Box 4.1

ANALYSIS OF THE EVOLUTION OF THE CRYPTO-ASSET MARKETS AND ITS FINANCIAL STABILITY IMPLICATIONS

This box describes the changes in crypto-asset market valuations and in the degree of market concentration by asset type. It also presents some recent developments that are likely to shape their future performance, such as the difficulties of monitoring activity in this market, the authorisation of crypto exchange-traded funds (ETFs) and crypto-friendly regulatory and supervisory changes in the United States. Taking all this into consideration, the box concludes with an updated assessment of the financial stability implications of crypto-assets, which have already been examined in previous Financial Stability Reports (FSRs).[1]

Crypto-asset prices and market concentration

The global crypto-asset market has grown considerably over the last five years. The market capitalisation of the MVIS crypto-asset index[2] grew exponentially between early 2020 and late 2021, recording what was then the index's all-time high (Chart 1). This index corrected sharply in 2022, affected by the fall in the price of the main unbacked crypto-assets, such as bitcoin, against a background of monetary policy tightening that reduced the incentives to hold these assets. The MVIS index recovered in 2023, albeit without returning to its pre-2022 correction level. However, since early 2024, the index has recovered sharply and, like bitcoin, its predominant component, reached new all-time highs.

The gains in 2024 were driven, first, by the approval of spot bitcoin exchange-traded products (ETPs) in the United States early that year (bitcoin futures ETFs already existed in the United States and spot ETFs in other jurisdictions). This helps to broaden the investor base for these assets, as ETFs simplify the investment process and make it more accessible.[3]

Second, expectations that the monetary policy tightening cycle was nearing its end may have increased the appetite for certain risky assets, such as crypto-assets. In addition, the next peak recorded by both the MVIS Index and bitcoin coincided with Donald Trump's re-election as President of the United States. The new US Administration has announced its intention to boost the development of this type of asset and has already approved a number of crypto-friendly measures. In particular, the Executive Order "Establishment of the Strategic Bitcoin Reserve and United States Digital Asset Stockpile" of 6 March 2025.[4] In early 2025 crypto-asset prices had been suffering a sizeable downward correction, which has reversed since the approval of this Executive Order.

The crypto-asset market is highly concentrated among a handful of assets. For example, six of the main assets (bitcoin, ethereum, Cardano, Tether, USD Coin, BNB) accounted for over 90% of the capitalisation of the MVIS in early May 2025. At that date, three unbacked crypto-assets (bitcoin, ethereum, Cardano) represented 82.5% of the capitalisation of the MVIS and bitcoin dominated with a market share of 71% (Chart 2). Meanwhile, the three main backed crypto-assets (Tether, USD Coin, BNB) accounted overall for a small percentage of the capitalisation of the MVIS (10.6%), with Tether standing out among them.[5] Use of these backed assets is currently mainly aimed at supporting operations in the unbacked segment, thereby fulfilling an ancillary function.

The price volatility on the crypto-asset market essentially owes to asset prices in the unbacked segment. In particular, bitcoin's price has fluctuated sharply. In 2024, its market capitalisation rose by 124%, while that of ethereum and Cardano increased by 46% and 41%, respectively. By

1 See, for example, the special chapter on crypto-assets of the Banco de España's Spring 2022 FSR.

2 The MVIS CryptoCompare Digital Assets 100 Index tracks the top 100 (backed and unbacked) crypto-assets by market value.

