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Crypto shocks and retail losses

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Crypto shocks and retail losses

Key takeaways[1]

- *A new data set on retail holdings of cryptoassets reveals that in the wake of the Terra/Luna collapse and the FTX bankruptcy, crypto trading activity increased markedly, with large and sophisticated investors selling and smaller retail investors buying.*
- *Data on major crypto trading platforms over August 2015–December 2022 show that, as a result, a majority of crypto app users in nearly all economies made losses on their bitcoin holdings.*
- *Nevertheless, despite crypto's large user base and the substantial losses to many investors, the market turmoil in 2022 had little discernible impact on broader financial conditions outside the crypto universe, underlining the largely self-referential nature of crypto as an asset class.*

Millions of investors entered the crypto market over the past few years. They bought and sold coins on exchanges and lending platforms, including in decentralised finance (DeFi) markets. The inflow of investors – especially retail investors – continued despite crypto's high price volatility and the lack of productive real-world use cases.

After prices peaked in November 2021, crypto's rise reversed course in 2022, when the prices of many cryptoassets collapsed. As valuations tumbled, over $1.8 trillion of crypto value dissolved. Over $450 billion vanished during the market turmoil following the Terra/Luna collapse in May 2022 alone; another $200 billion was lost in the wake of the FTX bankruptcy in November 2022.

This Bulletin addresses three main issues surrounding the crypto market, building on a new database (Auer et al (2022)). First, it investigates trading behaviour by large and small investors around the world during the Terra/Luna and FTX meltdowns. Second, it assesses whether users made or lost money on their investments on average. And third, it analyses whether the market turmoil in crypto and DeFi in 2022 had any discernible effects on financial conditions in the broader financial markets outside the crypto universe.

Market dislocations and crypto trading

To investigate patterns in crypto trading, we build on a novel database on retail use of crypto exchange apps at daily frequency for 95 countries from August 2015 to mid-December 2022. Data on the adoption of crypto apps come from Sensor Tower, which collects information on downloads and active use for apps – our proxy for new users – from the Apple and Google Play store on more than 200 crypto exchange apps.[2] Additionally, we collect on-chain data on the daily distribution of bitcoin holdings by account balance from IntoTheBlock. We contrast small and medium bitcoin holders (those with less than one and

[1] This paper draws on Auer et al (2022). The database is available at www.bis.org/publ/work1049_data_xls.xlsx.

[2] Sensor Tower gauges unique downloads per iOS or Google Play account. This methodology avoids double-counting due to re-downloads. Active users are defined as any user that has at least one session on an app over a specific time period.

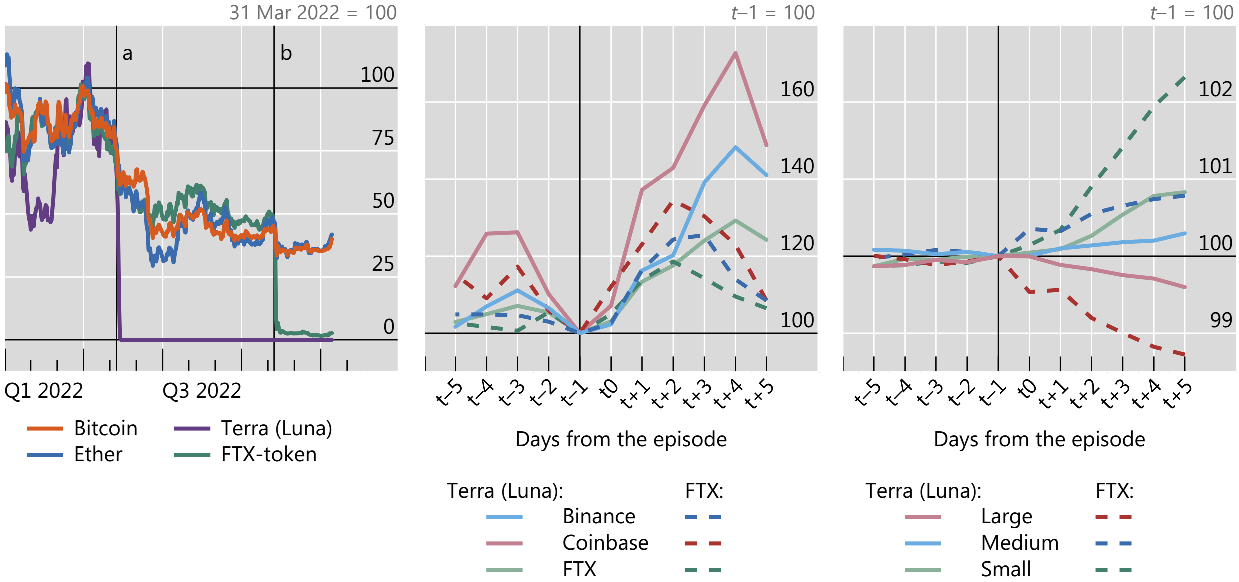
between one and 1,000 bitcoin, respectively) with large holders that own wallets in excess of 1,000 bitcoin – so-called "whales".

