ESMA TRV Risk Analysis

Crypto assets: Market structures and EU relevance
Financial Innovation

Crypto assets: Market structures and EU relevance

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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).

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. 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.

Chart 1
Crypto-asset market capitalisation
Volatile market growth

0 500 1,000 1,500 2,000 2,500 3,000
Jan-15 Jan-17 Jan-19 Jan-21 Jan-23
Bitcoin Ethereum Tether Others

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).

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

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

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.

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

<table>
<thead>
<tr>
<th>Crypto Asset</th>
<th>Market capitalisation</th>
<th>Turnover</th>
<th>% of market share</th>
<th>% of market share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bn USD</td>
<td>%</td>
<td>bn USD</td>
<td>%</td>
</tr>
<tr>
<td>Bitcoin</td>
<td>850</td>
<td>51%</td>
<td>1,432</td>
<td>19%</td>
</tr>
<tr>
<td>Ether</td>
<td>269</td>
<td>17%</td>
<td>565</td>
<td>7%</td>
</tr>
<tr>
<td>Tether</td>
<td>93</td>
<td>6%</td>
<td>2,216</td>
<td>29%</td>
</tr>
<tr>
<td>Binance Coin</td>
<td>48</td>
<td>3%</td>
<td>41</td>
<td>1%</td>
</tr>
<tr>
<td>Solana</td>
<td>43</td>
<td>3%</td>
<td>101</td>
<td>1%</td>
</tr>
<tr>
<td>Ripple</td>
<td>31</td>
<td>2%</td>
<td>127</td>
<td>2%</td>
</tr>
<tr>
<td>USD Coin</td>
<td>25</td>
<td>2%</td>
<td>265</td>
<td>3%</td>
</tr>
<tr>
<td>Cardano</td>
<td>20</td>
<td>1%</td>
<td>29</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Dogecoin</td>
<td>12</td>
<td>1%</td>
<td>47</td>
<td>1%</td>
</tr>
<tr>
<td>Toncoin</td>
<td>8</td>
<td>&lt;1%</td>
<td>2</td>
<td>&lt;1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,660</strong></td>
<td><strong>86%</strong></td>
<td><strong>4,820</strong></td>
<td><strong>64%</strong></td>
</tr>
</tbody>
</table>

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 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.

![Crypto-asset price indexes: Boom and bust of crypto prices](chart2.png)

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.

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.

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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.
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. 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 markets. 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 2024.

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 500, 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. However, price movements are often more extreme for crypto assets and their volatility is usually much larger.

<table>
<thead>
<tr>
<th></th>
<th>Bitcoin</th>
<th>Ether</th>
<th>Binance Coin</th>
<th>Ripple</th>
<th>Cardano</th>
<th>Solana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitcoin</td>
<td>1</td>
<td>0.82</td>
<td>0.64</td>
<td>0.56</td>
<td>0.64</td>
<td>0.55</td>
</tr>
<tr>
<td>Ether</td>
<td>1</td>
<td>0.82</td>
<td>0.65</td>
<td>0.56</td>
<td>0.56</td>
<td>0.61</td>
</tr>
<tr>
<td>Binance Coin</td>
<td>0.64</td>
<td>1</td>
<td>0.65</td>
<td>0.56</td>
<td>0.66</td>
<td>0.61</td>
</tr>
<tr>
<td>Ripple</td>
<td>1</td>
<td>0.65</td>
<td>1</td>
<td>0.54</td>
<td>0.66</td>
<td>0.61</td>
</tr>
<tr>
<td>Cardano</td>
<td>0.56</td>
<td>0.56</td>
<td>0.66</td>
<td>0.54</td>
<td>0.66</td>
<td>0.61</td>
</tr>
<tr>
<td>Solana</td>
<td>0.55</td>
<td>0.46</td>
<td>0.52</td>
<td>1</td>
<td>0.61</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Table 2: Selected crypto asset price correlations

**Highly interconnected market**

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

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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.

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.

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

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.

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.

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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 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 tokens. 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.

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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).

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Chart 6
Stablecoins prices
Frequent deviations from their pegs

<table>
<thead>
<tr>
<th>Stablecoin</th>
<th>Dec-21</th>
<th>Jun-22</th>
<th>Dec-22</th>
<th>Jun-23</th>
<th>Dec-23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tether</td>
<td>1.05</td>
<td>0.95</td>
<td>0.9</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>USD Coin</td>
<td>1.1</td>
<td>1.05</td>
<td>1.0</td>
<td>0.95</td>
<td>0.9</td>
</tr>
<tr>
<td>Binance USD</td>
<td>1.05</td>
<td>1.1</td>
<td>1.1</td>
<td>1.05</td>
<td>1.05</td>
</tr>
</tbody>
</table>

Note: Hourly price of relevant stablecoins, in USD. 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, we find that most trading is performed on exchanges based in tax havens.

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

**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.

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


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 establish know-your-customer policies.


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.

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.

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.

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\(^{24}\) 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 displays **bid-ask spreads** for Bitcoin trading pairs. For most exchanges, the spreads are very small, significantly below 1 basis point. 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.

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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.
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.

**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


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’.


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 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).

**Crypto-asset trading pair**: Any tradeable combination of crypto assets available at crypto-asset exchanges. A trading pair consist 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).