large exposures for a given amount of collateral.

Another issue is that, in most cases, cryptoassets make up the collateral. This practice amplifies credit risk as movements in one cryptoasset often ripple through the whole market. A negative shock in cryptoasset markets would affect both the value of the investment and the collateral, and, as DeFi protocols require overcollateralised positions, this would strain investors' positions further. If the value of the collateral drops significantly, investors may not be able to meet their obligations, leading to defaults and potentially spillovers to the broader financial system.

Leverage contributes to the build-up of credit risk (Aramonte et al (2021)). Cryptoasset markets allow for excessive and opaque use of leverage.[17] Leverage is available broadly through margin accounts in cryptoasset exchanges, allowing for the automatic unwinding of positions and account liquidation. The use of leverage can amplify market volatility, as traders can take on larger positions and magnify price movements. This increased volatility can result in rapid price swings, which can cause significant market disruptions and increase the risk of market instability. Leverage in crypto markets has increased with the issuance of derivatives products where the underlying assets are cryptoassets. Finally, leverage may also make it more difficult for regulators to monitor and address related risks.

2.3.4 Recent developments: crypto exchange accounts in traditional financial institutions

In August 2022, the Chilean competition authorities completed a legal action against one of several commercial banks accused of denying the opening of current accounts to two crypto exchanges in Chile, and of unjustifiably closing accounts that were

[16] This would be the case in some ICOs where creators of the token keep a significant share to ensure their control over the protocols. In that way, there were no safeguards against price manipulation and fraud.

[17] Some exchanges that allow leverage are Bybit, KuCoin and Huboi. Some exchanges allow leverage of up to 120x or more.

already opened. Consequently, the bank committed itself to opening current accounts for any crypto exchange. But if the crypto exchanges associated with the reopened accounts were to suffer losses or experience financial distress, this could impair the financial position of banks if they had extended credit or provided other financial services to the exchanges.

Mexico provides an example of an approach to mitigating this risk. Its financial regulators have made it clear that a healthy distance must be maintained between cryptoassets and the Mexican financial system (see Box A). In Mexico, besides typical crypto exchanges, some e-commerce and fintech companies are starting to offer the possibility to exchange, receive, store and transfer cryptoassets; thus providing crypto exchange services to their existing customer base. However, given that financial institutions' operations with cryptoassets in Mexico are limited to internal operations only, the risks from losses or financial distress due to a cryptoassets exchange is limited. Mexico has adopted this system, together with its fintech law and the regulation of the payments system, to ensure a healthy development of the banking and financial sectors, and to avoid and limit the risks that could affect financial stability.

2.4 Operational risk

Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. As in the traditional financial system there are cyber security risks and fraud prevention issues. But there are also operational risks related to the unique aspects of DLT-based arrangements.

2.4.1 Technological dependency and blockchain infrastructure

Cryptoasset markets depend heavily on technology, which raises operational risks. Cryptoassets are based on complex and rapidly evolving technologies that require specialised knowledge to develop and maintain. Coding errors, bugs, blackouts and other technical problems can lead to significant losses for investors, exchanges and other market participants. Operational issues also include broader risks related to maintaining the reliability and operational capability of the protocols associated with cryptoassets. This includes, for example, risks related to the validation and confirmation of transactions and the management and integrity of the distributed ledger. Many key activities, such as source code control, infrastructure operation and mining activities, are often concentrated with a relatively small number of participants, creating the potential for misconduct, market manipulation and other market integrity issues. Users often lack the ability to read code and must rely on technology experts to truly understand the protocols.

The blockchain infrastructure, which is the basis for all cryptoassets, also entails specific risks. One of the key features of blockchain technology is its irreversibility. Once a transaction is recorded on the blockchain, it cannot be undone. This feature can be problematic in situations where a transaction needs to be reversed, such as in the case of a hack or fraud. In addition, crypto suffers from the inherent limitations of permissionless blockchains, which lead inevitably to the system's fragmentation, accompanied by congestion and high fees (BIS (2022)).

2.4.2 Cyber security and cryptoasset service providers

The strong connection with technology exposes cryptoassets to cyber security issues. Cyber attacks can take various forms, such as phishing attacks, hacking and malware

(Huang and Yang (2022)). Phishing includes spear phishing, DNS hacking, phishing bots and fake browser extensions. In other cases, hackers use malware to mine cryptoassets in the computers of unsuspecting victims or steal private keys. Cyber criminals hide malicious code in webpages or ads. Once the user clicks on them, hackers gain access.

Operational vulnerabilities also extend to cryptoasset service providers (wallets, exchanges etc). They could face operational disruptions, interruptions in the continuity of services or system failures that may lead to users not being able to redeem their investments or trade. All service providers in cryptoasset markets are vulnerable to coding errors that could result in funds being lost or sharp price swings that would affect their value. In some cases, users will rely on third-party applications to manage their digital assets. For example, wallets can be an important source of vulnerabilities. If a hacker gains access to a user's wallet and steals their funds, the transaction would be irrevocable.

2.4.1 Recent developments: crypto exchange pilot in the Colombian sandbox

Colombia's sandbox has been enabled by the Colombian financial regulators as a mechanism to promote technological, product and business model innovations. A pilot has been approved that allows alliances between financial institutions under the surveillance of the Financial Superintendency of Colombia and crypto exchanges to conduct digital transactions, such as deposits and withdrawals with cryptoassets within a controlled space, which helps to mitigate the operational risk. Through this sandbox, innovative models are implemented with a relaxation of specific regulations, so that allow entrepreneurs can try out new models, and regulators can better understand such experiments for regulatory purposes. Participants can test and carry out operations in Colombian pesos with crypto firms, protected by high security standards, reporting obligations and adequate risk management.

Operations are supervised by the financial authorities, who ensure that consumer protection from the financial consumer standpoint is safeguarded. These initiatives seek to improve the prevention of money laundering, risk management, cyber security and AML/CFT compliance etc.

2.5 Bank disintermediation risk

Wide cryptoasset adoption could have implications for the channelling of credit by banks to the real economy and, thus, for financial stability. A significant shift from bank deposits into privately issued digital assets could have implications for lending and intermediation by the banking sector. This is more of a concern for emerging market economies (EMEs) than it is for advanced economies. It could also pose macro-financial risks if there is currency substitution – also known as "cryptoisation" (IMF (2021)). In addition, this would tend to reduce the monetary authority's control over liquidity in the economy, thus weakening the effectiveness of monetary policy by affecting its transmission channels. If the impact of a lack of confidence goes beyond an individual bank or financial institution and involves contagion to other regulated entities or spreads to the real economy, systemic risk may emerge (IMF (2021); Iyer (2022); BCRA (2022)).

2.5.1 Domestic currency substitution

Currency substitution refers to a situation where individuals or businesses substitute a new alternative currency for traditional fiat currency. In the context of cryptoassets, currency substitution refers to the substitution of fiat currency with cryptoassets.[18] There are several reasons why users in EMEs would substitute their currency for cryptoassets. First, some individuals and businesses may see unbacked cryptoassets as a hedge against economic and political uncertainty because the value of cryptoassets is not tied to any specific government or central authority. Additionally, the nature of unbacked cryptoassets means that they are not subject to the same risks associated with domestic fiat currencies, such as inflation or currency devaluation (UNCTAD (2023)).[19]

Second, cryptoassets could offer greater transaction efficiency than traditional fiat currencies. Transactions can be completed faster and with lower transaction fees, which may be particularly attractive to individuals and businesses operating in regions with slow or unreliable financial systems.[20] On the other hand, cryptoassets face operational issues, as pointed out in the report, which may limit their purported advantages in terms of efficiency.

Third, pseudo-anonymity and other privacy features of cryptoassets may also be attractive to some individuals and businesses, as they might allow for more secure and private transactions compared with traditional fiat currencies. Cryptoassets promise an immutable record of pseudo-anonymous transactions on encrypted, open-source, permissionless and trustless platforms (Bains et al (2022)).[21] However, cryptoassets are not completely anonymous. For example, it is possible to trace the movement of funds through the blockchain and infer information about the parties involved in a transaction, especially if they are not using other privacy measures. Additionally, some exchanges and other cryptoasset service providers may require users to undergo KYC processes, which can link a user's personal information with their cryptoasset holdings.[22] As a result, DLT weakens but does not eliminate the ability to track money flows, undermining the claim that DLT can provide greater anonymity than traditional bank accounts or bearer instruments such as physical cash and coins (USDT (2022)).

2.5.2 Reserve currency substitution

On the other hand, if cryptoassets become mainstream, they could also replace the global reserve currency as a perceived safe store of value in EMEs (BCRA (2022)). The

[18] The IMF uses the term cryptoisation to describe the substitution of cryptoassets for domestic fiat currency (IMF (2021)).

[19] Stablecoins could be more comparable with monetary instruments, which implies the possibility, depending on their design and issuer among other elements, of manifesting the weaknesses of traditional money.

[20] Some of the unique aspects of these economies are the absence of a global reserve currency, the relatively low banking coverage and macroeconomic instability. For a more structured characterisation of an EME, see IMF (2021).

[21] In particular, the cryptoasset ecosystem has seen the rise of anonymity-enhanced cryptoassets, mixers and tumblers, decentralised platforms and exchanges, privacy wallets and other types of products and services that enable or allow for reduced transparency and increased obfuscation of financial flows, and that present ML/TF, fraud and market manipulation risks (IMF (2022); FATF (2021)).

[22] Some initiatives use data analytics techniques to track all transactions in a DLT network, eg Chainalysis, Messari, Lukka and TRM.

report denotes this substitution process as "cryptoisation 2.0", a novel form of cryptoisation that is more EME-focused. Cryptoassets would facilitate the circumvention of capital control measures in EMEs. This will also have implications for exchange rates via both direct and indirect effects (FSB (2020); IMF (2021); He et al (2022)).

2.5.3 Recent developments: cryptoassets as legal tender and cryptoasset payment cards

The adoption of Bitcoin as legal tender, as in El Salvador from September 2021, implies large risks, especially given the currency's high price volatility. The risks pertain to financial stability, financial integrity, consumer protection and contingent fiscal liabilities (IMF (2021)). In El Salvador businesses are required to accept Bitcoin for payments and the government sponsors a Bitcoin wallet to incentivise the cryptoasset's adoption as a medium of exchange. A year after the introduction of Bitcoin as legal tender, only a fifth of the population was using the Chivo Wallet for Bitcoin transactions. More than double that number downloaded the app, but only to claim the $30 offered as an incentive. Among business owners, only a fifth said they were accepting Bitcoin as payment (Alvarez et al (2022)). The government spent more than $100 million buying bitcoins, which one year later were worth less than $50 million.

