

ESMA TRV Risk Analysis

Financial Innovation

Crypto assets: Market structures and EU relevance



ESMA Report on Trends, Risks and Vulnerabilities Risk Analysis

© European Securities and Markets Authority, Paris, 2024. All rights reserved. Brief excerpts may be reproduced or translated provided the source is cited adequately. Legal reference for this report: Regulation (EU) No 1095/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Securities and Markets Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/77/EC, Article 32 'Assessment of market developments, including stress tests', '1. The Authority shall monitor and assess market developments in the area of its competence and, where necessary, inform the European Supervisory Authority (European Banking Authority), and the European Supervisory Authority (European Insurance and Occupational Pensions Authority), the European Systemic Risk Board, and the European Parliament, the Council and the Commission about the relevant micro-prudential trends, potential risks and vulnerabilities. The Authority shall include in its assessments an analysis of the markets in which financial market participants operate and an assessment of the impact of potential market developments on such financial market participants.' The information contained in this publication, including text, charts and data, exclusively serves analytical purposes. It does not provide forecasts or investment advice, nor does it prejudice, preclude or influence in any way past, existing or future regulatory or supervisory obligations by market participants. The charts and analyses in this report are, fully or in part, based on data not proprietary to ESMA, including from commercial data providers and public authorities. ESMA uses these data in good faith and does not take responsibility for their accuracy or completeness. ESMA is committed to constantly improving its data sources and reserves the right to alter data sources at any time. The third-party data used in this publication may be subject to provider-specific disclaimers, especially regarding their ownership, their reuse by non-customers and, in particular, their accuracy, completeness or timeliness, and the provider's liability related thereto. Please consult the websites of the individual data providers, whose names are given throughout this report, for more details on these disclaimers. Where third-party data are used to create a chart or table or to undertake an analysis, the third party is identified and credited as the source. In each case, ESMA is cited by default as a source, reflecting any data management or cleaning, processing, matching, analytical, editorial or other adjustments to raw data undertaken.

ISBN 978-92-95235-13-7, DOI 10.2856/328752, EK-05-24-123-EN-N

European Securities and Markets Authority (ESMA)
Economics, Financial Stability and Risk Department
201-203 rue de Bercy
75012 Paris
FRANCE

risk.analysis@esma.europa.eu

ESMA – 201-203 rue de Bercy – CS 80910 – 75589 Paris Cedex 12 – France – www.esma.europa.eu

Financial Innovation

Crypto assets: Market structures and EU relevance

Contact: paul.reiche@esma.europa.eu ¹

Summary

This article provides a detailed overview of patterns in crypto-asset secondary markets.

Over the last decade, crypto assets have developed into an extensive system and gained considerable attention, especially due to the risks they pose to consumers and financial stability. ESMA monitors these risks and has repeatedly issued warnings to investors.

The article aims to improve specifically our understanding of crypto-asset trading and the extent to which it resembles or differs from traditional financial markets. We also identify current and potential areas of risk, not only to consumers but also to market order and financial stability. Finally, our analysis informs and supports the implementation of the EU Markets in Crypto-Assets (MiCA) regulation.

We find that crypto-asset prices are characterised by highly volatile boom and bust cycles and an overall co-movement with equity markets. While a large number of crypto assets have emerged, market capitalisations and trading volumes remain significantly concentrated in a few assets. Only around 20% to 30% of transactions involve fiat currencies and most transactions occur within the system itself.

The distribution of involved fiat money reflects a high reliance on the US dollar and the South Korean won as the market's on- and off-ramp. The euro only plays a minor role and the announcement of the MiCA regulation has not caused an increase in euro transactions so far.

Trading volumes are highly concentrated in a few crypto exchanges: Ten exchanges process about 90% of trades, and the largest exchange alone accounts for almost half of global trading volumes. Moreover, we find that market liquidity can vary widely and tends to be higher in the largest exchanges.

Identifying the origin of order flow or the geographic location of crypto exchanges remains problematic. We observe that around 55% of trading volume is executed on crypto exchanges that hold an EU license as a virtual asset service provider (VASP). However, most of those transactions are likely to occur outside the EU.

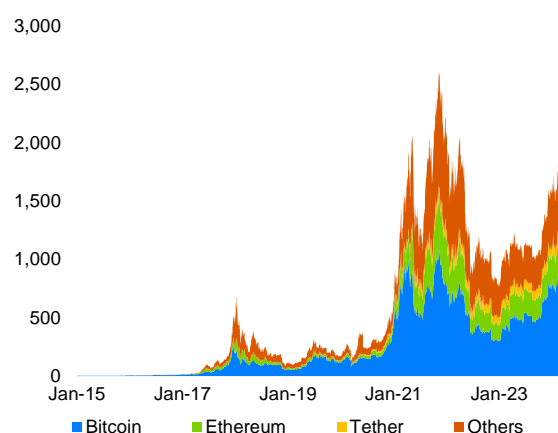
¹ This article was written by Malena Calissano, Filippo Giuglini and Paul Reiche.

Introduction

Since its inception in 2008 with the creation of Bitcoin, the crypto market has grown and evolved into a **complex, inherently global system**. However, it has remained enormously volatile. In 2021, it experienced an annual growth of 300% up to a market capitalisation of EUR 2.5 trillion, but quickly fell back to around EUR 1 trillion over the course of 2022. Since then, the market has rebounded and, as of December 2023, stands at EUR 1.6 trillion (Chart 1).

Chart 1

Crypto-asset market capitalisation Volatile market growth



Note: Market capitalisation of Bitcoin, Ethereum, Tether and other crypto-assets, in EUR billion.
Sources: CoinMarketCap, ESMA.

Considering the crypto market's extreme volatility, the proliferation of different crypto assets and the many scandals, frauds and cyberattacks to which they can be subject, crypto assets can pose a **significant threat to consumers**. Moreover, through growing interlinkages with the traditional financial system, they may also have the potential to jeopardise market order and financial stability (BIS, 2023).