3 For more details, see this Statement of the U.S. Securities and Exchange Commission.

4 This Executive Order created, first, a Strategic Bitcoin Reserve that will treat bitcoin as a reserve asset. Under the Executive Order, the Strategic Bitcoin Reserve will be capitalised with bitcoin owned by the Department of Treasury that was forfeited as part of criminal or civil asset forfeiture proceedings. Other agencies will evaluate their legal authority to transfer any bitcoin owned by those agencies to the Strategic Bitcoin Reserve. The United States will not sell bitcoin deposited into this Strategic Bitcoin Reserve. Lastly, the Secretaries of Treasury and Commerce are authorised to develop budget-neutral strategies for acquiring additional bitcoin, provided that those strategies impose no incremental costs on American taxpayers. Second, the Executive Order also established the U.S. Digital Asset Stockpile, consisting of digital assets other than bitcoin owned by the Department of Treasury that were forfeited in criminal or civil asset forfeiture proceedings. The US Government will not acquire additional assets for the U.S. Digital Asset Stockpile beyond those obtained through forfeiture proceedings. The Secretary of the Treasury may determine strategies for responsible stewardship, including potential sales from the U.S. Digital Asset Stockpile. For more details, see White House. (2025). "Fact Sheet: President Donald J. Trump Establishes the Strategic Bitcoin Reserve and U.S. Digital Asset Stockpile".

5 Tether is a stablecoin whose value is pegged 1:1 with the US dollar, enabling swift and stable transactions through multiple blockchains. What sets it apart from other stablecoins is, among other things, its wide adoption around the world and lower transparency than other alternatives such as USD Coin.

Chart 1
Market value of the main crypto-assets (a)

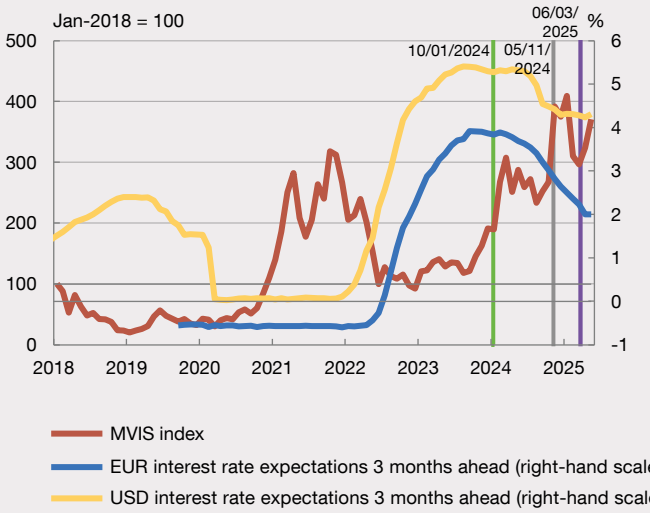
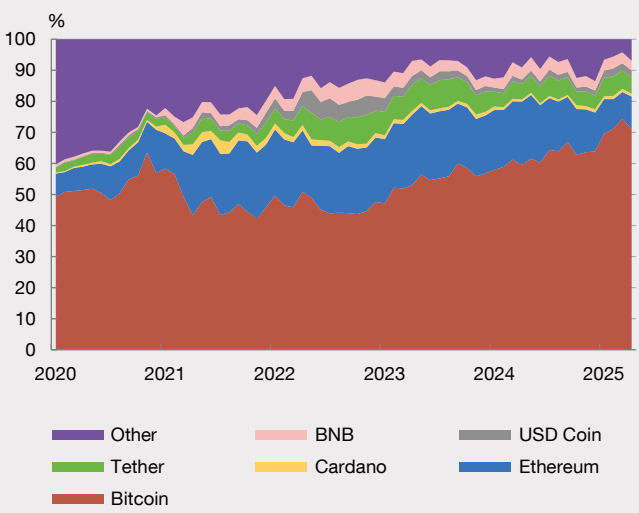


Chart 2
Share of MVIS capitalisation of different crypto-assets (b)



SOURCES: LSEG Datastream, MVIS, CoinMarketCap and Banco de España. Latest observation: 12 May 2025.

a The crypto-asset index is the MVIS CryptoCompare Digital Assets 100 Index, which comprises the top 100 (backed and unbacked) crypto-assets by market value. Interest rate expectations are proxied by overnight index swap (OIS) rates three months ahead. The green vertical line denotes 10 January 2024 (spot bitcoin ETPs approved in the United States), the grey vertical line denotes 5 November 2024 (President Trump's re-election) and the purple vertical line denotes 6 March 2025 (Executive Order establishing the Strategic Bitcoin Reserve).
b The market shares are calculated using the percentage of the capitalisation corresponding to each crypto-asset, according to MVIS index data. The unbacked crypto-assets are bitcoin, ethereum and Cardano. The backed crypto-assets are Tether, USD Coin and BNB.