As prices rose, more and more users entered the crypto system. Between August 2015 and its peak in November 2021, the price of bitcoin rose from $250 to $69,000. Meanwhile, the monthly average number of daily active users grew from around 100,000 to more than 30 million globally. During the rapid price increases in late 2017 and early 2021, around 100 million and 500 million new users joined (Auer et al (2022)).[3]

Over the course of 2022, however, the price of many crypto coins, including bitcoin and ether, fell by around 75% (Graph 1.A). Two episodes of market turmoil stand out. First, in May 2022 algorithmic stablecoin TerraUSD (UST), which was supposed to keep a one-for-one peg to the US dollar, collapsed. When the value of UST plummeted from $1 to almost zero in a few days, it sent shockwaves through the system. Between May and June, over $450 billion in asset value in crypto and DeFi were destroyed. Second, in November 2022 the crypto platform FTX collapsed following a run sparked by concerns about its liquidity and solvency. Similar to the Terra/Luna crash, the price of the FTT token (an in-house FTX token) fell rapidly, and ultimately FTX filed for bankruptcy. As part of the rout, bitcoin, ether and other cryptoassets fell by over 20% in value in a matter of days.

In stormy seas, "the whales eat the krill" Graph 1

A. As prices tumbled... B. ...all users traded more...[1] C. ...but whales sold while krill bought[2]



[a] Terra USD and Luna collapse, 8 May 2022. [b] FTX collapse, 7 November 2022.

[1] Based on daily active users of cryptoexchange apps. [2] Based on the number of BTC held in addresses with balance less than 1 BTC (small), 1–1000 BTC (medium), and more than 1000 BTC (large).

Sources: CoinGecko; IntoTheBlock; Sensor Tower; authors' calculations.

A striking pattern during both episodes was that trading activity on the three major crypto trading platforms increased markedly. As shown in Graph 1.B, the number of daily active users on Binance,

[3] The use of crypto apps differs starkly across countries. While some jurisdictions registered fewer than one average monthly users of crypto exchange apps per 100,000 people, others registered 1,500 or more. The group of top downloading jurisdictions comprised both advanced economies such as Australia, Canada, Ireland, the Netherlands, New Zealand, the United Kingdom and the United States and emerging market and developing economies (EMDEs) such as El Salvador, Hong Kong SAR, Korea, Singapore, Turkey and the United Arab Emirates.

Coinbase and FTX jumped after news about the troubles of Terra (solid lines) and FTX (dashed lines) broke. These patterns suggest that users tried to weather the storm by adjusting their portfolios away from owning tokens under stress towards other cryptoassets, including asset-backed stablecoins.

However, larger investors probably cashed out at the expense of smaller holders. The data reveal that owners of large wallets, the "whales", reduced their holdings of bitcoin in the days after the shock episodes (Graph 1.C). Medium-sized holders, and even more so small holders ("krill"), increased their holdings of bitcoin. The price patterns suggest that larger investors were able to sell their assets to smaller ones before the steep price decline. As discussed in Auer et al (2022), large holders thus profited at the expense of smaller investors.

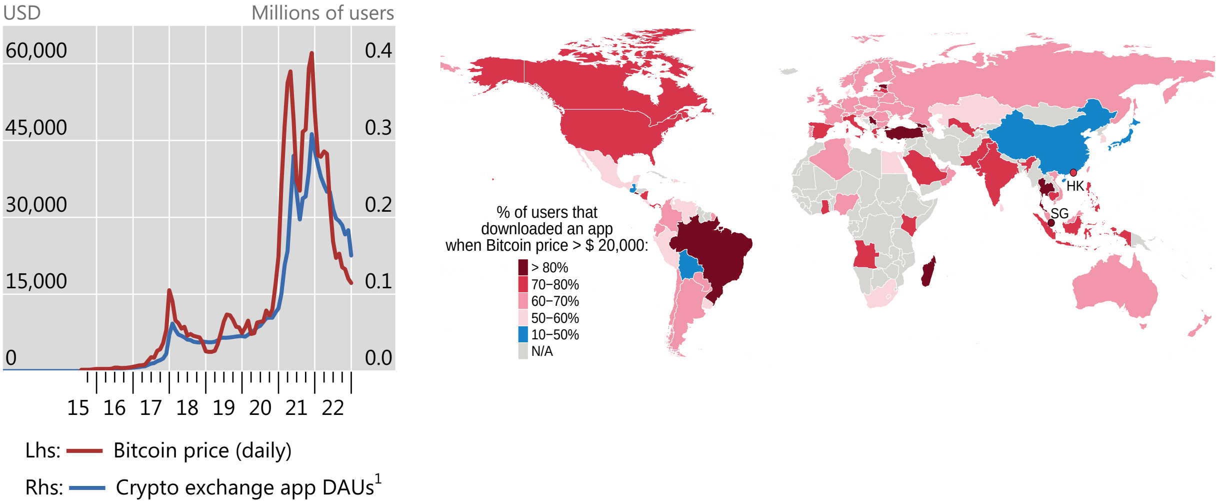
From rags to riches to rags?