Another example of a potential domestic currency substitution risk is the case of a prepaid card offered by a large crypto exchange that allows its users, with a valid national ID, to make purchases and pay bills using cryptoassets. Users can perform transactions, both in physical and online stores, where their cryptoassets are converted to fiat currency in real time at the point of purchase. As mentioned before, this type of product may be perceived as a hedge or a solution against economic and political uncertainty, and it may encourage an accelerated adoption of cryptoassets. It is worth monitoring the development of this product to evaluate the adoption of cryptoassets and the potential currency substitution risk.

2.6 Capital flow risk

Cryptoassets can change the volume and volatility of capital flows. Cross-border cryptoasset transactions are often opaque, which facilitates the circumvention of existing foreign exchange and capital flow management regulations. Domestic fiat money can be exchanged into an unbacked cryptoasset or a stablecoin pegged to a foreign reserve currency through digital wallets or services provided by crypto exchanges. The cryptoasset is then transferred across borders and exchanged into foreign fiat money as desired. The proceeds from these transactions can be deposited in foreign bank accounts or invested in other assets or through mobile money accounts, instead of using a conventional bank account (He et al (2022)).

2.6.1 Unknown residency

In the context of EMEs, pseudonymity makes it challenging to determine the residency of the counterparties involved in a crypto-related transaction. This makes it difficult to identify the source and destination countries of crypto capital flows, as well as the parties involved. Additionally, the lack of granular data limits the identification of specific use cases (eg retail payments, FX), therefore hindering the measurement of currency substitution and the assessment of use cases.

Cryptoassets can operate offshore and hence beyond regulatory oversight. Cryptoassets can be traded and stored on a global network of computers, often offshore servers and digital wallets, making it possible for them to operate beyond the jurisdiction of any one country. For example, a person can create a digital wallet on a computer or mobile device and store cryptoassets in it, without having to go through any formal registration process or identity verification. This can make it challenging for authorities to monitor the flow of cryptoassets and to identify individuals who are using them for illicit purposes.

2.6.2 Effects on other macro variables

Cross-border crypto flows could affect other policy variables. For example, swift changes in crypto capital flows may have an impact on supply and demand in traditional FX markets, which may contribute to sudden movements in the nominal exchange rate. In addition, these movements could hinder exchange rate management in EMEs, where capital flow management measures are typically used to contain external shocks (IMF (2023)). The growing adoption of cryptoassets might erode the effectiveness of these policy tools (He et al (2022)).

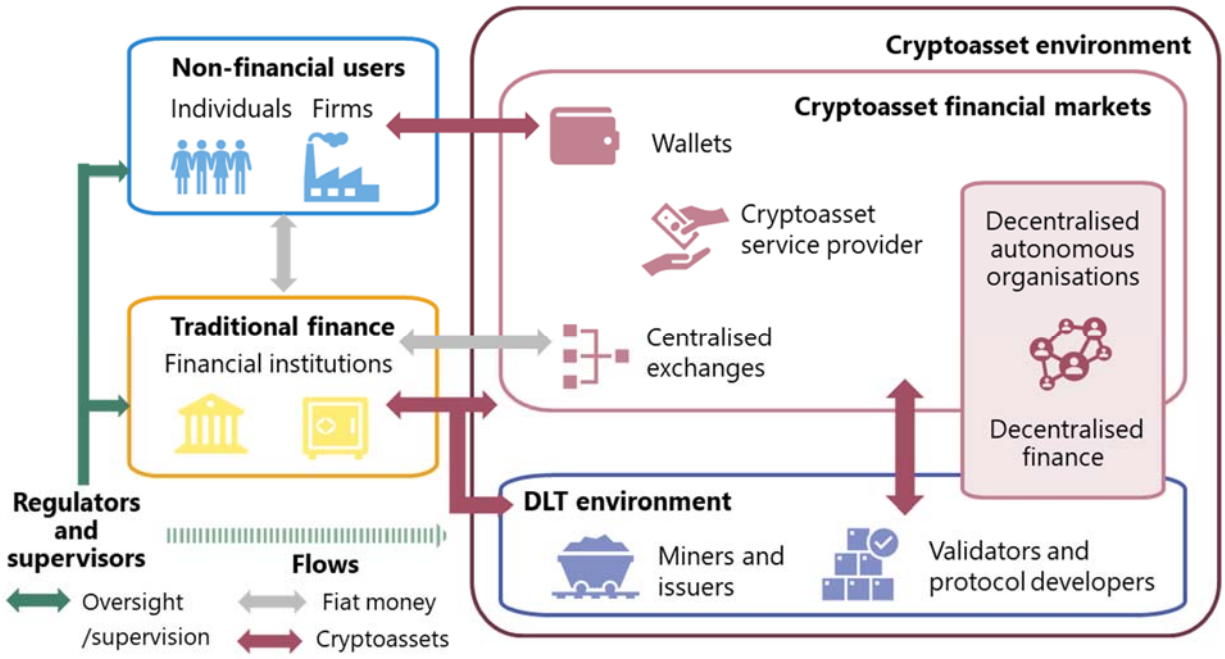
2.6.3 Recent developments: cryptoassets for remittances

The use of cryptoassets for international remittances could be adopted as a cheaper and faster alternative to traditional means of sending money abroad. In their latest estimate, one of the biggest Mexican crypto exchanges claimed that, in the first half of 2022, it processed remittances for $1 billion in cryptoassets, approximately 3.6% of the total flow in that period. If this kind of service became widespread, capital flow risks could develop. However, as mentioned before, Mexican financial authorities have emphasised the importance of maintaining a healthy distance between financial institutions and cryptoassets (see Box A). Financial institutions are not permitted to carry out external operations with cryptoassets, nor can they offer related services to their clients. Users must therefore convert cryptoassets to Mexican pesos to use them as a means of payment and to enter the financial system. These measures imply a clear delimitation of the potential risks that the use of cryptoassets for remittances and cross-border payments might imply for financial stability.

3. Transmission mechanisms

Graph 3 depicts the financial ecosystem and shows the connections between its elements. There are three main components: non-financial users, traditional financial markets and cryptoasset markets. The arrows denote flows between the three components. A red arrow corresponds to cryptoasset flows and grey to fiat money flows. The green arrows represent the regulators and supervisors' oversight over each component. A degraded arrow denotes lack of oversight and/or authority in those markets.

Connecting cryptoasset markets to traditional financial markets Graph 3



Source: Task force's elaboration.

3.1 Cryptoasset markets

Table 2 lists the broad activities and entities within cryptoasset markets (FSB (2022)). Activities include creating, issuing and redeeming cryptoassets; operating infrastructure and validating transactions; providing custodial wallet and custody services; paying for goods and services; facilitating exchange of cryptoassets; use of collateral to borrow or purchase other cryptoassets; lending in cryptoassets; insurance and directly owning cryptoassets.

Entities in cryptoasset markets use technology, cryptography and finance to provide related services. In the diagram, we can identify three layers. First, at the heart of cryptoasset markets is the DLT environment where protocol developers, miners and validators mint cryptoassets and provide the technological infrastructure of the ecosystem. Cryptoassets flow from the DLT environment to the second and third layer. The second layer is the financial environment, consisting mainly of two types of entity: centralised finance (CeFi) entities and decentralised autonomous organisations (DAOs). The former includes large centralised crypto exchanges that typically offer users access to a wide range of cryptoassets, as well as fiat currency deposits and withdrawals. The latter are organisations that operate on a decentralised blockchain network, governed by rules encoded in smart contracts. DAOs are self-governing and self-executing, with little or no intervention from human operators. The third layer is the peer-to-peer environment, where wallets allow self-custody of cryptoassets without relying on a third party. Finally, cryptoasset service providers offer support for activities across the layers within the ecosystem such as exchange, trading, staking, payments and custody.

Activities and entities in cryptoasset markets

Table 2

Activities	Entities
• Creating, issuing and redeeming cryptoassets. • Operating infrastructure and validating transactions. • Provision of custodial (hosted) walled and custody services. • Payment for/of goods, services, gifts and remittances. • Facilitate the exchange of cryptoassets. • Use of collateral to borrow/purchase other cryptoassets. • Lending in cryptoassets. • Insurance. • Direct/outright exposures to cryptoassets.	• Miners. • Validators. • Issuers. • Protocol developers. • Centralised finance entities. • DAOs (Decentralised Autonomous Organisations). • Cryptoasset service providers. • Wallet providers.

Source: FSB (2022).

The links between the traditional financial system and cryptoasset markets are diverse. As the degree of interconnectedness becomes stronger, risks can spill over more easily to the traditional financial system. Interconnections can involve different dimensions, for example, the size of cryptoasset holdings or liabilities, operations with cryptoassets or overlapped services. Financial institutions can be exposed to cryptoasset-related risks through direct holdings of cryptoassets. In addition, if the firms that borrow from these banks engage in cryptoasset-related activities, a shock in the cryptoasset market may increase the default probabilities of these firms and further affect their lenders. As interconnections spread and multiply, traditional financial institutions and users may not be able to recognise or track them when evaluating financial risks. Disruptions in the cryptoasset market can potentially spill over to other financial markets through confidence effects. For example, a sharp drop in the value of cryptoassets could erode investor risk appetite. This could lead to outflows from the traditional financial system and tighten financial conditions.

3.2 Non-financial users

Non-financial users are households, sovereigns and non-financial firms. They interact with cryptoasset markets either directly or through the traditional financial system. Regardless of the use case, the transmission channel of risks is the direct holding of cryptoassets. For example, one way to start the process is with "on-ramping" which connects a user's bank account in the traditional financial system to a crypto exchange. The holder transfers fiat currency from their bank account to an exchange account in a crypto exchange or cryptoasset payment service provider. Then a digital wallet stores the cryptoasset. Once in the digital wallet, the user can then engage in a full range of crypto-related activities, such as direct transfer between digital wallets, crypto trading and DeFi applications. The reverse process is "off-ramping", when the user cashes out and the fiat currency value of the cryptoassets reaches their bank account.

One of the most popular uses of cryptoassets is for investment and trading. The rapid appreciation that cryptoassets experienced in 2021 made them an attractive investment asset. Some enthusiasts argued that, in the long term, the most popular cryptoassets would always have a positive yield. Yet, the 2022 turmoil has shown otherwise, as their value came crashing down. Most users who invested when the rally was in full force lost all their money. Another use of cryptoassets in EMEs is to allegedly protect against currency devaluation and maintain the value of their saving. That said, cryptoasset prices have been more volatile than most EME currencies.