contrast, in 2025 Q1 bitcoin depreciated by 11.5%, ethereum by 45.2% and Cardano by 21.3.%. This was followed by a significant rally in April and May. This performance is influenced by economic, technology and investor attention factors. Carbó and Gorjón (2022) show that, in the case of bitcoin, the impact of these factors varies over time.[6]

The paper uses long short-term memory[7] neural network techniques and SHapley Additive exPlanations[8] machine learning interpretability techniques to approximately replicate bitcoin price developments between 2015 and 2023. Up to 2018 bitcoin's growth was predominantly driven by technological factors, such as mining difficulty.[9] However, since 2018, the influence of public attention – measured by Google Trends searches and Twitter mentions – has become more prominent. By contrast, economic variables, such as the S&P 500 index and gold prices have not proven to be stable determinants of bitcoin's price.

Carbó and Gorjón (2022) also identify the emergence of new determinants of bitcoin's price over time, such as institutional adoption and the emergence of new, large-scale investors. The surge in this asset's price in 2024 that coincided with the approval of spot bitcoin ETPs in the United States cannot be explained by the model in this paper, as it is a new factor that did not apply when the

6 J. M. Carbó and S. Gorjón. (2022). "Application of machine learning models and interpretability techniques to identify the determinants of the price of bitcoin", Documentos de Trabajo, 2215, Banco de España.

7 A deep learning model capable of working with time series and capturing both short and long-term dependencies. S. Hochreiter and J. Schmidhuber. (1997). "Long short-term memory". *Neural Computation,* 9(8), pp. 1735-1780.

8 A game theory-based interpretability method that assigns each variable a clear contribution to a machine learning model's prediction. S. M. Lundberg and Su-In Lee. (2017). "A Unified Approach to Interpreting Model Predictions". *Advances in Neural Information Processing Systems,* Vol. 30.

9 Mining difficulty is a parameter that adjusts automatically to keep the average block creation rate consistent. To validate transactions on the bitcoin network miners must solve mathematical puzzles whose complexity increases or decreases based on total computational power, thereby ensuring that blocks are produced at a stable rate.

analysis was conducted. However, the emergence of new explanatory variables is unsurprising in view of past trends.

The challenge of monitoring market activity

Monitoring the market value of crypto-assets is difficult. The advantages of bitcoin blockchain[10] data include their immutability and transparency. This means that transactions can be analysed, addresses can be clustered and the concentration of balances and the activity of the most important miners[11] can be estimated.[12] However, these data have certain limitations when it comes to monitoring cross-border transactions, assessing risks to financial stability and detecting unlawful activity, such as money laundering.

First, blockchain data do not include information on the location or identity of the agents. This makes it difficult to segment crypto market activity by country. While clustering techniques and the identification of addresses associated with exchange platforms can partially reduce anonymity, they do not suffice to accurately identify transactions. In addition, blockchain transactions exclude transactions within centralised exchanges,[13] where assets can change hands without being reflected in the chain.

Lastly, the fragmentation of data sources and the lack of reporting standards limit consistent monitoring. This makes it necessary to supplement the analysis with external data or data provided by third parties (with no connection to prudential financial authorities), with the risks this entails.

Crypto-assets and ETFs

Crypto-asset investors prefer to operate on the spot market[14] for its immediacy and simplicity, among other reasons. This market currently has a capitalisation of around $3 trillion, with unbacked crypto-assets, especially bitcoin and ethereum, being the most frequently traded assets.[15]

However, despite the spot market's success, the market for crypto ETFs shows significant growth potential. In particular, bitcoin ETFs (spot and futures) already represent around 6% of bitcoin's total market capitalisation (3.1% in the case of ethereum)[16] (Chart 3). This is a significant figure considering that the first bitcoin ETF (BTCC) was launched in 2021 and spot bitcoin ETFs were not authorised in the United States until 2024.[17]

Crypto ETFs are predominantly traded in the United States, although trading levels in Europe can be expected to grow in the coming years.[18] The European Union (EU) introduced a regulatory framework for crypto-assets in 2024. The Markets in Crypto-Assets (MiCA)[19] Regulation governs the issuance of stablecoins and other crypto-asset classes, the provision of crypto-asset services in the EU, the protection of crypto-asset holders and customers of crypto-asset services, measures to prevent crypto-related insider trading and market manipulation (to ensure the integrity of crypto-asset markets) and other disclosure obligations, which could help bridge some of the aforementioned gaps.