ESMA has identified and warned against these risks from an early stage (ESAs, 2018 and 2022) and closely monitors the crypto-asset market in its semi-annual trends, risks, and vulnerabilities report (TRV). Furthermore, we have published an in-depth assessment of crypto-asset risks to financial stability (ESMA, 2022) and two analytical articles on smart contracts and decentralised finance (ESMA, 2023a and 2023b).

The structures and dynamics of **crypto-asset secondary trading** are of particular interest for understanding investor and financial stability risks. They entail important information on the relative sizes of market segments, asset classes and individual assets. They also help to assess the liquidity and volatility in these markets.

This article analyses crypto-asset secondary trading on the basis of granular trading and orderbook data ². It sheds light on the **crypto market's structure** and supports the implementation of the MiCA regulation, which was adopted in June 2023. Crypto markets are global in nature, and the activities of market participants and service providers remain impossible to trace back to individual jurisdictions in systematic ways. Our analysis, therefore, necessarily looks at crypto markets at large.

The remainder of this article is structured along two main dimensions:

1. It focuses on crypto-asset trading from an **asset perspective**, covering the breadth of tradable instruments, their market shares, price developments and asset correlations.
2. It then concentrates on **crypto exchanges**, their subsegments, market concentration and liquidity measures. A final section summarises our findings and concludes.

Crypto asset trading

This section describes the crypto-asset market from an asset perspective. It covers all assets that are or were historically traded at crypto exchanges. We follow the definition of the Financial Stability Board (FSB) and consider all 'private-sector digital assets that depend primarily on cryptography and distributed ledger or similar technology' (FSB, 2022), including all backed and unbacked crypto assets, along with security, utility and other tokens.

Assets, trading volumes, market capitalisation: high concentration

The number of **actively traded crypto assets** ³ stood at around 2,000 (5,100 trading pairs ⁴) as of 2020. Along with the evolution of market capitalisations, this number increased to 2,400 assets (6,000 trading pairs) in summer 2021.

² Our data comprise off-chain transactions that are published by crypto-asset exchanges and do not necessarily imply blockchain settlements.

³ Crypto-asset trading activity is not reported to public authorities. This analysis rests on data from the commercial data provider Kaiko. We consider assets

that were traded at least once per month. The total number of existing crypto assets is likely higher.

⁴ Trading pairs are tradeable asset combinations at crypto exchanges. They consist of two assets which can be exchanged against each other.

Over the following year, and concomitant with the broader crypto market contraction, this number temporarily fell back before recovering to a new maximum of around 3,700 assets (7,900 trading pairs) in the fourth quarter of 2023.

Table 1
Top 10 crypto assets by market capitalisation
Highly concentrated market

	Market capitalisation		Trading volume	
	bn USD	% market share	bn USD	% market share
Bitcoin	850	51%	1,432	19%
Ether	269	17%	565	7%
Tether	93	6%	2,216	29%
Binance Coin	48	3%	41	1%
Solana	43	3%	101	1%
Ripple	31	2%	127	2%
USD Coin	25	2%	259	3%
Cardano	20	1%	29	< 1%
Dogecoin	12	1%	47	1%
Toncoin	8	< 1%	2	< 1%
	1,660	86%	4,820	64%

Note: Top 10 crypto assets as of December 2023 by market capitalisation and annual trading volume, in USD bn. Respective market shares in %.
 Sources: CoinMarketCap, Kaiko, ESMA.

Although the number of actively traded assets has increased between 2020 and 2023, the crypto **market remains highly concentrated**, as shown in Table 1. Three crypto assets alone – Bitcoin (BTC), Ether (ETH) and the stablecoin Tether (USDT) – account for 74% of the total crypto market capitalisation as of December 2023 and 55% of the 2023 annual trading volume. This compares with 86% and 64% respectively for the ten largest crypto assets.

Stablecoins such as Tether and USD Coin (USDC) are a special kind of crypto asset that aim to keep a stable value pegged to a reference asset, usually a fiat currency. Most stablecoins are reserve-backed and pegged to the US dollar. They have gained increased popularity as vehicles to cash into and out of crypto assets and grown to a combined market capitalisation of USD 190 billion in May 2022. However, they have since suffered from capital outflows and only recently settled at a market capitalisation of around USD 130 billion as of December 2023.

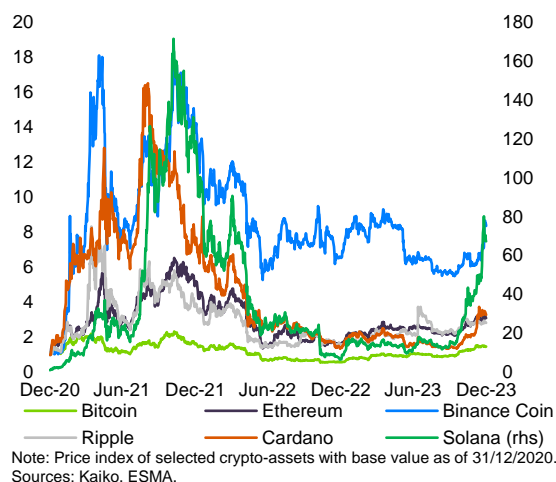
While unbacked crypto assets like Bitcoin and Ether dominate the market in terms of capitalisation, stablecoins are in the **lead when considering trading volumes** (Table 1). In fact, the respective Tether and USD Coin turnover ratios ⁵ of 24 and 10 exceed the Bitcoin or Ether turnover ratios of only 2. This can be explained by the use of stablecoins as a common medium of exchange and store of value. Moreover, they

allow investors to trade in and out of different crypto assets and realise paper gains without triggering taxable events (Arner et al., 2020; Aramonte et al., 2021).

Asset prices: intra-market correlations, and with TradFi

Chart 2 depicts price indexes of selected crypto assets from December 2020. The wider crypto **market surge in 2021** is also visible here. The fiscal stimulus to counter the effects of the COVID-19 pandemic and a low interest rate environment fuelled a mania of speculation and ‘fear-of-missing-out’ behaviour in crypto markets (ESMA, 2022). In fact, the prices of most crypto assets soared (accompanied by heightened volatility) up to the market’s all-time high in November 2021.