Some individuals use cryptoassets as a means of payment for goods and services. Some merchants and service providers accept cryptoassets as payment, and there are also crypto debit cards that allow individuals to spend their cryptoassets at any merchant that accepts normal debit cards. However, as the price of cryptoassets changes constantly, they are not suitable as a unit of account. The price of a good that a user is trying to buy could change from one minute to another.

Finally, some individuals use cryptoassets for cross-border payments. Cryptoassets can provide a more efficient and cost-effective way to send money than a traditional remittance service. Indeed, some stablecoin initiatives focus on remittances or cross-border transactions as an alternative to traditional channels. In this way, these initiatives allow users to send stablecoins related to a country's currency to any recipient connected to the internet. In these cases, the initiatives reduce costs and increase efficiency, while promoting financial inclusion.

3.3 Traditional financial markets

Traditional financial institutions perform different activities where they interact with cryptoassets. They may hold cryptoassets directly, provide custody services for cryptoassets, serve as trading platforms and issue stablecoins. They may also allow connections to crypto exchanges and run "on-ramp"/"off-ramp" processes.

Some traditional financial institutions hold cryptoassets directly, mainly as a store of value. For example, some traditional financial institutions may invest a portion of their assets in cryptoassets. In most EMEs banks are not allowed to hold cryptoassets on their balance sheets or to offer cryptoasset-related products to their clients (see Box A).

Banks and brokerage firms may offer custodial services to hold and secure cryptoassets on behalf of their clients and carry out other financial services. For example, some financial institutions offer trading and investment services related to cryptoassets, including providing access to crypto exchanges and facilitating investment in crypto-based products such as futures contracts and ETFs. Traditional financial institutions may also play a role in the payment and settlement of transactions involving cryptoassets, including facilitating the conversion of fiat currencies to cryptoassets and vice versa. Finally, some may act as market-makers for cryptoassets, providing liquidity to the market and helping to maintain stable prices.

Traditional financial institutions also play a key role in the stablecoin market. Private entities that issue stablecoins hold their reserves in banks and other financial institutions. The specific banks holding the reserves may not be publicly disclosed, but the stablecoin issuer typically provides some level of transparency around the assets backing the stablecoin. Tether, for example, claims that its USDT stablecoins are backed one to one by US dollars held in reserves, although there have been concerns about the transparency and accuracy of these claims. The company has also faced criticism for the lack of transparency around the specific banks holding its reserves. Tether has provided some limited information about the location of its reserves, indicating that they are held in a combination of banks and other financial institutions in multiple jurisdictions.

3.4 Indirect channels

Users and financial institutions can suffer spillovers from cryptoasset markets even if they have no direct exposure to them. Users can be indirectly exposed if they are clients of a bank that directly invests in cryptoassets. The same applies to a financial institution that requests loans to invest in cryptoasset markets. Spillovers to core financial markets from cryptoassets may arise as investors become more familiar with and increase their cryptoasset holdings (BoE (2022)). Stress in cryptoasset markets that undermines investors' wealth and increases their risk aversion to purchasing or taking long positions in other financial assets may ultimately reflect a loss of confidence for related assets. Indeed, the high volatility of cryptoassets' prices may exacerbate this effect whenever crypto market corrections can influence or spread into other financial asset prices. In the face of a correction in cryptoasset prices, investors may sell other financial assets, catalysing this contagion into the traditional financial system and markets.

Confidence effects are another indirect transmission channel. Price manipulation, cyber incidents on cryptoasset service providers and governance issues may undermine confidence in cryptoasset markets. Damage to the crypto world's credibility could limit the usefulness of cryptoassets for transactions on an economically significant scale. The failure of one cryptoasset market participant can also quickly transmit risks to other parts of the cryptoasset ecosystem. A drop in confidence can potentially inflict heavy losses on investors and threaten market stability. Furthermore, it can have spillover effects on public confidence in the role of regulated entities and financial authorities (FSB (2022)). More generally, if cryptoassets become a significant part of the financial system, negative developments involving cryptoassets could undermine public confidence in certain aspects of the financial system and financial regulators (FSB (2018)).

4. Risk catalysts in EMEs

4.1 Adoption of cryptoassets

Various surveys show that cryptoassets have been more intensively adopted in EMEs than in AEs. According to the 2022 Global Crypto Adoption Index, 18 of the top 20 positions correspond to EMEs. The only AEs in the top 20 are the United States in fifth position and the United Kingdom in 17th place (Chainalysis (2022)). Other surveys show similar results (Statista (2022); Finder (2022)). Factors that could incentivise the use of cryptoassets in EMEs are the need to store value due to high inflation or high currency depreciation, the need by migrants to transfer money back to their countries (remittances) and also, in some countries, the search for yield. Venezuela, where the domestic currency has depreciated considerably during the past few years, is an example of the first case. Venezuela received $37.4 billion in cryptoassets during 2022, a 32% increase from the previous year (Chainalysis (2022)). Another example of material growth in the use of cryptoassets is El Salvador, which received $116.4 million in remittances through cryptoasset digital wallets between January and November 2022 (BCRS (2022)).

Beyond the results obtained from these different surveys and studies, there are currently no methods or reliable sources of information to estimate holdings or flows of cryptoassets. Still, there are some proxies such as the number of internet visits to

the websites of cryptoasset providers or the P2P share of all cryptoasset transaction volumes. Another way to estimate adoption is through downloads of crypto exchange apps (Auer et al (2022)). The information obtained from these sources confirms the results of the surveys, where a greater use/adoption of cryptoassets is observed in several EMEs. For example, the monthly proportion of traffic related to P2P cryptoasset platforms to all web traffic was highest in several EMEs from April 2019 to June 2021. Likewise, EMEs had the highest P2P share of all cryptoasset transaction volumes (Chainalysis (2022)). Finally, the top countries for downloads of crypto exchange apps were the United Arab Emirates, Hong Kong SAR, Korea, Singapore, El Salvador and Turkey.

This report finds three main catalysts that can amplify the financial stability risks of cryptoassets in EMEs, namely (i) the economic, financial and institutional landscapes; (ii) the degree of technological infrastructure and knowledge; and (iii) the regulatory stance.

4.2 Economic, financial and institutional landscapes

The economic, financial and institutional landscape of EMEs can foster greater adoption of cryptoassets and increase the chance of currency substitution. The interaction between cryptoassets and an economy is complex and multifaceted, depending heavily on the macro-financial conditions that prevail within that economy. In particular, the relationship between cryptoassets and inflation and currency depreciation is significant. When inflation is high and the domestic currency is depreciating, users may perceive cryptoassets as a "safe haven" investment, which can increase demand for them (IMF (2023)). The same situation could happen in a scenario where there is a lack of a solid fiscal position. The probability of a sudden sovereign default could undermine the value of an EME currency and push citizens to buy cryptoassets. Conversely, in more robust and stable economic scenarios, there may be less demand for cryptoassets as local currencies can also serve as a good store of value.

In some EMEs, there is a high risk of dollarisation. Cryptoassets have emerged as a potential solution to the challenges related to traditional dollarisation, such as problems with accessing and storing foreign assets, as well as exchange rate restrictions. This is because cryptoassets can be easily transferred across borders through global crypto exchanges, P2P transfers and crypto wallets.

Finally, a macro-financial backdrop that lacks credible central banks and solid financial or monetary institutions could foster demand for highly speculative assets such as cryptoassets. In times of deep crisis, if the strength of central bank fiat money is questioned, users may flock to cryptoassets and normalise the use of alternative transaction channels. If a crypto exchange's credibility is as high as that of a central bank, users may prefer to store their wealth on a crypto exchange.

The weak rule of law can also be a risk catalyst for financial stability risks. First, a weak rule of law can lead to scams and fraud, which are more common in cryptoasset markets. Second, this can make it difficult to enforce contracts and protect property rights. This would increase the vulnerabilities associated with lack of accountability and governance in cryptoasset markets. Third, it can also lead to regulatory uncertainty. A lack of clear regulation and inconsistent enforcement can create confusion and raise market risk.

4.3 Technological infrastructure and knowledge

Cryptoassets are highly technology-dependent. This raises operational vulnerabilities, for example, vis-à-vis cyber-related attacks. With relatively low and unequal technological development, EMEs will be more vulnerable facing cryptoassets complexities and rising adoption rates. The rapid evolvement of cryptoasset markets requires regulatory authorities to monitor risks, particularly those related to cyber and operational issues in a timely manner, and to respond swiftly when the risk materialises.[23] As mentioned, weak or non-existent regulation frameworks towards cryptoassets is particularly prevalent in some EME jurisdictions with outdated infrastructure and insufficient human and technological resources for continuous engagement by regulators and policymakers. This can translate into deep hurdles when facing and resolving cyber issues. Standards are needed to reduce operational risks and enhance reliability.,

The combination of the lack of financial literacy and technological knowledge in EMEs can create a potent catalyst for risks to financial stability, especially concerning cryptoassets. The intricate nature of cryptoassets and blockchain technology requires a solid grasp of both financial concepts and the underlying technology. Without sufficient knowledge in these areas, individuals and businesses may struggle to understand the complexities, risks and potential benefits of engaging with cryptoassets. This lack of technological literacy can lead to vulnerable positions as they are more susceptible to making uninformed or ill-advised financial decisions (Cantu and Ulloa (2020)). This can lead to a range of issues such as high levels of debt, improper investment choices and vulnerability to predatory practices. Additionally, a lack of financial literacy can contribute to a lack of awareness and understanding of the potential consequences of cryptoasset markets fluctuations, making individuals and businesses more vulnerable to shocks.

4.4 Regulatory stance

The risks associated with cryptoassets within the traditional financial system depend, among other elements, on whether such transactions occur within a regulated or unregulated environment. Regulatory frameworks offer incentives for regulated entities to adopt risk management and mitigation practices that promote financial stability as a public policy goal. Box A summarises the current state of regulation related to cryptoassets in the Americas. WEF (2023) provides information on regulation in other countries such as Canada, France, Hong Kong, India, Singapore, South Africa, Switzerland, United Arab Emirates and United Kingdom.

Regulatory quality and the control of corruption, which may be less developed in EMEs, can affect the prudential adoption of cryptoassets. Countries with strong legal frameworks and established cryptoassets regulations could facilitate the prudential adoption of such assets in a safer and more transparent environment. This may increase consumer and investor protection and prevent frauds.