The MiCA regulatory framework is applied to all crypto-assets not regulated by EU legislation on financial instruments. The aim is to provide security and guarantees

10 Blockchain is a distributed ledger technology that stores data in chronologically chained and cryptographically secured blocks, ensuring that the data are immutable and enabling the decentralised verification of transactions.

11 A miner is a participant in a blockchain network who validates and groups transactions in blocks by solving computational puzzles in exchange for a reward in the form of a crypto-asset.

12 J. M. Carbó, H. Jahanshahloo and J. C. Piqueras. (2024). *Análisis de fuentes de datos para seguir la evolución de Bitcoin*, Documentos Ocasionales, 2411, Banco de España.

13 Centralised exchanges are platforms that intermediate in the sale and purchase of crypto-assets and manage their users' balances internally. Transfers between accounts on the same platform are not recorded on the public blockchain.

14 In the spot market, investors buy and sell digital assets directly rather than using an intermediate vehicle such as an ETF.

15 According to real-time data from CoinMarketCap.

16 According to real-time data from CoinMarketCap.

17 BTCC, the first spot crypto-asset ETF, was launched in Canada in 2021. The first bitcoin futures ETF (BITO) was launched in the United States in 2021. The first spot bitcoin ETF in the United States was launched in 2024.

18 See link.

19 Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets (MiCA) aims to create a harmonised, pan-EU regulatory framework for markets in crypto-assets. For more information on this regulation, see the CNMV website (in Spanish).

Chart 3
Market capitalisation of assets under management in cryptoasset ETFs as a percentage of each asset's total market capitalisation (a)

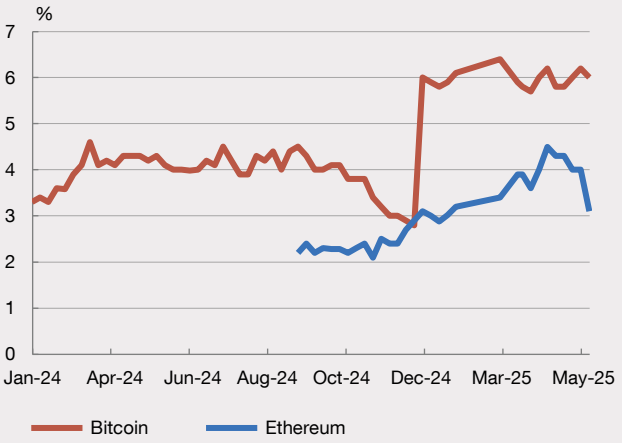


Chart 4
MVIS capitalisation as a percentage of S&P 500 capitalisation (b)

SOURCES: LSEG Datastream, MVIS, CoinMarketCap and Banco de España. Latest observation: 12 May 2024.

a Weekly data. Includes both bitcoin spot and futures ETFs.
b Monthly data.

for crypto-asset holders. This regulation could make it easier for banks and investment funds to market crypto-based financial products, such as ETFs. The framework may also reduce the likelihood of disorderly market conditions developing, which could otherwise pose greater risks to the financial system.

Much of the success of crypto ETFs owes to the straightforward access they offer investors – both retail and institutional – to crypto-asset trading and investment in various blockchain-related companies. By holding ETF shares, investors can invest in several assets at the same time.

In short, crypto ETFs have helped lower transaction and entry costs in the sector within a regulated trading environment, thus fostering market liquidity, particularly when conditions are favourable. However, despite the growth and development of such products, they pose considerable challenges for investors given the significant market price risk and potential cyber security issues.