Chart 2
Crypto-asset price indexes
Boom and bust of crypto prices



The beginning of 2022 witnessed an abrupt fall of crypto-asset prices amid an environment of rising inflation, tighter macroeconomic policies, and an overall uncertain outlook. Several bankruptcies and failures weighed on investor confidence and further drove prices down ⁶.

Overall, the market collapse laid bare a variety of **unsustainable or fraudulent business models**, an excessive amount of system leverage, and high interconnectedness within the crypto-asset system (Panetta, 2022). This interconnectedness becomes evident when calculating price return correlations for the largest crypto assets

⁵ Turnover is defined as annual 2023 trading volume divided by end of December market capitalisation.

⁶ The most notable events comprise the collapse of the Terra-Luna stablecoin ecosystem in May 2022, the

failures of lending platform Celsius and crypto hedge fund Three Arrows Capital in June, and the bankruptcy of crypto exchange FTX in November 2022. For further details on those events see: [TRV 2-22](#) and [TRV 1-23](#).

(Table 2). We observe strong positive relationships ranging from around 0.50 to 0.80, indicating considerable co-movement of prices and that investors tend not to distinguish between those top assets.

Table 2

Selected crypto asset price correlations Highly interconnected market

Bitcoin	1					
Ether	0.82	1				
Binance Coin	0.64	0.65	1			
Ripple	0.56	0.56	0.49	1		
Cardano	0.64	0.66	0.56	0.54	1	
Solana	0.55	0.61	0.54	0.46	0.52	1
	Bitcoin	Ether	Binance Coin	Ripple	Cardano	Solana

Note: Price return correlations of selected crypto assets from January 2021 to December 2023.

Sources: Kaiko, ESMA.

The exuberant environment that attracted investors during the crypto boom thus concluded, marking the beginning of the so-called **crypto winter in 2022**.

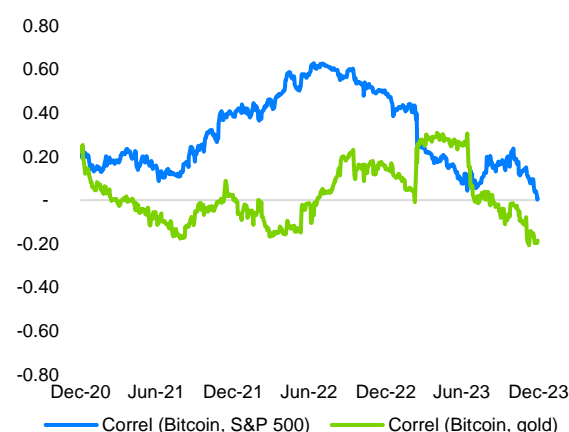
2023 was characterised by increased **regulatory scrutiny and enforcement actions** – primarily in the United States – that had an impact on markets⁷. Only in the fourth quarter of 2023 have crypto-asset prices started a significant recovery and reflected, once again, year-on-year growth rates of around 100%, predominantly driven by the anticipation of regulatory approval for spot Bitcoin exchange-traded funds in the United States, which occurred in January 2024⁸.

Crypto assets have historically shown a mostly procyclical behaviour and a **moderately positive correlation with stock markets**. The correlation between Bitcoin and the S&P 500⁹, for example, rose to more than 0.6 during the wider market downturn in 2022 but has significantly declined over the course of 2023 (Chart 3). An overall positive correlation with equities suggests that crypto assets behave like a risky asset class and that both may be driven by the same underlying factors, including investor sentiment (Adrian et al., 2022). However, price movements are often more extreme for crypto assets and their volatility is usually much larger.

Crypto proponents often describe Bitcoin as digital gold¹⁰, in the sense of an asset whose value is independent from the economy and that can serve as a portfolio diversifier or hedge against inflation. However, when calculating the return correlation **between Bitcoin and gold, we do not find a clear relationship**. Moreover, crypto assets are characterised by a clearly higher volatility. A parallel to gold only seems to occur in periods of punctual stress. For example, during the US banking turmoil in March 2023, both Bitcoin and gold soared simultaneously as investors fled towards non-financial assets.

Chart 3

Bitcoin price correlation with traditional assets Overall positive correlation with equity markets



Note: 90-day price return correlation (measured daily) between Bitcoin, the S&P 500 stock market index, and gold.

Sources: Refinitive, ESMA.

Trading patterns: important links to traditional finance

To grasp the composition of trading volumes, we segment transactions by involved assets, i.e. the assets that are swapped against each other (Chart 4). We distinguish three types of assets: crypto assets¹¹, stablecoins, and fiat currencies.

Crypto-to-crypto and stablecoin-to-crypto transactions

Around 70% to 80% of secondary market transactions occur between crypto assets and other crypto assets or stablecoins, i.e. they do not involve any fiat currency. Spot trading of crypto

⁷ For instance, [BNB's price fluctuation due to SEC's lawsuit](#), [Solana's token SOL controversy over SEC's classification as a security](#), and [Ripple winning a lawsuit against the SEC](#).

⁸ Financial Times, '[SEC approves first spot bitcoin ETFs in boost to crypto advocates](#)', 11 January 2024.

⁹ The correlations of Bitcoin with the Nasdaq 100 index

or the Stoxx Europe 600 index follow a similar trend.

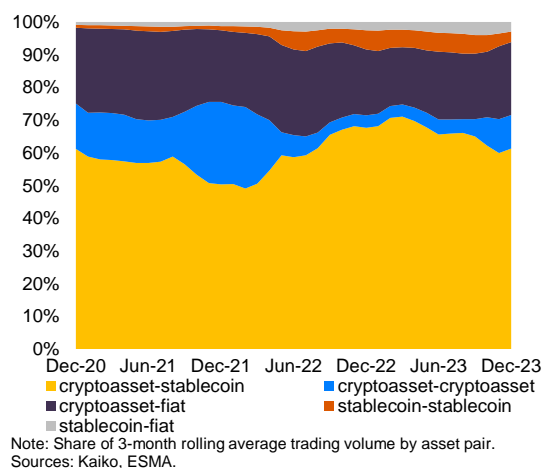
¹⁰ The Block, '[How is bitcoin similar to gold?](#)', 25 August 2023.