Regulation of non-crypto financial services also plays a role. Confidence arising from the sound regulation of non-crypto-related financial activities may discourage the use of cryptoassets but certain types of regulation could encourage their use. For

[23] For instance, smart contracts offer new functionalities including programmability, opening up new opportunities for development, creativity and entrepreneurship. Nonetheless, these dynamics also open up scope for operational or cyber risks.

example, some countries impose controls on the quantity of domestic currency that can be transferred abroad, leading to the use of P2P platforms for international transactions to avoid these limits and controls. Regulatory differences between jurisdictions could create opportunities for regulatory arbitrage.

Finally, the key financial or monetary authorities may lack the power to authorise or supervise cryptoasset market agents, making it challenging to enact and enforce rules and regulations in a timely manner. Thus, rules and frameworks aimed at mitigating cryptoasset risks and maintaining confidence in the financial system are necessary to reduce the risks associated with cryptoassets.

Box A

Crypto regulation in the Americas

Argentina

In Argentina, there is no specific regulation on cryptoassets and crypto-related activities. However, there are some legislative initiatives that address various aspects of cryptoassets. In May 2023, the Central Bank of Argentina (BCRA) stated that Payment Service Providers may not carry out transactions with cryptoassets or allow their clients to make them. The measure seeks to mitigate the risks associated with transactions with these assets that could affect the users of financial services and the national payment system. In December 2022, a draft bill for the supervision and regulation of cryptoasset advertising was submitted to the Senate, which aims to prevent fraud and misleading advertising and ensure accurate communication of the risks associated with cryptoassets. In May 2022, the Central Bank of Argentina (BCRA) established that financial institutions may not carry out transactions or allow their clients to make transactions with cryptoassets, seeking to mitigate the risks that crypto-related activities pose to both users and the financial system. In May 2021, the BCRA and the National Securities Commission (CNV) issued a joint statement warning about the risks and implications of using and investing in cryptoassets. In October 2019, the BCRA forced credit and debit cards issuers to request authorisation from the central bank to enable foreign payments to acquire cryptoassets. In December 2017, the CNV issued a communiqué on initial coin offerings to warn investors about the risks of participating in these investment schemes. In July 2014, the Financial Information Unit (UIF) forced regulated entities (ie banks, investment funds, insurance funds etc) to report to the UIF all transactions involving cryptoassets.

Brazil

In Brazil, Law no 14,478, enacted in December 2022, provides guidelines for the provision of virtual asset services and the regulation of virtual asset service providers (VASP). This law amends the Criminal Code to provide for the crime of fraud using virtual assets, securities or financial assets. Also, it amends laws that define crimes against the national financial system and money laundering to include service providers of virtual assets. The provisions of this law do not apply to assets representing securities and do not change any powers of the Securities Commission. In addition, the law provides that virtual asset service providers may operate in the country only with prior authorisation from a federal public administration entity (which has broad powers over VASP activities).

Canada

In Canada, the Canadian Securities Administrators (CSA) has published a framework to regulate and oversee cryptoasset trading platforms (CSA (2020). Also, cryptoassets are considered virtual currencies under Canada's anti–money laundering and anti-terrorist financing regime (Proceeds of Crime [Money Laundering] and Terrorist Financing Act). Businesses that deal in virtual currencies – such as for providing exchange or value transfer services – are considered money services businesses under this regime and are subject to compliance and reporting requirements. Earlier last year, in its Budget (2022), the federal government announced a financial sector legislative review focused on the digitalisation of money. In the first phase, the focus will be on digital currencies including cryptoassets (Budget (2021)). More recently, in line with guidance from the Basel Committee on Banking Supervision, the Office of the Superintendent of Financial Institutions (OSFI) has announced an interim approach to the exposure of banks and insurers to cryptoassets (OSFI (2021a)). The interim approach determines the regulatory requirements that banks and insurers must meet for holding cryptoassets. It categorises cryptoassets into two groups and outlines the respective capital and liquidity treatment of each group as well as limits. OSFI has also proposed a Digital Innovation Roadmap, which outlines its workplan including developing prudential regulation for stablecoins (OSFI (2021b)).

Chile

The Fintech Law, approved by the Congress in October 2022, seeks to stablish a regulatory framework for certain technology-based financial services, with the purpose of promoting financial innovation and greater competition in the financial system. The law recognises the use of certain cryptoassets as means of payment, and empowers the Central Bank of Chile to determine such assets. The law also regulates custody and brokerage firms and establishes minimum capital requirements and reporting obligations for such firms. With this law, cryptoassets, exchange platforms and custodies will be regulated by the Financial Market Commission (CMF). Previous to this law, the Central Bank of Chile issued a statement regarding the risks associated to the acquisition of cryptoassets for investment purposes. The Financial Market Commission will oversee exchanges and cryptoasset custody providers.

Colombia

The Financial Superintendency of Colombia stated in 2017 that financial entities are not authorised to custody, invest, intermediate, or operate with cryptoassets, nor are they allowed to use their platforms to carry out operations with cryptoassets. The Central Bank of Colombia has indicated that cryptoassets should not be considered as foreign exchange. More recently, in June 2021, the Ministry of Finance together with the Financial Superintendency of Colombia initiated a supervisory sandbox, a controlled space that allows the development of business models related to financial innovation that involve alliances between financial entities. At the cryptoassets level, this allows the testing of programs for digital transactions, such as the deposit and withdrawal of cryptoassets. The sandbox's crypto pilot allows the exchange of cryptoassets via alliances between financial institutions and crypto exchange companies. The purpose of the sandbox is to assess technological developments that allow verifying digital identities and recording transactions, and other measures to manage operational risks, cyber risks and asset-laundering risk. The results and findings of this project have not been disclosed by the SFC. At present, the Congress is discussing a bill to regulate cryptoasset exchange platforms operating in Colombia. The bill provides legal status for these platforms and proposes requirements and limitations for exchange operations.

Mexico

In March 2018, the Law to Regulate Financial Technology Institutions entered into force. It regulates operations with cryptoassets by financial entities and empowers the central bank to authorise Financial Technology Institutions and Credit Institutions to operate with specific cryptoassets determined by the Bank. Secondary regulation establishes that these institutions may only carry out internal operations with cryptoassets subject to the central bank's prior authorisation. Likewise, institutions must prevent the risk of such operations from being transmitted, directly or indirectly, to their clients. The central bank does not authorise operations intended to provide exchange, transmission or custody services of virtual assets directly to clients. The Federal Law of Prevention and Identification of Operations with Illicit Resources considers as vulnerable activity the regular offering and professional exchange of cryptoassets by other entities that are not financial institutions. The Ministry of Finance requires that entities carrying out vulnerable activities must be registered in the Federal Taxpayer Registry and have a valid Advanced Electronic Signature. Mexican residents can buy, hold and sell cryptoassets via different private exchange platforms. These exchanges assist in the purchase or sale of cryptoassets that are property of their clients, or provide means to custody, safeguard or transfer cryptoassets. Thus, users can open an account and buy cryptoassets with Mexican pesos. However, these platforms do not fall within the regulatory perimeter of the financial system. The Bank of Mexico has not authorised direct customer operations between cryptoassets and financial institutions.

Peru

In December 2022, a new cryptoasset draft law (no 1042/2021-CR25) was introduced which seeks to define cryptoassets and regulate cryptoasset transactions. The draft law is seen as a first step to establishing regulatory clarity for virtual asset exchange service providers and others involved in blockchain and cryptography. The draft law proposes the creation of a public register and provides that registrants must operate lawfully in the country. It also considers the use of cryptoassets to create and incorporate companies and proposes that the assets could be considered property or intangible assets. Thus far, the government has warned that no supervision is provided by the Securities Market Agency, the Banking, Insurance and Pension Fund Manager Agency, or the Central Reserve Bank of Peru. The Bank has stated that, as these financial assets are not legal tender or supported by the central bank, they fail to meet the functions of money as a medium of exchange, unit of account and store of value. In July 2023 a new rule required all virtual asset providers to report to the Financial Intelligence Unit for AML and CFT purposes.

United States

In the United States, some digital assets and related activities are covered under certain existing regulations, but there is no comprehensive, nation-wide regulatory framework at present. For example, if particular criteria are met, digital assets may be covered under securities or commodities laws; the Securities and Exchange Commission and the Commodity and Futures Exchange Commission have taken enforcement actions against a number of digital assets-related entities. Other digital asset firms may be subject to US state laws in areas where they operate, including those related to money transmission or bespoke rules for digital assets and their operators. Last year, the Financial Stability Oversight Council (FSOC) published a report entitled "Digital Asset Financial Stability Risks and Regulation", in which it identified gaps in existing regulations and made recommendations of ways that Congress could address the gaps in question. There are a number of bills in the US Congress that seek to create a regulatory framework for digital assets.

5. Principles for regulating and supervising cryptoasset markets in EMEs

After the cryptoasset bubble burst in early 2022, the question of whether and how to regulate cryptoassets has drawn attention from regulators globally. Some believe that regulating cryptoassets would give them a "seal of approval", which could spur broader adoption. Others believe that regulation could ensure the financial system is well protected against risks from cryptoassets, and investors are better protected. Overall, there is no consensus among authorities on how to regulate cryptoassets. For instance, while there may be some agreement to regulate cryptoassets for AML/CFT purposes, it is not entirely clear that they should be treated or regulated as financial assets or securities. Depending on how cryptoassets are defined, they may fall under the mandate of an existing supervisory entity. The taxonomy in Annex A can serve as a guide for understanding the nature of different cryptoassets.

Three lines of high-level policy options, an outright ban, containment and regulation, have been considered (Aquilina et al (2023)). These options are important for EMEs and different jurisdictions could consider them in relation to their own situation.

An outright ban would prohibit all or a selection of crypto-related activities. But given the offshore and pseudo-anonymous nature of cryptoasset markets, an outright ban might not prove enforceable. On the contrary, policymakers would lose all sight of these markets, making these markets even less transparent and predictable. In addition, all potential innovation gains from cryptoasset markets would be lost.

Another option is containment. This implies controlling the flows between crypto markets and traditional financial systems or by limiting their connections. However, this strategy does not address the vulnerabilities inherent in cryptoasset markets and would still result in financial stability risks. In addition, as with a ban, controlling funds might not be feasible in practice.

A third option is regulation. Motivations to regulate cryptoassets can vary across jurisdictions. Financial policy objectives span consumer protection and financial conduct, fostering competition and financial inclusion, establishing prudential requirements etc. The actors in the cryptoasset ecosystem to be regulated/supervised

may be banks and other financial institutions, or issuers, exchanges, wallet providers, validators, the underlying technology, regulated financial institutions or financial infrastructure, among others. An emerging principle is "same activity, same risk, same regulatory outcome".