Key US regulatory and supervisory developments for the digitalisation of finances and crypto-assets

Several of the Executive Orders implemented by the new US Administration since taking office affect the technology sector and the digitalisation of finances. On 23 January it issued the *"Strengthening American Leadership in Digital Financial Technology"* Executive Order, aimed at promoting the ability of individual citizens and private-sector entities to access and use public blockchain networks, maintain custody of digital assets and develop dollar-backed stablecoins. At the same time, the Securities and Exchange Commission (SEC) issued *Staff Accounting Bulletin 122*, providing greater flexibility to traditional financial institutions interested in providing crypto-custody services.

On 6 March the *"Establishment of the Strategic Bitcoin Reserve and United States Digital Asset Stockpile"* Executive Order was issued, creating the Strategic Bitcoin Reserve and the United States Digital Assets Stockpile (the latter for assets other than bitcoin). Under this Executive Order, assets may be added to the Strategic Bitcoin Reserve through criminal or civil asset forfeiture proceedings or acquisitions by the Department of the Treasury, while the US Digital Asset Reserve may only be expanded by forfeitures.[20]

Further, the *GENIUS Act* and *STABLE Act* are in passage through the House of Representatives and seek to define "payment stablecoins" as a digital asset redeemable at a

20 For more information on these crypto-asset reserves, see footnote 4.

predetermined fixed amount and that hold assets in reserve that can be liquidated only to redeem the stablecoins. For dollar-denominated stablecoins, issuers would be required to hold at least one dollar of permitted reserve assets for every dollar worth of stablecoins issued, and reserve assets would be restricted to insured deposits, central bank reserves and short-dated Treasury bills approved by regulators.

The bill would also exempt payment stablecoin issuers from the regulatory capital standards applied to traditional banks, as well as imposing tailored capital, liquidity and risk management rules, along with requirements to disclose redemption procedures and report on reserve composition, which would be certified by executives of the stablecoin issuer and "examined" (but not necessarily audited) by auditors.

In any event, given the differing regulatory demands placed on crypto issuers in the EU and the United States, closer monitoring and oversight may be warranted. For instance, stablecoins may be based on the multi-issuance model, where they are issued by both EU and non-EU entities. In such cases, one of the two may be subject to more stringent regulatory obligations vis-à-vis holders of the stablecoin. That issuer may be required to meet those obligations not only towards holders of its own issues of that stablecoin, but also towards holders of those issued by the other issuer that is subject to looser requirements.

Such a scenario might warrant close supervision, insofar as it could compromise the financial standing of the issuer subject to more stringent requirements and – depending on the eventual systemic importance of such multi-issuance models – ultimately, financial stability.

Lastly, in late April 2025 the Federal Reserve Board eased supervisory guidance for banks related to their crypto-asset activities. First, it rescinded its 2022 supervisory letter on crypto-related risk management, which established an expectation that banks under its authority provide advance notification of planned or current crypto-asset activities. Instead, it will monitor banks' crypto-asset activities through the normal supervisory process.

The Board also rescinded its 2023 supervisory letter regarding the supervisory non-objection process for state member bank engagement in blockchain-based dollar token activities. Previously, under this procedure banks needed to demonstrate to the supervisor their ability to conduct these activities in a safe and sound manner and receive written authorisation before engaging in them.

Finally, the Board, together with the other US regulatory agencies, withdrew two 2023 statements regarding banks' crypto-asset exposures. The Board announced that it will work with other agencies to consider whether additional guidance to support innovation, including crypto-asset activities, is appropriate.[21]

Financial stability implications

The special chapter of the Spring 2022 FSR highlighted several crypto-related risks which remain applicable today,[22] including the above-mentioned market and cyber security risks. At present, the systemic importance of these risks is limited by the market's relatively small size. For instance, in early 2025 the market capitalisation of the MVIS index represented 6.2% of the S&P 500 (5.8% on the last data available following the April turbulence) (Chart 4). However, if crypto-asset markets continue to grow, so too could their systemic importance.