¹¹ We refer to crypto assets excluding stablecoins in this case, while stablecoins are normally defined as a subset of crypto assets.

assets is thus largely self-referential, without touchpoints to traditional financial markets. Moreover, purely crypto-internal transactions do not affect the system’s market value, as no inflows or outflows take place.

From 2020 to 2021, when the crypto market experienced strong growth, we observe a heightened share of ‘crypto-crypto’ volumes and a continuous decrease of ‘crypto-stablecoin’ volumes at centralised exchanges. However, with the beginning of the crypto winter in 2022, this observation turns around, with ‘crypto-crypto’ volumes decreasing and giving place to ‘crypto-stablecoin’ trading. Only in the second half of 2023 did the ‘crypto-crypto’ share rise again, amid the market’s recovery. The pattern indicates that investors might more frequently **switch into and out of stablecoins** when volatility is high ¹².

Chart 4
Trading volumes by asset-pair type
50–80% of trading involves stablecoins



Fiat-to-crypto transactions

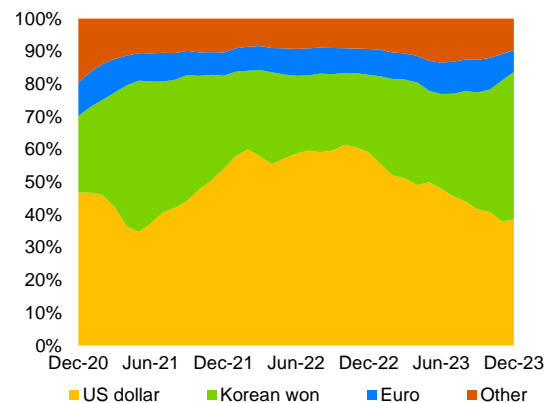
The transaction share involving fiat currencies reflects investors’ on-ramp/off-ramp activity and thus indicates either an increased appetite or flight-to-safety behaviour when cashing out. We observe an overall **downward trend of the ‘crypto-fiat’ share** from around 30% in 2021 to only 20% as of 2023. This is consistent with the crypto winter highlighted above but may also be attributed to the rising popularity of stablecoins, which allow investors to increase or reduce their exposure without leaving the crypto system.

¹² As Kaiko provides exchanges’ off-chain data, trading volumes might not always reflect final blockchain settlements and ignore pure on-chain transactions outside of crypto exchanges.

¹³ Those values will naturally be skewed toward the US dollar, due to its frequent usage also in jurisdictions

To get a sense of crypto investors’ geographical location and given that fiat is used to enter or exit the market ¹³, we looked at the distribution of fiat-to-crypto transactions (Chart 5).

Chart 5
Fiat-to-crypto trading volumes
South Korean won increases its dominance



We observe a clear **dominance of the US dollar and the South Korean won**, which together account for around 80% of fiat volume. The US dollar has historically been the most used fiat currency, which is not entirely surprising given its dominance also in traditional international markets (Drehmann and Sushko, 2022). However, its share has been declining since the last quarter of 2022. On the other hand, usage of the South Korean won has increased significantly, driven by trading volumes in South Korean exchanges, most notably Upbit. Multiple factors can explain this phenomenon, such as the high popularity of crypto assets among South Koreans and the government’s welcoming stance and proactive regulation of this market ¹⁴.

The euro plays only a minor role, with a relatively stable share of around 10%. The announcement of the MiCA regulation has not caused an increase in euro volumes at the current juncture but could constitute a potential growth driver once implemented in 2024, as it is intended to enhance investor protection.

other than the United States. A reliable geographic distribution could only be obtained through identifying counterparty locations, which Kaiko data do not allow.

¹⁴ Cointelegraph, [‘An overview of cryptocurrency regulations in South Korea’](#).

Stablecoins

As of December 2023, stablecoins represented a combined market capitalisation of around USD 130 billion, equivalent to **8% of the overall crypto market**. The largest stablecoins were Tether (USD 95 billion), USD Coin (USD 25 billion) and Dai (USD 5 billion). The once third largest stablecoin, Binance USD, has almost disappeared in 2023, after the US SEC accused its issuer, Paxos, of offering unregistered securities and it was ordered to stop minting new tokens¹⁵. Euro-denominated stablecoins remain negligible at present, with a combined value below EUR 500 million.

The stablecoin market is thus **highly concentrated**, similarly to the overall crypto market, with Tether alone accounting for around 70% of the market capitalisation and 80% to 90% of the trading volume (relative to all stablecoins). It should be noted that Tether has repeatedly faced controversies regarding the opacity around its reserves, and some analysts even claimed it was not fully backed by assets (Faux, 2021).

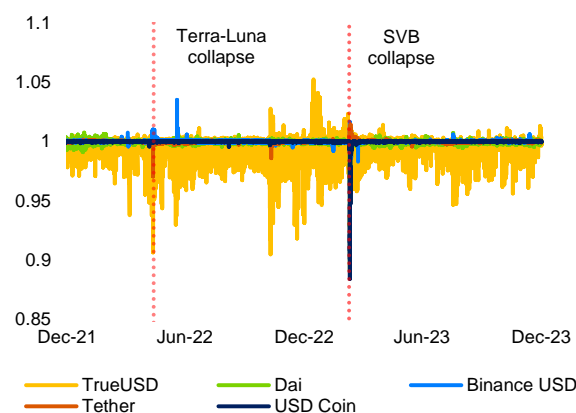
Despite their promise to keep a stable value, stablecoins **frequently deviate from their peg**, especially in situations of wider crypto market stress. One notable situation occurred with the collapse of the Terra-Luna ecosystem in May 2022, which exposed the inherent fragilities of algorithmic stablecoins and caused contagion in the wider crypto market. Tether temporarily fell about 5% below its peg. In March 2023, USD Coin faced a similar liquidity crunch and temporarily lost its peg when its issuer revealed a sizeable exposure to the failing Silicon Valley Bank. It took USD Coin three days to recover its peg. Smaller and less traded stablecoins, such as TrueUSD, seem to de-peg frequently (Chart 6).