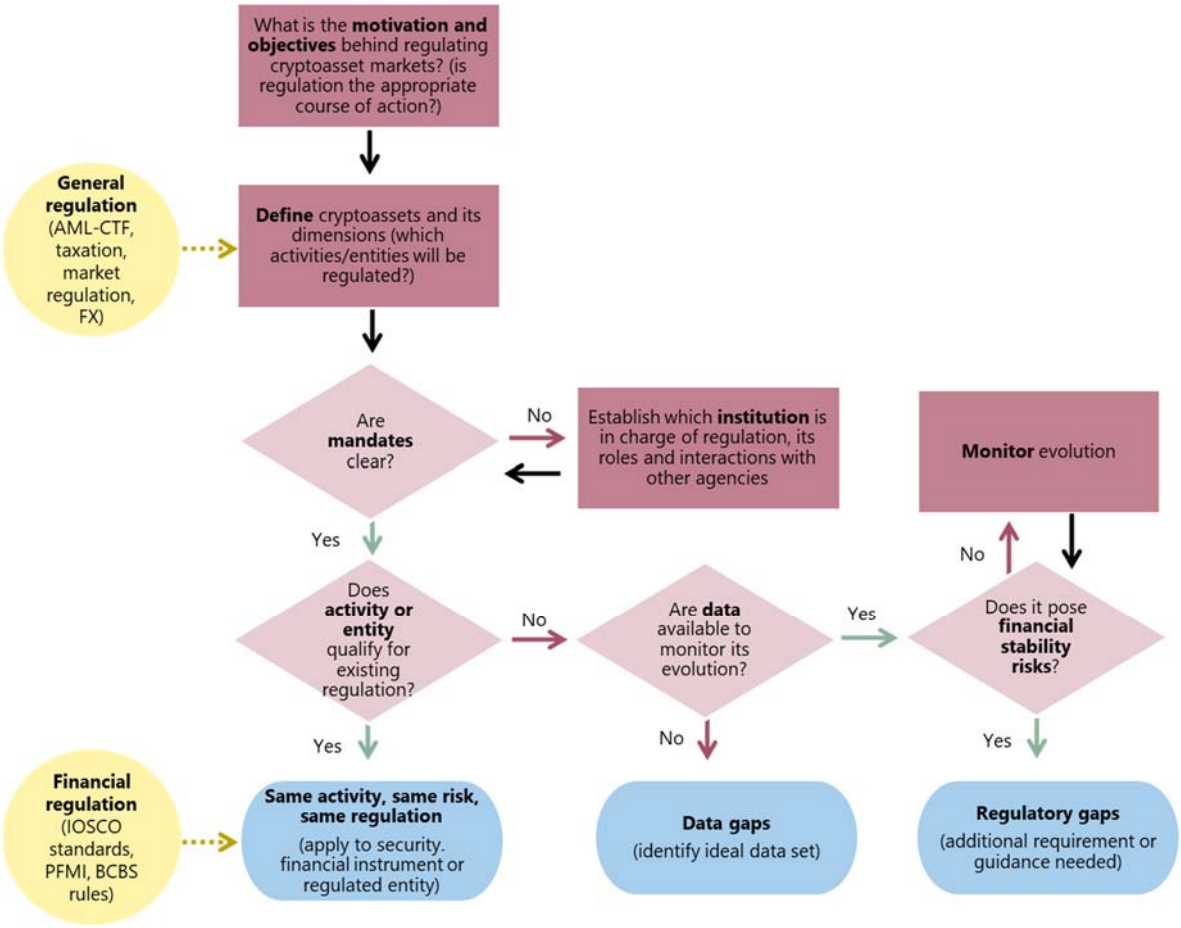
Authorities should ensure that the benefits that will be obtained as a result of regulating and supervising must be greater than the costs involved (World Economic Forum (2023)). Depending on the characteristics of each country, the costs may be higher. If the government chooses to regulate and supervise cryptoassets, initially it may be advisable to test the adoption of the new framework in a regulatory sandbox. In any case, authorities should consider financial education as a risk mitigant to complement every policy initiative. Raising awareness of the vulnerabilities and risks of cryptoassets might deter potential users or at least let consumers make informed decisions on their investments. In EMEs, policies that improve economic and institutional development could complement or even substitute for regulation. For example, sound domestic policies that encourage local financial opportunities and economic growth may reduce incentives for widespread use of cryptoassets. Measures to raise efficiency in the banking industry may also reduce the demand for cryptoassets. Moreover, changes to current exchange rate constraints and restrictions in accessing and storing foreign assets will affect cryptoassets adoption as well. Finally, improvements to payment systems, which aid interoperability among various domestic payment systems, can facilitate remittances and trade, also reducing the need for these activities to take place in cryptoasset markets.

Graph 4 proposes a flowchart for a path towards regulation of cryptoassets. The first step is to determine the motivations behind the regulation, ie financial inclusion, technological upgrades, safety, soundness of the financial sector, preserving the integrity of payment systems etc.[24] The second step is to decide the scope of regulation, ie, which cryptoassets or crypto service providers should be regulated, and what activities should be regulated. For example, their use as a means of payment or store of value, trading in exchanges, issues related to AML/CFT and taxation, among others.

From this point on, three issues are particularly important to establishing a regulatory path in EMEs. First, the authority in charge of regulating and supervising cryptoasset markets needs to be defined. Activities or entities to be regulated may fall under the umbrella of some existing regulator or supervisor. Does any existing authority have the necessary resources and legal powers? If not, is it possible to grant powers and resources to an existing authority or to a new authority? The second issue is related to activity versus entity-based regulation. In this case, a holistic approach would establish activity-based regulation that is enhanced and complemented by entity-based regulation. The third issue is data gaps. The only way to truly monitor financial stability risks is by filling the data gaps that are necessary to understand the technology and the interconnections across the traditional and cryptoassets markets. The report assesses the ideal data sets to monitor crypto markets and the issues involved in obtaining that data.

[24] A general concept that validates the need of regulation is based on the "representation hypothesis" (Tirole (1996)) in the sense that in a situation characterised by asymmetric information (moral hazard, adverse selection), the interest of the general population needs to be represented by an external agent: the regulator. As such, it is important to define the motivations behind the regulation. For example, to decide what is the main purpose (eg correcting market failures, managing risks or promoting competition).

Considerations for a path towards regulation of cryptoassets Graph 4



Source: FSB (2022); Task force's elaboration.

5.1 Defining clear mandates for regulation and supervision

First, it is important that there is legal harmonisation in terms of mandates, authorities' roles and supervision activities. Regulatory and supervisory authorities must coordinate to clearly define their roles and responsibilities, as well as accountability for the functions and activities that each authority must conduct. Mandates must be clear, regardless of the role authorities may have within the traditional financial markets. Authorities should then allocate resources and establish deadlines to complete the process. Resources may be conducted to create new areas and capacity building. Deadlines may be set to provide a soft landing for current and new (supervised) participants. Finally, authorities will need to assess other legal bodies to make them compatible with this new cryptoasset framework. For example, this includes the authorities in charge of AML/CFT requirements, cyber-risk, digital ID and data protection, among other policies.

In terms of synergies, it is predictable that both central banks and/or financial authorities will acquire new mandates to regulate and supervise cryptoassets' activities, processes or business models (eg crypto exchanges). Nevertheless, it is likely existing that legal frameworks do not include key definitions for this market.

5.2 Activity-based vs entity-based regulation

Once mandates are clear, the next step would be to establish the standards and regulatory requirements for entities, business models, activities or services related to cryptoassets. A baseline is "same risk, same activity, same regulation". When considering specific regulatory guidelines, a key issue is whether entity-based (EB) or activity-based (AB) financial regulation would be preferable (FSB (2011); Carstens (2021)).[25] AB regulation strengthens the resilience of a systemically important activity directly, by constraining entities in their performance of that activity alone (Borio et al (2022)).[26] This means that an AB approach should refer to a given (usually systemic) activity, regardless of the individual characteristics of the entities carrying out the activity and not varying between entities. EB regulation strengthens the resilience of activities indirectly, by imposing restrictions on their combination at the level of entities (Borio et al (2022)). This means that an EB approach would be calibrated at the level of the entities performing such activities, restricting those specific characteristics which may affect the risks and the consequences related to their failure.

Table 3 below maps specific risks identified in previous sections and provides some considerations on activity-based (AB) and entity-based (EB) approaches. It should be read from left to right. For example, a market risk arises from vulnerabilities in crypto markets related to asset prices, such as the lack of an intrinsic value of the asset or the absence of a backing authority. A possible course of action would be to issue EB regulation requiring capital and liquidity buffer requirements.

However, distinguishing between instruments, activities and entities in cryptoasset markets is not an easy task. Different components can perform similar roles in different contexts on many levels. The combination of activities leads to a mix of risks, including liquidity transformation and leverage. In addition, some trading platforms and cryptoassets providers are co-owned or affiliated, which increases interconnectedness. This leads to inappropriate related-party transactions or other self-dealing, as was recently shown in the downfall of FTX. Similar incentives in the traditional financial system are addressed by regulatory constraints and prudential requirements, which do not exist in cryptoassets markets.

A holistic approach would consider enhancing AB regulation with EB considerations. This would avoid to excessively rely on them separately. The failure of an entity/activity may imply the failure of the related activity/entity, then a more conservative and preventative comprehensive approach would consider indirectly improving the activities' resilience when regulating entities. The aim of EB regulation would then be to create "individual war chests" in good times, either for crypto-related NBFIs or for financial institutions with crypto exposures, to address collective

[25] Policy discussion regarding entity-based (EB) and activity-based (AB) financial regulation is long-standing. It started to appear in various financial stability regulatory proposals and recommendations after the global financial crisis, when policymakers reacted to address financial stability risks stemming from both from banking and non-banking institutions. More recently, the topic started to be discussed again due to the greater systemic importance of non-bank financial intermediaries (NBFIs), the digitalisation of finance, the emergence of cryptoassets and the surge of new players in the financial system, such as big tech companies.