The apparent resilience of the crypto-asset market since 2018 (despite fluctuations and several corrections), along with the development of ETFs and the regulatory reforms in the United States, appear to reinforce the growth expectations. The notion that blockchain technology on its own will lead to new and sound forms of money, payment media or investment remains prevalent among participants in this market. The new US Administration's interest in the crypto market heightens the risk of these ideas becoming entrenched.

These perceptions have emerged despite the significant limitations of crypto-assets. Unbacked crypto-assets, such as bitcoin, lack a price anchor, making them impractical as deposit or payment instruments. Their acceptance as investment assets has been driven by

21 For a more complete description of the changes to the supervisory guidance on crypto-assets by the US Federal Reserve Board, see the press release of 25 April 2025.

22 See footnote 1 of this box.

social contexts, fostering the proliferation of "manias".[23] The personal and social risks of these assets, such as fraud, pyramid schemes and the reallocation of funds away from productive uses, tend to be underestimated against a backdrop of high short-term returns.

Other fundamental drawbacks of these assets include the high energy cost of validating transactions for the more decentralised crypto-assets and concentration risk in the market (e.g. operational risk in less decentralised networks). In addition, instances of market fraud can emerge, as illustrated by the FTX case.[24]

Stablecoins might be viewed more favourably from a risk perspective, provided that their characteristics and use are regulated according to sound prudential standards. In Europe, the aforementioned MiCA has enhanced the security of these assets, which could eventually lead to new payment channels. However, such use of stablecoins remains highly limited compared with their role as a vehicle for value accumulation or as an ancillary payment media for trading unbacked crypto-assets.

The recent escalation in geopolitical tensions has created a unique new environment that has fuelled the adoption of crypto-assets and raised concerns. Countries not aligned with the United States may turn to crypto-assets as an alternative to the dollar, although such usage remains limited. The geopolitical caution behind this shift is also evident in initiatives geared towards replacing international payment networks such as Swift.

These geopolitical distortions could result in public policies on crypto-assets that have potentially adverse effects on financial stability. For instance, bitcoin being included among a central bank's reserve assets. The central bank's ability to stabilise the exchange rate would be restricted given bitcoin's limitations as a payment instrument. Likewise, crypto-assets' price volatility suggests it would be unwise to use them to accumulate public wealth. Lastly, some countries may seek to establish a dominant position in the stablecoin segment (predominately hedged by the national currency), which might provide an incentive to ease security standards for these assets to encourage their rapid expansion.[25]

Against this background, central bank digital currencies (CBDCs) may provide an alternative means of delivering modern payment services with comparable security levels to cash. CBDCs offer the technological benefits of crypto-assets (e.g. transaction immediacy) while reducing operational risks for users and – if appropriately designed – replicating the key features of fiat money (whose value is conferred by law) as a means of payment, unit of account and store of value. CBDCs could therefore be an appealing alternative to certain types of crypto-assets (such as stablecoins), thus limiting their growth and the associated risks.

In view of this, the prohibition, set out in the US Administration's Executive Order of 23 January 2025, of any progress towards the establishment of a dollar CBDC could have undesired adverse effects on the global monetary system.

In any event, the introduction of a CBDC demands a thorough cost-benefit analysis, a public interest-orientated implementation strategy and alignment with price and financial stability objectives. With respect to financial stability, the potential impact of a CBDC on bank deposits – and the subsequent effects for liquidity, funding costs, profitability and solvency – require particular analysis. For instance, in developing its own CBDC (the digital euro), the European Central Bank has envisaged two specific design features (the non-remuneration of and limits on holdings) explicitly with a view to mitigating risks to financial stability.[26]

23 The term "mania" denotes an irrational and collective disconnect between market value and intrinsic value. Charles P. Kindleberger and Robert Z. Albier. (2005). "Manias, Panics and Crashes", Ariel Economía.

24 FTX was a crypto-asset exchange platform. It is now under insolvency proceedings and is accused of defrauding customers. See CoinLedger.

25 See the US Presidential Executive Order of 23 January 2025, "Strengthening American Leadership in Digital Financial Technology".

26 See ECB Opinion of 31 October 2023 (CON/2023/34).