These events raise considerable concerns regarding stablecoins' implicit promise of price stability. Moreover, stablecoins should be scrutinised closely as they can act as risk transmission channel between crypto and traditional markets (ESMA, 2022). The EU's MiCA regulation has a particular focus on stablecoins and introduces a comprehensive set of rules for stablecoin issuers.

Chart 6

Stablecoins prices

Frequent deviations from their pegs



Note: Hourly price of relevant stablecoins, in USD.
Sources: Kaiko, ESMA.

Crypto asset exchanges

Our dataset contains over 100 crypto exchanges, out of which we identify 56 **active exchanges**¹⁶ as of December 2023. This covers all large, centralised exchanges. Out of the 56 active exchanges, we identified 7 decentralised exchanges (DEXs)¹⁷, and 9 entities that operate at least one entity as part of their group structure which is registered as a VASP in the European Economic Area¹⁸.

Geographic location

Locating business activity is difficult as crypto assets emerged as an inherently digital and global phenomenon. The data at our disposal do not allow to identify the geographical origin of order flows or where trading is taking place. For DEXs, one might even argue that no location can be determined at all, as trades are directly performed on-chain. However, we can approximate the geographical distribution by allocating trading volumes to the countries in which crypto exchanges are headquartered (Chart 7).

¹⁵ CNBC, '[Crypto firm Paxos to face SEC charges, ordered to stop minting Binance stablecoin](#)', 13 February 2023.

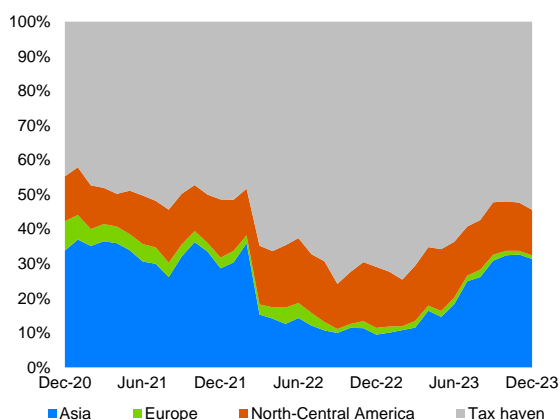
¹⁶ Active exchanges are those that registered at least one transaction in December 2023 according to Kaiko data. The actual number of exchanges may differ.

¹⁷ We understand that the contained DEXs are only a small subset of the overall DEX population. Kaiko offers a separate dataset on DEXs and on-chain activity and we understand that our current dataset contains only those DEXs that publish off-chain information on

executed transactions. As of December 2023, the public website [defillama.com](#) lists 285 DEXs with a total value locked above USD 1 million.

¹⁸ The term VASP is defined under the EU's fifth Anti-Money Laundering Directive (AMLD5). VASPs are required to register with their respective national authority and are supervised for compliance with respect to anti-money laundering and know-your-customer requirements. The MiCA regulation refers to these entities as crypto-asset service providers (CASPs).

Chart 7
Trading volume by exchange domicile
Most crypto exchanges located in tax havens



Note: Share of monthly trading volume (in USD) by geographic location of the exchange headquarters. Location manually identified from publicly available sources.
Sources: Kaiko, ESMA.

Until the implementation of the MiCA regulation, crypto assets and related service providers remained mostly unregulated. In fact, crypto exchanges **largely operate outside of national legal frameworks** and are often based in countries with lighter regulatory requirements. Binance, for example, claims to not have a headquarters, while former crypto exchange FTX was based in the Bahamas and incorporated in Antigua and Barbuda.

By matching on-chain activity with web traffic data, Chainalysis approximates that during the last two years, around 20% of crypto transaction value was received by investors from North America, another 20% from central, northern, and western Europe, and 20% from central and southern Asia (Chainalysis, 2023). Based on the domiciles of crypto exchanges ¹⁹, we find that most trading is performed on exchanges based in tax havens ²⁰.

As regulatory efforts around crypto ramp up in various jurisdictions, **crypto firms are starting to establish subsidiaries** to comply with national or regional rules. However, it will take time until a complete geographical distribution of their activities becomes available.

In this sense, the MiCA regulation is not only the first initiative to set clear and harmonised rules for

¹⁹ Exchange domicile is based on publicly available information and in most cases refers to the location of exchanges' headquarters.

²⁰ The classification of territories as tax havens is based on PwC Portugal, 'Tax Guide 2023 – Favourable Tax Regimes', last reviewed on 23 October 2023.

²¹ Among other things, crypto-asset service providers will be required to create a legal entity in the EU, obtain authorisation from the relevant competent authority and

crypto-asset issuers and service providers in the EU, but it will further contribute to increased transparency through comprehensive disclosure requirements ²¹.

Market shares and concentration

Table 3 displays the largest crypto exchanges by annual trading volume and their corresponding market shares in 2023. The top 10 exchanges execute around 90% of total trading volume and, with a volume of over USD 3.7 trillion or a market share of 49%, **Binance is the largest exchange**. The runner-up, Upbit, recorded only about a seventh of this volume. When comparing volumes year-over-year, we find a significant decline across all exchanges, while the only notable change in market share occurred for Binance, with an annual increase of 13pp.