[26] Regarding the EB and AB approaches per se, Borio et al (2022) stress that policy debate regarding EB and AB regulations has been muddied by the imprecise use of related terms and definitions. Therefore, they propose a framework for defining and classifying financial stability regulations as either EB or AB. For this reason, this report uses some of their definitions and framework, as they objectively classify the differences, and the relative merits of both regulatory approaches.

downturns in times of stress (Carstens (2021)). Therefore, an essential element in the regulatory proposals for these entities would be to require appropriate buffers and shock-absorbing capacity. For example, improving margining practices and building capital and liquidity buffers, which must be custom-made to reflect entities' specific characteristics and vulnerabilities.

Approach to entity- vs activity-based regulation

Table 3

FS risks	Vulnerabilities in cryptoasset markets	AB	EB	Possible policy action
Market risk	No intrinsic value, lack of backing authority or trustworthy counterparty		X	Capital and liquidity buffer requirements.
	Lack of clarity on reserves		X	Liquid reserve composition requirements.
	Token ownership concentration		X	Limits for the concentration of cryptoassets /diversification requirements.
	Shallow markets		X	Limits for the concentration of cryptoassets /diversification requirements.
	Lack of transparency and information		X	Disclosure requirements.
	Prone to fraud and scams		X	Consumer protection requirements.
	Lack of consumer/investor protections		X	Consumer protection requirements.
	Can operate outside regulatory oversight	X	X	International coordination.
Liquidity risk	Centralisation in large exchanges		X	Disclosure requirements and policies that enhance competition.
	Liquidity mismatch in reserves		X	Liquidity management requirements for entities.
	Susceptible to investor runs		X	Liquidity buffer requirements.
	Scalability trilemma	X		Liquidity buffer requirements.
Credit risk	Related party transactions	X	X	Governance requirements.
	Financial connections affiliated entities	X	X	Disclosure requirements.
	Lack of sound governance	X	X	Governance requirements.
	Lack of disclosure requirements		X	Disclosure requirements.
	Overcollateralised positions	X	X	Due diligence and risk management requirements.
Operational risk	High technological dependency		X	Capital and liquidity buffer requirements.
	Pitfalls of blockchain infrastructure	X	X	Operational requirements.
	Cyber security risks		X	Contingency plan requirements for resources recovery/access.
	Operations of digital wallets and exchanges		X	Cyber security requirements, due diligence and risk management requirements.
Bank disinterme-diation risk	Domestic currency substitution	X		Reduce indirect incentives for widespread usage: -Develop sound domestic policies to encourage financial and economic growth -Increase the central bank's credibility -Reduce vulnerabilities in banking systems -Re-assess exchange rate restrictions -Improve payment systems
	Reserve currency substitution	X		Reduce indirect incentives for widespread usages: -Develop sound domestic policies to encourage financial and economic growth -Increase the central bank's credibility -Reduce vulnerabilities in banking systems -Reassess exchange rate restrictions -Improve payment systems
Capital flows risk	Anonymity and opacity	X		International coordination both for AB and EB regulations.
	Offshore operations	X	X	Due diligence and risk management requirements.
	Speed and ease to move funds	X	X	International coordination both for AB and EB regulations.

Source: Task force's elaboration.

5.3 Addressing data gaps

The lack of transparent, consistent and reliable data on the functioning of cryptoasset markets hinders authorities from identifying and assessing their financial stability risks. Cryptoasset markets are decentralised in nature, making data collection challenging. The difficulty is further magnified by the inherent pseudonymity in crypto-related activities. Even though "on-chain" transactions are recorded on the blockchain directly and the data are publicly accessible, it is very challenging and sometimes impossible to identify the counterparties involved.

These gaps imply that the amount of insight that can be obtained on the structure and functioning of cryptoasset markets is limited at present, making it difficult for authorities to monitor the evolution of these markets and assess their financial stability risks.[27] Authorities can currently refer only to some proxies for the ideal data sets. There are public sources that provide access to certain data on crypto trading and DeFi activities. For example, websites that provide information and online data, data aggregators and so-called blockchain analytics companies. These sources of information are not verifiable and should be treated with caution as they lack adequate transparency or consistency, in the general context of a lack of reporting and disclosure standards. Moreover, the available metrics provide only a partial and potentially inaccurate picture of activity within the cryptoasset ecosystem, as well as of the potential channels of contagion with the traditional financial system.[28]

For financial sector exposures, current data are limited to some surveys, for example the survey of selected global banks by BIS (BIS (2022)). On the household side, quantifying household holdings of cryptoassets is usually done through ad hoc and relatively small-scale surveys that are limited to a few countries. There are issues of how representative are the samples, and high costs limit the scope and frequency of surveys. Also, there is no globally consistent standard. For monitoring operational risk, authorities often use data collected by certain data vendors on data breaches, operational disruptions (including cyber attacks) and fraud events.

Data on monitoring cryptoasset usage for payments are aggregated and limited in terms of representativeness. On the one hand, for "on-chain" transactions, some commercial data vendors often provide aggregated data on cryptoasset transactions for payment purposes. However, the granularity and accuracy of the data are not guaranteed. On the other hand, the prominence of centralised service providers implies that a non-negligible volume of transactions is conducted "off-chain", which impedes data collection for monitoring and risk analysis.

Ideally, the available information should enable authorities to monitor the cryptoasset markets and identify risk factors in a timely manner and to quantify the materiality of risks to the financial stability. The goal would be to design policy actions to mitigate the risks while supporting innovation. Along these lines, the data set should help to illuminate the broader picture of the cryptoasset ecosystem, including its size, range of activities and market structure, as well as the degree of direct and indirect interconnectedness with the traditional financial system. Table 4 presents a

[27] Significant data gaps also have important consequences for regulatory design, where the materiality of financial stability risks is key to deciding whether to modify the regulatory perimeter or to conduct more intensive surveillance, but data to assess these aspects are only available for entities within the regulatory perimeter (This is a Catch 22 situation according to FSB (2022)).

[28] To estimate the evolution of the degree of crypto adoption, some authorities use public interest metrics based on internet searches for specific terms in the domestic context (eg Google Trends) (BCRA (2022)).

breakdown of the ideal data sets and metrics according to the financial stability risks identified in this report, as well as the gaps and challenges in each case, with a special emphasis on the limitations faced by authorities in EMEs.

Ideal data set to monitor developments in cryptoasset markets and data issues

Table 4

FS risks	Ideal data set and metrics to monitor cryptoasset markets	Data issues
Market risk	• Holding of cryptoassets - By cryptoasset type (unbacked, stablecoins) - By nature of the holder (households, firms, financial institutions) • Prices and trading volumes (by cryptoasset) • Realised volatility (by cryptoasset) • Leverage in crypto-lending transactions • Correlations between cryptoassets and mainstream assets	• Currently, holdings of cryptoassets by institutions and household are only available by some ad hoc surveys in few countries • Currently available cryptoassets price data sources are subject to reliability and consistency issues
Liquidity risk	• Disclosure of cryptoasset issuers and CASP (eg financial statement, breakdown of activities) • Reserve assets composition of asset-backed stablecoins	• Lack of disclosure from cryptoasset issuers and CASP • Lack of disclosure of reserve of assets from stablecoin issuers
Credit risk	• Financial sector exposures to cryptoassets and CASP - Amount of exposure to cryptoassets issuers and CASP - Information on the counterparty (identity, location, financial statements etc). • Bank lending portfolio - Share of loans to clients with exposures in cryptoassets (and default rates) - Share of loans to cryptoasset issuers and CASP (and default rates)	• Same as market risk • Lack of standardised disclosure - FIs engagement in crypto-related activities - FIs cryptoasset exposures - Lending activity to cryptoasset issuers and CASP
Operational risk	• Operational disruptions and fraud - Number and volume of operational disruptions - Number and volume of cryptoasset fraud • Critical infrastructure - Number of (active) users in infrastructures that provide access to cryptoassets (eg CEXs, wallets) - By CASP activity/function (eg exchange, trading, custody) - By decentralisation level (eg CEXs/DEXs, custodial/non-custodial wallets)	• Reliability of commercial data vendors • Lack of standardised taxonomy of CASP
Bank disintermediation risk	• Use in payments - Lists of CASP that permits to pay with cryptoassets - Volume of payment transactions by cryptoasset - List of traditional PSP that support payments using cryptoassets - Volume of crypto-related transactions processed by traditional PSP • Use as a store of value - Share of households invested in cryptoassets (by cryptoasset - Share of cryptoasset holdings relative to household wealth - Correlations between bank deposit withdrawals and household adoption rates (eg custodial activity)	• Aggregate data on payment activity • Aggregate data on holding of cryptoassets by households • Reliability of commercial data vendors and blockchain analytics companies
Capital flow risk (capital flows volatility, FX market disruptions, exchange rate risk)	• Cryptoassets transaction flows by currency involved (domestic and reserve currencies) - Residency of the counterparties - Type of transaction (eg remittances, FX use case) - Type of cryptoassets employed (unbacked, stablecoins) • Correlations - FX markets flows and cryptoasset trading volumes - Nominal exchange rate and adoption rates (country-specific) - Reserve currency and selected cryptoassets	• Lack of formal reporting of transactional data by CASP • Pseudonymity makes it challenging to determine the residency of the counterparties involved in a crypto-related transaction, hard to identify cross-border flows • Aggregate data on cross-border activity • Reliability of commercial data vendors and blockchain analytics companies.

Source: Task force's elaboration.

5.3.1 Potential paths forward

Given the cross-border and cross-sectoral nature of cryptoassets and crypto-related activities, international coordination is key in developing initiatives to address data gaps. One such potential next step may be for national authorities to work together to define the type and scope of data needed for effective monitoring of cryptoasset markets developments, with an emphasis on the identification of critical connections points with financial institutions and core market infrastructures. National authorities could also collaborate in defining the additional disclosure and reporting required for effective monitoring of regulated entities exposures, either through their engagement in the crypto space or indirectly through the increasing adoption of cryptoassets at the retail level. In this framework, a necessary condition will be the development of a commonly accepted taxonomy of cryptoassets as well as of crypto-related activities and associated providers. Ongoing initiatives at the international and SSB level (eg BIS, FSB, BCBS) will help in this respect. Moreover, considering that cryptoassets can be used in activities and services that in some way resemble those within the regulatory perimeter, coordination between authorities within each jurisdiction is also important.

A potential next step may be for authorities to collaborate on the establishment of a shared data repository where key information such as crypto-related activity and exposures of financial institutions, among others, would be stored. This could be based on existing initiatives. To improve the accuracy and representativeness of cryptoasset ecosystem surveys, national authorities could coordinate efforts in developing of standards. Finally, to improve the monitoring of financial stability risks in EMEs, including risk catalysts, authorities could collaborate with private data vendors, as well as blockchain analysis companies and academia. Together the repository could collect information at a level of granularity that allows for further analysis to identify concrete use cases and to differentiate domestic from cross-border flows.