A pattern of losses on crypto investments varying by the size of retail investor holding is confirmed for longer periods. Graph 2.A suggests that new users entered the crypto universe lured by the prospect of rising prices. While the bitcoin price and user numbers have moved in lockstep, upticks in user numbers usually lagged rises in the price by an average of about two months.[4] The fact that adoption rises in the wake of price increases suggests that users enter the system attracted by high prices and in the expectation that prices continue to go up. Indeed, as shown in Auer et al (2022), this positive correlation remains robust when controlling for other potential drivers, such as overall financial market conditions, uncertainty or country characteristics. In particular, the price of bitcoin remains a much more important predictor of adoption compared with many other indicators, including stock market performance or volatility, changes in the price of gold or the levels of global uncertainty.

Retail investors have chased prices, and most have lost money — Graph 2

A. More users trade when the bitcoin price increases…

B. …but a large share of users in nearly all economies probably lost money[2]



[1] Cross-country monthly average of daily active users (DAUs). Calculated on a sample of more than 200 crypto exchange apps over 95 countries. [2] The use of this map does not constitute, and should not be construed as constituting, an expression of a position by the BIS regarding the legal status or sovereignty of any territory or its authorities, the delimitation of international frontiers and boundaries and/or the name and designation of any territory, city or area. Based on data up to mid-December 2022.

Sources: World Bank; CryptoCompare; Sensor Tower; authors' calculations.

[4] Similar price dynamics can be observed for the price of ether and new users on the Ethereum blockchain (Boissay et al (2022)).

To determine the performance of retail crypto investments at the individual level, we analyse the distribution of the number of users downloading the crypto exchange apps for different bitcoin prices. These data show that almost threequarters of the users downloaded a crypto platform app when the price of bitcoin was above $20,000. Assuming users invested in bitcoin on the same day they downloaded the app, we proxy the size of the loss on their initial investment relative to a given price level. Additionally, we perform a series of simulations. In particular, we assume that each new user bought $100 of bitcoin in the month of the first app download and in each subsequent month.

In nearly all economies in our sample, a majority of investors probably lost money on their bitcoin investment (Graph 2.B). The median investor would have lost $431 by December 2022, corresponding to almost half of their total $900 in funds invested since downloading the app. Notably, this share is even higher in several emerging market economies like Brazil, India, Pakistan, Thailand and Turkey. If investors continued to invest at a monthly frequency, over four fifths of users would have lost money.

Crypto crashes have little impact on broader financial conditions

The collapse of TerraUSD and the bankruptcy of FTX were each associated with large losses among venture capital and retail investors. In the light of the ongoing debate on how to address the risks from crypto, an important question is whether the stress in the crypto system spilled over to the wider financial system.

Graph 3 investigates the relationship between crypto adoption and the broader financial system during the two shock episodes. It plots a country's level of crypto adoption between January 2021 and June 2022 on the horizontal axis. This measure serves as a proxy for the losses subsequently incurred during the Terra/Luna crash by crypto investors. The vertical axis plots the change in local equity prices (Graph 3.A) or financial conditions (Graph 3.B) during the Terra/Luna shock (red dots) and the FTX collapse (blue dots). Each dot represents a country, and the lines show the estimated relationship between crypto usage and conditions in the wider financial system.

The evidence suggests that crypto shocks have a limited impact on equity prices or broader financial conditions. For either metric during the two crypto stress episodes, there is at best a weak correlation between broader stress and crypto losses. While the crypto collapse may have affected individual investors, the aggregate impact on the broader system was limited. These patterns underline the largely self-referential nature of DeFi and crypto (Aramonte et al (2022)).[5]

Conclusion

Around the world, bitcoin price increases have been tied to greater entry by retail investors. However, most global investors have probably lost money on their crypto investments. These losses could be exacerbated by the fact that larger, more sophisticated investors tended to sell their coins right before steep price declines, while smaller investors were still buying. These patterns highlight the need for better investor protection in the crypto space.