Table 3
Top-10 exchanges trading volume and market share
Highly concentrated market

Exchange	Trading Volume (bn USD)	YoY (%)	Market Share (%)	YoY (pp)
Binance	3,711	- 32%	49%	+ 10pp
UPbit	523	- 26%	7%	+ 2pp
OKX	475	- 48%	6%	± 0pp
Coinbase	462	- 44%	6%	± 0pp
Bybit	336	+ 378%	4%	+ 4pp
Huobi	276	- 29%	4%	+ 1pp
Uniswap	251	- 48%	3%	± 0pp
Kraken	220	- 45%	3%	± 0pp
KuCoin	197	- 59%	3%	- 1pp
MEXC	191	NA	3%	NA
	6,643		88%	

Note: Annual spot trading volume in billion USD and market share in % of largest crypto-asset exchanges.
Sources: Kaiko, ESMA.

Binance's dominance has been reducing since December 2022, leading to a market share of only 40% as of December 2023 (Chart 8). This development may be attributable to the series of US enforcement actions against Binance, starting with the Wells notice to Paxos – the issuer of the Binance USD stablecoin in February, the Wells notice to Binance and CEO Changpeng Zhao in June ²², and Binance's guilty plea as part of a resolution with the US government in November 2023 ²³. The South Korean exchange Upbit and other smaller crypto exchanges have consequently gained market share.

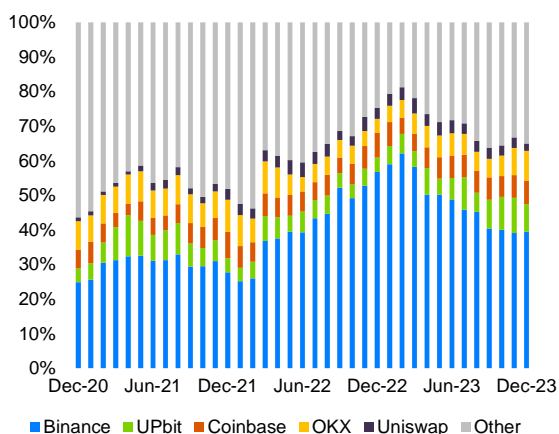
establish know-your-customer policies.

²² U.S. Securities and Exchange Commission, 'SEC Files 13 Charges Against Binance Entities and Founder Changpeng Zhao', 5 June 2023.

²³ U.S. Department of Justice, 'Binance and CEO Plead Guilty to Federal Charges in \$4B Resolution', 21 November 2023.

Binance also represents the largest crypto exchange that holds several **VASP licenses across the EU** ²⁴. Together with Coinbase, the second major holder of EU VASP licenses ²⁵, the exchanges combined an annual trading volume of more than USD 4 trillion in 2023, equivalent to around 55% of global crypto-asset trading and 95% of trading among EU VASPs (bearing in mind that a large part of this volume likely originates from non-EU investors). One might expect trading volumes processed by EU exchanges to increase with the application of the MiCA regulation, given the regulatory certainty and enhanced protection it will provide to firms and investors in the EU.

Chart 8
Distribution of trading volumes by crypto exchanges
Binance: the largest exchange by far



Note: Share of monthly trading volume (in USD) by crypto exchange.
Sources: Kaiko, ESMA.

To further explore the apparent accumulation of trading volumes in only a few crypto exchanges, we compute three measures of **market concentration** over the period 2018 to 2023, displayed in Table 4.

The Herfindahl-Hirschman Index (HHI) ²⁶ in column 1 indicates that the crypto-asset market went from ‘competitive’ between 2018 and 2021 (HHI <1,500), to ‘moderately concentrated’ in 2022 (1,500 < HHI < 2,500), to ‘highly concentrated’ in 2023 (2,500 > HHI). In fact, the market share of the five largest exchanges delivers a consistent picture, with an increasing percentage over the last five years which now

stands at 73%. For crypto exchanges with individual market shares below 1% (column 3), we cannot identify a clear pattern and believe that this figure is predominantly driven by the emergence of new exchanges during boom times, such as 2020/2021, and consolidation as during the market drought in 2022/2023.

Table 4
Market concentration among crypto exchanges
Highly concentrated market

Year	HHI	Top 5	< 1%
2018	1,197	68%	3%
2019	791	54%	5%
2020	901	59%	9%
2021	1,302	63%	9%
2022	1,789	65%	7%
2023	2,616	73%	7%

Note: Market concentration of crypto-asset exchanges, measured by trading volume. HHI: Herfindahl-Hirschman Index; Top 5: market share of the five largest crypto-asset exchanges; < 1%: percentage of trading volume traded on exchanges with less than 1% of market share.
Sources: Kaiko, ESMA.

Market liquidity on exchanges

To assess crypto market liquidity, we computed two liquidity metrics for different crypto exchanges: orderbook depth and bid-ask spreads.

Chart 9 displays the distribution of **orderbook depth** for Bitcoin trading pairs across selected crypto-asset exchanges ²⁷. Unsurprisingly, we find that large exchanges also represent the most liquid venues in terms of market depth. For Binance and Coinbase, a 2% Bitcoin depth in 2023 showed a median value of USD 20 million to USD 25 million, significantly above smaller exchanges and the median exchange in our sample. It should be noted that this metric can fluctuate widely, as indicated by the whiskers in the case of Binance and Coinbase.

²⁴ Binance holds several licenses across the EU. See: [Binance – Licenses and Registrations](#).

²⁵ Coinbase holds several licenses across the EU. See: [Coinbase – Licenses and Regulatory Disclosures](#)). It recently chose Ireland as its MiCA hub. See: Coinbase, ‘[Announcing Ireland as our EU MiCA Entity Location](#)’, 18 October 2023.

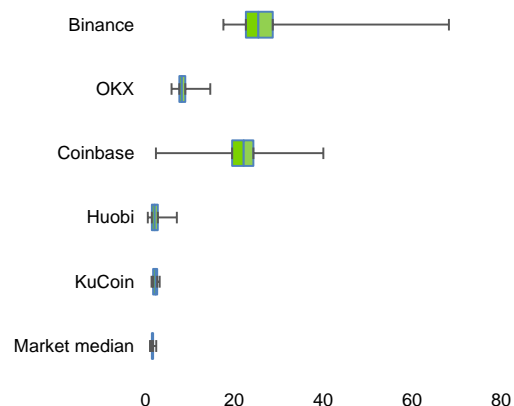
²⁶ The HHI is defined as the sum of squared market

shares in terms of 2023 trading volume.