6. Conclusions

Cryptoassets hold out the illusory appeal of being a simple and quick solution for financial challenges in EMEs. They have been promoted as low-cost payment solutions, as alternatives for accessing the financial system and as substitutes for national currencies in countries with high inflation or high exchange rate volatility. However, cryptoassets have so far not reduced but rather amplified the financial risks in less developed economies. Therefore, they should be assessed from a risk and regulatory perspective like all other assets. This will become even more pressing if cryptoassets are more widely adopted by retail investors and if links with the traditional financial system increase.

Authorities face a number of policy options to address risks in cryptoassets, ranging from outright bans to containment to regulation. Bans and containment – if they are effective – may prevent financial stability risks from arising. At the same time, there are risks if central banks and regulators react in an excessively prohibitive manner. For instance, activities may be driven into the shadows, and it may be more difficult to influence responsible actors in the sector. More generally, new approaches should not be automatically classified as "dangerous" simply because they are different. Responsible innovation, technology and new players can reduce frictions

and inefficiencies in payment systems and lower barriers to entry. Throughout history, technology has been key to driving improvement and increasing the resilience of financial services. While crypto-related activities have not fulfilled their stated goals to date, the technology could still be applied in various constructive ways. Creating a regulatory framework to channel innovation into such socially useful directions will remain a key challenge in future.

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Annex A: Glossary

Blockchain: A form of distributed ledger in which details of transactions are held in the ledger in the form of blocks of information. A block of new information is attached into the chain of pre-existing blocks via a computerised process by which transactions are validated.

Centralised exchange (CEX): A cryptoasset trading platform that facilitates the buying and selling of cryptoassets, either for fiat currencies, or for another digital asset. The platform functions as an intermediary and sometimes provides custody and other services.

Cryptoasset: A type of private sector digital asset that is expressed primarily through cryptography and distributed ledger or similar technology.

***Cryptoasset markets*:** Any place or system that provides buyers and sellers the means to trade cryptoassets and the associated instruments, including lending, structured investment products and derivatives. Cryptoasset markets facilitate the interaction between those who wish to offer and sell and those who wish to invest.

Decentralised autonomous organisation (DAO): In theory, a decentralised application consisting of rules of operation that dictate who can execute a certain behaviour or make an upgrade. Code helps create an organisational structure intended to function without a centralised management structure.

Decentralised finance (DeFi): A set of alternative financial markets, products and systems that operate using cryptoassets and 'smart contracts' (software) built using distributed ledger or similar technology.

Digital asset: A digital instrument that is issued or represented through the use of distributed ledger or similar technology. This does not include digital representations of fiat currencies. It is also called a coin or token.

Digital wallet: An application or device for storing the private keys providing access to the cryptoasset. Hosted wallets are typically held by a third-party provider, unhosted wallets by the user.

Distributed ledger technology (DLT): A means of saving information through a distributed ledger, ie a repeated digital copy of data available at multiple locations.

***E-money*:** A stored monetary value or prepaid product in which a record of the funds or value available to the consumer for multipurpose use is stored on a prepaid card or electronic device like a computer or phone, and which is accepted as a payment instrument by other than the issuer (multipurpose use). The stored value represents a claim enforceable against the e-money provider to repay the balance on demand and in full.

***Fiat money*:** Synonymous with "legal money" or "legal tender". Fiat money is a medium that is prescribed to be money by laws and regulations, that is, imposed by a government. The most tangible criterion of legal money is whether a medium can be used to pay taxes. It may have no intrinsic value of its own, eg when existing in paper or electronic form.

***Mobile money*:** A financial service using mobile money accounts typically offered by a mobile network operator (MNO) or another entity in partnership with an MNO. Unlike mobile banking, which is the use of an application on a mobile device to

execute banking services, a bank account is not needed to use mobile money services – only a mobile phone is required.

On-ramp/Off-Ramp: procedure by which fiat money is converted into cryptoassets (on-ramp) or the other way around (off-ramp).

***Peer-to-peer (P2P)*:** The P2P economy can be described as a collection of virtual marketplaces that connect individuals looking to trade goods and services with one another through digital platforms. On one side, you have the buyers, who want specific goods or services, and, on the other, the sellers that own the good to be sold (or rented) or control the assets needed to provide the service.

***Real-time gross settlement (RTGS)*:** The real-time settlement of payments, transfer instructions or other obligations individually on a transaction-by-transaction basis.

Smart contract: Self-executing applications that can trigger an action if some prespecified conditions are met.

Stablecoin: A cryptoasset that aims to maintain a stable value relative to a specified asset, or a pool or basket of assets.

Tokenisation: The process of creating a digital representation (token) of an asset and putting it on a distributed ledger. The information stored in tokenised form can include asset type, ownership details, valuation, legal framework, optionality and settlement requirements, among other elements that enable significant customisation opportunities for issuer and owner to elect.

Annex B: Taxonomy

A.1 Cryptoassets with a stabilisation mechanism

A cryptoasset with a *stabilisation mechanism* attempts to link its market value to an underlying asset or a portfolio of traditional assets. The most common are those that try to peg to fiat currencies aiming at the 1:1 ratio, with the purpose of avoiding fluctuations in their price (BIS (2021); FSB (2018); IMF (2021)). The effectiveness of the stabilisation mechanism typically determines or affects the market value of these cryptoassets (FSB (2018)).

A widely adopted model, used by the three largest cryptoassets with a stabilisation mechanism, is to support the value of the cryptoasset with a dedicated reserve of assets denominated in the reference currency. This reserve is typically equal in value to the number of outstanding cryptoassets, and the issuer promises to issue and redeem it for the reference currency on a one-to-one basis. (MacDonald and Zhao (2022)). This issue and redemption promise provide for arbitrage opportunities in the presence of price swings in the secondary market, which constitutes a major component of the stabilisation mechanism. Another stabilisation mechanism for these cryptoassets is the use of algorithmic techniques or other means to stabilise or impact their market value by, for example, automatically adjusting supply in response to changes in demand. The need for less volatile assets in DeFi applications has increased the importance of this kind of asset.[29]

Cryptoassets with a stabilisation mechanism (also known as stablecoins) can be classified according to various characteristics such as their price stabilisation mechanism, the type of the collateral backing them, or the role of traditional institutions, for example, in safekeeping the reserve assets or to conduct the issuance process (as it is the case of tokenised funds and off-chain collateralised stablecoins). For the purposes of this report, the type of stabilisation mechanism and the type of collateral employed will be taken as the basis for the development of a taxonomy.

A.2 Fiat-referenced cryptoassets ("stablecoins")

Fiat-referenced and crypto-backed cryptoassets are backed by an asset or portfolio of assets, against which users can exchange their holdings. They can be backed by cash or liquid and safe assets (like bank deposits and government securities); non-cash equivalent assets or a basket of traditional assets (like corporate bonds, commercial paper or commodities); or by other cryptoassets.

They may retain their value with respect to the asset they are pegged to, using a variety of means such as creation-and-redemption systems, arbitrage and direct rights to receive underlying reserve assets (or proceeds from their sale). Notwithstanding, depending on the arrangement, holders may or may not have a redemption right against the issuer or a direct claim on the reserve assets; reserve assets may or may not be usable in the event of a redemption request; and they may or may not be covered by various guaranty programmes or agreements for the protection of investors and consumers. In general, the value of a cryptoasset with a stabilisation mechanism is likely to be more stable when the reference asset has a high correlation with the underlying reserve asset.

[29] DeFi is a set of alternative financial markets, products and systems that operate using cryptoassets and smart contracts built using distributed ledger or similar technology (FSB (2022)).

Main cryptoassets in 2022

Table A1

Name (ticker) and type	Market Cap [1] [daily average volume][2]	Description	Main economic function
Bitcoin (BTC) w/o stabilisation mechanism	$379,555 million [$28,810 million]	Launched in January 2009, but first described in a 2008 whitepaper published by a person/group of people with the alias Satoshi Nakamoto. Decentralised and peer-to-peer cryptoasset without a stabilisation mechanism; the first-ever to come into actual use. The supply limit is established at 21 million tokens; and as of 31 July 2022, there were 19.1 million tokens already "mined" or in circulation.	Allegedly, as a decentralised store of value. Peer-to-peer and goods/services payment method. Investing and speculating purposes.
Ether (ETH) w/o stabilisation mechanism	$184,448 million [$16,360 million]	Issued in 2014, Ether is the native cryptoasset under the decentralised open-source blockchain system "Ethereum", first described in a whitepaper published by Vitalik Buterin in 2013. Ethereum is the pioneer of the smart-contract blockchain platforms, an essential tool behind decentralised applications. Ether has no limits on its total supply.	Allegedly, as a decentralised store of value. Peer-to-peer and goods/services payment method. Investing and speculating purposes.
Tether (USDT) Stablecoin	$67,520 million [$46,438 million]	Issued in October 2014, by the Hong Kong-based company Tether. Stablecoin pegged to the US dollar on a 1:1 basis. Peg is achieved via maintaining a sum of commercial paper, fiduciary deposits, cash, reserve repo notes and treasury bills in reserves equal in USD value to the number of USDT in circulation.	Bridge to trade cryptoassets and providing liquidity in crypto markets. International transfers of money. Hold dollar-based value in an accessible way. To participate in DeFi networks.
Dai (DAI) Collateralised	$6,487 million [$680 million]	Issued in 2017, is a collateralised and decentralised stablecoin with a stabilisation mechanism soft-pegged to the US dollar. The peg is maintained by maintaining reserves of different cryptoassets.	Work as a reserve of value even in a volatile market. Mean of exchange to facilitate the purchase, sell of exchange of goods or assets. A unit of account to value goods or services. A reference for deferred payments.
USDD (USDD) Algorithmic	$723 million [$37 million]	Decentralised and overcollateralised cryptoasset issued in May 2022 with a peg to the US dollar. An algorithm regulates its supply and guarantees its parity respect the US dollar, anchoring its value to TRX crypto currency. To issue a unit of USDD an equivalent value in US dollars of TRX must be burnt.	Bridge to trade cryptoassets and providing liquidity in the crypto markets. Online medium of payment. To participate in dApps and DeFi networks.
Fei USD (FEI) Hybrid [Reserve-backed algorithmic]	$128 million [$6 million]	Launched in April 2021 by Fei Labs Inc, FEI is a reserve-backed algorithmic stablecoin pegged to the USD. The Fei Protocol algorithmically manages a reserve of tokens (Protocol Controlled Value) which supports direct redemption of FEI at $1.	Bridge to trade cryptoassets and providing liquidity in the crypto markets.