Our analysis also suggests that the steep decline in the size of the crypto sector has not had repercussions for the wider financial system so far. However, if crypto were more intertwined with the real economy and the traditional financial system, the aggregate impact of a shock in the crypto world could have been much larger.

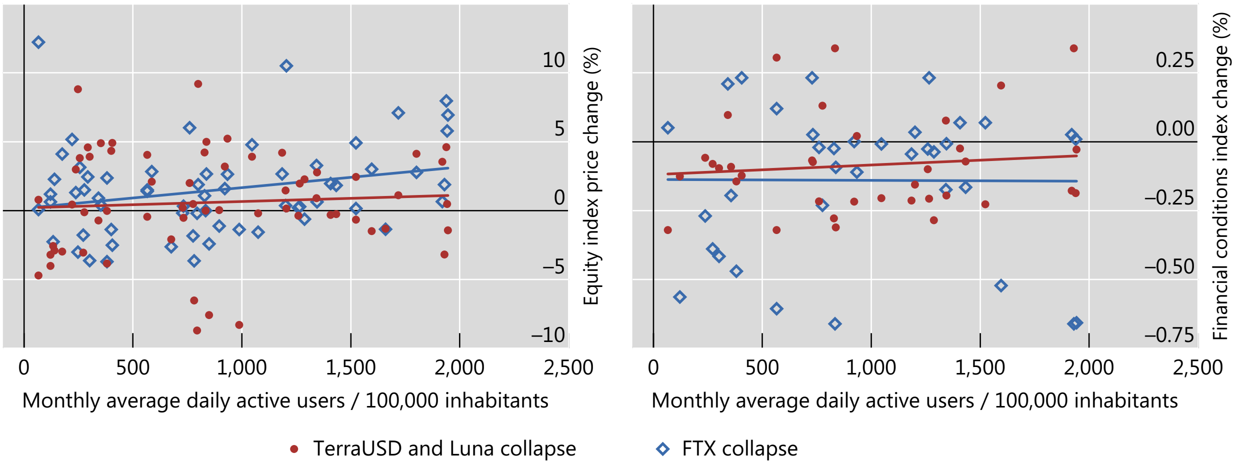
[5] While our results suggest that crypto shocks had no effect on the wider financial system, Benigno and Rosa (2023) show that, vice versa, the bitcoin price does not react to macroeconomic or monetary news.

Crypto turmoil had little effect on the broader financial system

Graph 3

A. No strong relationship between crypto adoption and stock market performance during turmoil…

B. …or with financial conditions



The variable on the x-axis corresponds to the country-specific maximum value of the crypto exchange apps' monthly average daily active users per 100,000 inhabitants over the period Jan 2021–Jun 2022. The variables on the y-axis correspond to the seven-day percentage change from a crash episode in the MSCI country-specific local currency price index for panel A, and the country-specific financial conditions index (FCI) for panel B. Data are winsorised at the 5th and 95th percentiles.

Sources: Bloomberg; Refinitiv Eikon; Sensor Tower; authors' calculations.

To ensure the stability of the financial system, societies must decide on the appropriate policy response to address risks in crypto before they become systemic. They should preferably act in a globally coordinated way. Options include banning specific crypto activities, containing crypto, regulating the sector or a combination of these (Aquilina et al (2023)). Containment may prevent risks in crypto from spilling over to the real economy and traditional financial system. The appropriate mix of measures will be needed to promote market integrity, investor protection and financial stability.

References

Aquilina, M, J Frost and A Schrimpf (2023): "Addressing the risks in crypto: laying out the options", *BIS Bulletin*, no 66, January.

Aramonte, S, S Doerr, W Huang and A Schrimpf (2022): "DeFi lending: intermediation without information?", *BIS Bulletin*, no 57, June.

Auer, R, G Cornelli, S Doerr, J Frost and L Gambacorta (2022): "Crypto trading and Bitcoin prices: evidence from a new database of retail adoption", *BIS Working Papers*, no 1049, November.

Benigno, G and C Rosa (2023): "The Bitcoin-Macro Disconnect", *Federal Reserve Bank of New York Staff Reports*, no 1052, February.

Boissay, F, G Cornelli, S Doerr and J Frost (2022): "Blockchain scalability and the fragmentation of crypto", *BIS Bulletin*, no 56, June.

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