²⁷ Orderbook depth is measured as value of standing buy and sell orders within an interval of 2% around the mid-price. Considered Bitcoin trading pairs are BTC-USDT, BTC-USDC and BTC-USD, out of which the most liquid pair is displayed for a given exchange. Kaiko orderbook data are only available for some exchanges and daily data were collected from May to December 2023.

Chart 9

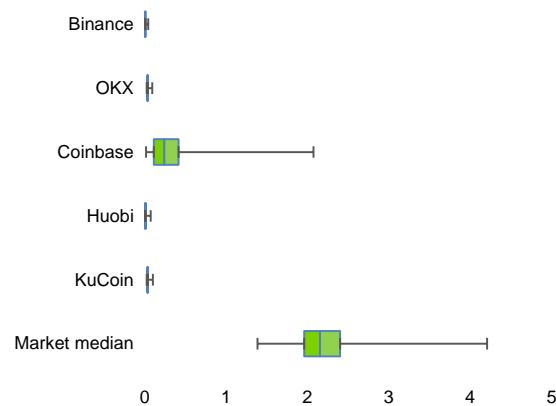
Bitcoin market liquidity: orderbook depth Depth varies largely across exchanges



Note: Distribution of orderbook depth for selected crypto-asset exchanges. Orderbook depth measured as value of standing buy and sell orders within an interval of 2% around the mid-price. Data covering BTC-USDT, BTC-USDC and BTC-USD trading pairs from May to December 2023, in million USD. Sources: Kaiko, ESMA.

Chart 10

Bitcoin market liquidity: bid-ask spread Spreads extremely low at large exchanges



Note: Distribution of bid-ask spreads for selected crypto-asset exchanges. Bid-ask spreads measured as the difference between the lowest ask-price and the highest bid-price, divided by the mid-price. Data covering BTC-USDT, BTC-USDC and BTC-USD trading pairs from May to December 2023, in basis points. Sources: Kaiko, ESMA.

Chart 10 displays **bid-ask spreads** for Bitcoin trading pairs²⁸. For most exchanges, the spreads are very small, significantly below 1 basis point²⁹. This could be an indication of increased high frequency and arbitrage trading in Bitcoin markets. Moreover, we note a higher dispersion of spreads for Coinbase and that the median exchange in our dataset displays markedly larger spreads. Overall, this metric is consistent with orderbook depth. First, larger depth coincides with smaller spreads, and second, the largest crypto exchanges offer higher liquidity (along the two considered metrics) when compared to the median exchange in our sample.

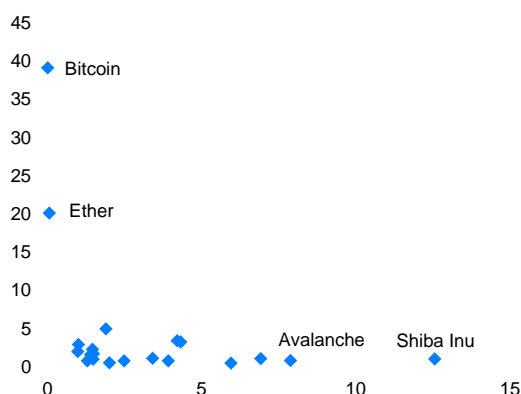
To assess liquidity differences across crypto assets, we compare **bid-ask spreads and trading volumes** of selected assets at Binance (Chart 11). Bitcoin stands out through its high trading volume but also its extremely low bid-ask spread. Ether displays a similarly low bid-ask spread despite exhibiting only around half of Bitcoin's volume. All other assets record significantly lower trading volumes and more sizeable spreads, indicating lower liquidity and markedly higher implicit trading costs.

²⁸ Bid-ask spreads are measured as the difference between the lowest ask-price and the highest bid-price, divided by the mid-price. Considered Bitcoin trading pairs are BTC-USDT, BTC-USDC and BTC-USD, out of which the most liquid pair is displayed for a given exchange. Kaiko orderbook data are only available for some exchanges and daily data were collected from

May to December 2023.

²⁹ Given the high absolute price of Bitcoin (around USD 40 000 as of December 2023), even a 0.1 basis point spread would result in a round-trip transaction cost of 40 cents per token due to spreads.

Chart 11
Trading volume and bid-ask spreads on Binance
Less traded assets have higher spreads

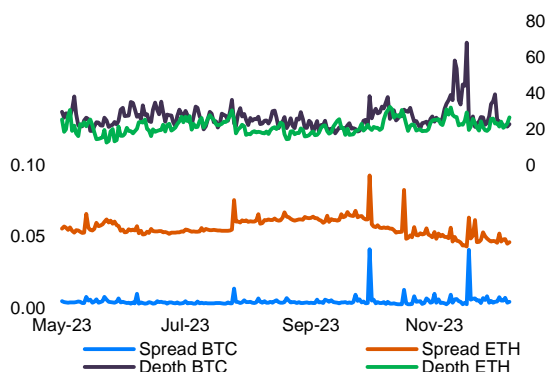


Note: Median bid-ask spreads in basis points (x-axis) vs annual trading volume in billion USD (y-axis) for selected crypto-assets on Binance. Bid-ask spreads collected from May to December 2023.
Sources: Kaiko, ESMA.

For Bitcoin and Ether trading on Binance, we observe **overall stable liquidity in 2023** (Chart 12). In November, Bitcoin depth even temporarily improved, due to its market rally and heightened turnover. As our available data do not cover a major crypto market selloff, we cannot comment on how liquidity at crypto exchanges might behave under wider market stress.

Overall, the presented market liquidity measures are consistent with a highly concentrated market, in which most trading occurs in only a few crypto assets and exchanges.

Chart 12
Bitcoin and Ether market liquidity on Binance
Liquidity remained overall stable in 2023



Note: Daily bid-ask spreads in basis points (bottom panel), and orderbook depth in million USD (top panel) for Bitcoin and Ether trading pairs on Binance. Data collected from May to December 2023.
Sources: Kaiko, ESMA.