Sources: CoinMarketCap, Coin Gecko and each cryptoasset's corresponding webpage.

[1] Data as of 31 August 2022. [2] Daily average volume of August 2022.

A.3 Tokenised funds

Are units of monetary value that are electronically recorded in a distributed ledger to represent a claim against the issuer; and are issued in order to conduct payment transactions with parties other than the issuer. They are a digital representation of an asset, fully redeemable at face value by the issuer.

They may also offer a higher level of transparency, such as complete disclosure of reserve assets and clear documentation of redemption rights, including full segregation from other corporate assets, because their reserves are, in many cases, managed by regulated companies. These cryptoassets with a stabilisation mechanism are existing currency units in a distributed ledger, rather than a new type of asset, which means that they are tokenised funds denominated in the currency or currencies of reference (Bullman et al (2019)). In this sense, each token represents a claim over the issuer's funds that it received from the users. Therefore, the issuer must ensure that the reserve funds are redeemable according to the terms disclosed to the users, through bilateral contracts or through clearly established and public rules.

A.4 Cryptoassets without a stabilisation mechanism (unbacked cryptoassets)

These assets are mainly native coins of blockchains which are not backed by any issuer, type of collateral or algorithm. Their value can fluctuate significantly over time depending on market sentiment and are often viewed as speculative assets. Their underlying validation technology relies on proof-of-work[30] or proof-of-stake,[31] and their function is either as a medium of exchange or a store of value (eg Bitcoin, Litecoin etc). Some criticise that the validation process for these cryptoassets makes them inefficient in terms of time and energy, and that they have no intrinsic value (apart from capital appreciation). But their high price volatility calls into question whether they can be regarded as a digital store of value.

Another group of cryptoassets without a stabilisation mechanism are tokens issued through smart contracts on certain blockchains such as Ethereum, Binance Smart Chain, Solana, Cardano etc. A large group of these tokens are governance tokens for DeFi protocols such as AAVE and MakerDAO. The value of these tokens depends on the scope and the number of applications run on the platform since they affect the number of transactions and the amount of transaction fees, which in turn, influence the price of the platform token (Makarov and Schoar (2022)). Coins are the native cryptoassets of a blockchain, such as Bitcoin or Ethereum; whereas tokens, are cryptoassets created by platforms and applications that are built on top of an existing blockchain. Therefore, a blockchain can only have one native cryptoasset (coin), although it can have hundreds of tokens built on top of it.

[30] "Proof-of-work" is a mechanism typically used in permissionless DLT networks to validate changes on a ledger. It involves calculations that are hard for those requesting a change in a ledger to perform but easy for other participants to verify (FSB (2019)).

[31] "Proof-of-stake" is a consensus mechanism where the network validators can stake coins in order to validate block transactions based on the size of their stake. Thus, validators are demonstrating that they have a "stake" in the initiative's correct functioning.

Box B

The 2021–22 cryptoasset markets boom and bust

In recent years, the worldwide market for cryptoassets has abruptly grown, evolved and crashed. Between January 2020 and the peak market capitalisation in November 2021, the outstanding value of cryptoassets rose by around 15 times, reaching $2.9 trillion. Since then, the market cap has fallen to around $796 billion at the end of December 2022, accounting for 0.2% of all financial assets worldwide. Currently, there are more than 22,250 distinct cryptoasset tokens in circulation, implying the market is offering a wide range of initiatives beyond those that are most widely recognised.

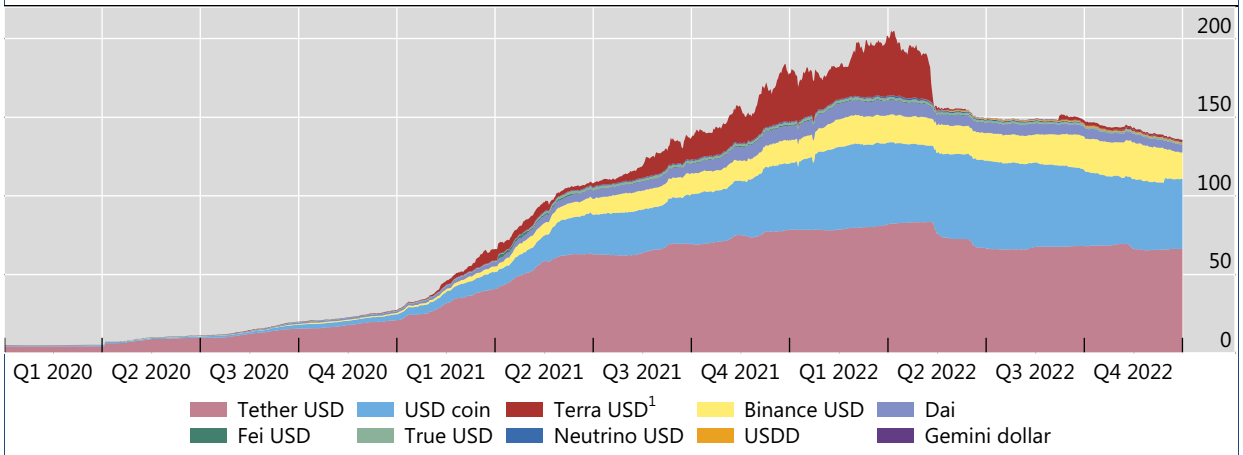
As of December 2022, there were at least 100 operational stablecoins. The market capitalisation of operational stablecoins soared in recent years from $28 billion in January 2021 to more than $138 billion in December 2022. In 2022, the average daily transaction volume of the largest 20 stablecoins was $63 billion.

TerraUSD (UST), the most important algorithmic stablecoin, collapsed on 9 May 2022. During the second week of May, UST broke par value against the US dollar due to large sales of cryptoassets and redemptions via withdrawals from Anchor Protocol, a DeFi lending platform where UST was mostly transacted. As a result of the high yields offered to its users, UST had previously reached $19 billion in market capitalisation, becoming the third largest stablecoin. Arbitrage opportunities between UST and Luna, its sister stablecoin, were the base for UST's stabilisation mechanism. However, with market sentiment turning, Luna's supply grew exponentially (from 345 million to 6.5 trillion) and its price fell. The market capitalisation of Luna fell below that of UST, making it impossible to support the peg. The price of UST fell to $0.02 and that of Luna fell to $0.00002, from $87.

As a result of the UST and Luna episode, the prices and market capitalisation of other cryptoassets, including stablecoins, fell dramatically (Graph B1). A 26% loss in cryptoassets' market capitalisation, from $1.7 trillion to $1.3 trillion, was registered within the month of May 2022. However, the decrease was not homogeneous among all cryptoassets, with Bitcoin seeing a smaller drop than Ether and smaller cryptoassets without a stabilisation mechanism. In the case of stablecoins, redemptions had an impact, with market capitalisation falling from almost $188 billion to $159 billion. The sector has contracted to a size not seen since February 2021.

Stablecoins market cap

In USD billions — Graph B1



[1] Terra collapsed in May 2022.

Source: CoinGecko.

Similarly, Tether (USDT), the largest stablecoin by market cap, was also affected by the UST episode, posting large redemptions. USDT is crucial for the cryptoasset ecosystem, since half of all bitcoins traded on exchanges is traded against USDT. Indeed, USDT broke its peg for a few days, falling to $0.97, before recovering. Investor panic and the resulting flight to fiat currencies and some other stablecoins, was the main cause of USDT's price decline. Investors seem to be worried about the USDT collapse, having concerns related to the quality of reserves backing USDT. Responding to these concerns, Tether announced that its reserves were larger than its market capitalisation and that they included more additional Treasuries than it had made public previously. There are still uncertainties and concerns regarding the composition of its reserve assets, such as the fact that the financial releases are not audited but "attested", and their claims about Tether´s most liquid reserve assets being held at two Bahamas banks. Although USDT recovered its peg, it saw redemptions of almost $17 billion between May and end-July 2022.

More recently, FTX went from being one of the largest cryptoasset exchanges to declaring bankruptcy within a single week. On 2 November, Coindesk published an article indicating that Alameda Research, a cryptoasset hedge fund and affiliate of FTX, allegedly had outstanding holdings of FTT, the token issued by FTX. This implied very close ties between FTX and Alameda, despite being independent entities. Subsequently, on 6 November, Binance (the largest crypto exchange) announced that it would sell its holdings of FTT tokens (then worth about $500 million). This triggered a crash in FTT´s price and in those of some of the other main cryptoassets. On 8 November, after 48 hours of intense speculation about its creditworthiness and that of its affiliate, FTX faced problems processing a large volume of withdrawal requests (approximately $5 billion) and was forced to suspend redemptions.

Consequently, on 9 November, Binance withdrew from its previously announced purchase of FTX, which led to the latter's collapse. On 10 November, the Bahamas Securities and Exchange Commission froze the assets of FTX Digital Markets Ltd. (as did regulators in Japan and Australia, for the corresponding local subsidiaries). The next day, FTX filed for Chapter 11 bankruptcy protection, triggering a sharp sell-off in broader cryptoasset markets.

The events described here illustrate the latent risks in the cryptoasset market, revealing some of the problems and vulnerabilities affecting them. These include risks related to inappropriate and/or unsustainable business models; liquidity risks; risks related to a lack of transparency in corporate governance and processes; risks related to the inappropriate use of client funds; cyber risks; and risks derived from the high level of interconnection within the sector. Regarding the latter, it should be noted that each of the events described involved shocks and contagion to the main cryptoassets, with repercussions on their price volatility and their market capitalisation. However, due to the still limited links between cryptoassets and the traditional financial sector, any contagion remained within the crypto sector, without significant effects for the traditional financial system.

Annex C: Task force members

Central Bank of Colombia	Pamela Cardozo (Chair) Andrés Murcia (Chair) Juan Sebastián Lemus (Leader, sub-group)
Bank of Mexico	Jorge Luis García (Leader, sub-group) Liduvina Cisneros
Central Bank of Argentina	Iván Hundewadt Emiliano Giupponi
Central Bank of Brazil	Glener Dourado
Bank of Canada	Laura Zhao
Central Bank of Chile	Iván Abarca
Central Reserve Bank of Peru	Jorge Muñoz Anthony Meza
Federal Reserve Bank of New York	Elizabeth Caviness
Bank for International Settlements	Jon Frost Christian Upper Carlos Cantú (Secretary) Carolina Velásquez