Conclusion

By relying on granular crypto-asset trading and orderbook data, we have shed further light on the structure of the crypto-asset market.

A **high level of concentration** has emerged as the key feature at both the asset and the exchange level. While this might be advantageous from an efficiency standpoint (due to economies of scale), it raises considerable concerns regarding the implications of a failure or malfunction at a major asset or exchange for the wider crypto ecosystem.

Crypto assets are **strongly interconnected**, as shown in the high correlations between individual asset prices. Contrary to the frequent claim that crypto assets could represent a safe haven in times of wider market stress, we find a certain co-movement with equities and no stable relationship with gold.

Fiat-crypto trading volumes reflect on- and off-ramp activity into and from the crypto-asset market. However, **only 20% to 30% of all transactions involve fiat currencies**, and about 80% of those involve the US dollar or the South Korean won. The euro only plays a minor role.

Stablecoins form part of over 60% of all transactions. They fulfil a function similar to fiat money, are used to store value without leaving the crypto system, and to cash into or out of other crypto assets. They have historically shown significant fluctuations from their peg, despite their implicit promise of price stability. Tether accounts for 70% of stablecoin market capitalisation and 90% of stablecoin volumes.

While it is difficult to trace the origin of transactions, we find that crypto exchanges are often domiciled in countries that could be labelled as tax havens. We observe that the market concentration among exchanges has increased over time and that **Binance alone accounts for more than 50% of trading volume**. Around 55% of transactions are executed on crypto exchanges that hold an EU VASP license. However, most of those transactions are likely to occur outside of the EU.

Finally, we have calculated two market liquidity metrics and found that **liquidity is similarly concentrated** in a few exchanges but can vary widely between exchanges and over time. Unsurprisingly, we find that liquidity is significantly better for the most-traded assets.

ESMA will continue to monitor crypto assets, the risks they pose to consumers and their implications for traditional financial markets. Going forward, the findings and indicators of this article will contribute to this activity.

References

- Adrian, T., Iyer, T. and Qureshi, M. S. (2022), '[Crypto Prices Move More in Sync With Stocks, Posing New Risks](#)', IMF blog, International Monetary Fund.
- Aramonte, S., Huang, W. and Schrimpf, A. (2021), '[DeFi risks and the decentralisation illusion](#)', BIS Quarterly Review, Bank for International Settlements.
- Arner, D. W., Auer, R. and Frost, J. (2020), '[Stablecoins: Risks, Potential and Regulation](#)', BIS Working Paper No 905, Bank for International Settlements.
- BIS (2023), '[Financial stability risks from cryptoassets in emerging market economies](#)', BIS Papers No 138, Bank for International Settlements.
- Chainalysis (2023), '[The 2023 Geography of Cryptocurrency Report](#)'.
- Drehmann, M. and Sushko, V. (2022), '[The global foreign exchange market in a higher-volatility environment](#)', BIS Quarterly Review, Bank for International Settlements.
- ESMA (2022), '[Crypto-assets and their risks for financial stability](#)', Publications Office of the European Union, Luxembourg.
- ESMA (2023a), '[Decentralised Finance: A categorisation of smart contracts](#)', Publications Office of the European Union, Luxembourg.
- ESMA (2023b), '[Decentralised Finance in the EU: Developments and risks](#)', Publications Office of the European Union, Luxembourg.
- ESAs (2018), '[ESMA, EBA and EIOPA warn consumers on the risks of Virtual Currencies](#)'.
- ESAs (2022), '[EU financial regulators warn consumers on the risks of crypto-assets](#)'.
- Faux, Z. (2021), '[Anyone Seen Tether's Billions?](#)', Bloomberg Businessweek.
- Financial Stability Board (2022), '[Assessment of Risks to Financial Stability from Crypto-assets](#)'.
- Panetta, F. (2022), '[Crypto dominos: the bursting crypto bubbles and the destiny of digital finance](#)', Keynote speech at the Insight Summit held at the London Business School.

Glossary

Non-exhaustive list of terms used in this article. Descriptions based on usage by official international institutions, incl. BIS, FSB, IMF and IOSCO. Terms and their definitions may change in future given the rapidly-evolving nature of crypto-asset markets.

Algorithmic stablecoin: A type of stablecoins that use algorithms to defend their peg. Usually, this is done by automatically issuing more coins when their price is too high and buying coins off the market when their price is too low. Contrary to reserve-backed stablecoins, they do not rely on a one-to-one reserve backing of issued coins.

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

Crypto asset: A type of private sector digital asset that depends primarily on cryptography and distributed ledger or similar technology.

Crypto-asset exchange: Any trading platform where crypto-assets can be bought and sold, regardless of the platform's legal status.

Crypto-asset service provider (CASP): Any entity whose occupation or business is the provision of one or more crypto-asset services to third parties on a professional basis. The term is defined under the MiCA regulation.

Crypto-asset trading pair: Any tradeable combination of crypto assets available at crypto-asset exchanges. A trading pair consists of two assets which can be exchanged against each other, for example, the 'Bitcoin-Ether' or the 'Bitcoin-US dollar' pair.

Decentralised exchange (DEX): Any marketplaces that allow users to trade crypto assets directly with each other without the need for a central authority or intermediary.

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

Distributed ledger technology (DLT): A means of saving information through a distributed ledger (i.e. a repeated digital copy).

Smart contract: A self-executing application that can trigger an action if some prespecified conditions are met.

Stablecoins: A crypto-asset that aims to maintain a stable value relative to a specified asset, or a pool or basket of assets.

Virtual asset service provider (VASP): Any entity that offers services relating to crypto assets and digital tokens. The term is defined under the EU's fifth Anti-Money Laundering Directive. VASPs are required to register with national authorities and are supervised for compliance with respect to anti-money laundering and know-your-customer requirements. The MiCA regulation refers to these entities as crypto-asset service providers (CASPs).

