

Market structure of cryptoasset exchanges: Introduction, challenges and emerging trends

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Introduction

Cryptoasset exchanges rose to occupy a central role in the crypto ecosystem as cryptoassets matured from a specialized interest to an alternative asset class.¹ They match buyers and sellers in milliseconds, serve as a gateway for users to swap between fiat money and cryptoassets and help start-ups raise capital through initial exchange offerings (Chavez-Dreyfuss 2019). For these reasons, cryptoasset exchanges play an essential role in promoting an efficient and vibrant cryptoasset market.

However, leveraging the services of cryptoasset exchanges carries risk for participants. Benefits such as executing trades in a split second happen at the expense of exchanges substituting the public blockchain with private ledgers. This means that the exchanges (or their payment processors) have complete control over user funds. Moreover, most of the exchanges are located offshore and are not subject to regulatory oversight that ensures consumer protection and market integrity (Massad 2019). Combined, these two factors mean that exchange users risk having their money stolen by hackers, payment processors or the exchanges themselves. A high-profile example of this is the November 2022 collapse of the exchange FTX where the exchange misappropriated about US\$8.7 billion of customers' assets.² As a Bitcoin purist might say, "not your keys, not your coins."

With these benefits and risks in mind, we provide a comprehensive background of centralized cryptoasset exchanges and highlight the key differences between them and exchanges in traditional financial markets. Our work proceeds as follows. First, we characterize the typical functions that cryptoasset exchanges perform and contrast them with those performed by traditional financial market infrastructures. We then describe how centralized cryptoasset exchanges tend to be vertically integrated and solely responsible for facilitating transactions. Next, we establish three facts about cryptoasset exchanges:

- they vary in terms of size, location and design
- they store user funds of significant value
- they have lost user funds on many occasions

Lastly, we discuss several trends and attempts in the industry to address salient issues that users face. In particular, innovations and regulations are being developed to better safeguard user assets, integrate exchanges with traditional payment infrastructures and bridge liquidity between exchanges.

¹ Two measures of this rise are the growing adoption from institutional investors, documented by Bhutoria (2020), and the significant growth in trading of cryptoasset securities and derivatives on regulated trading platforms.

² See p. 2 of "Second Interim Report of John J. Ray III to the Independent Directors: The Commingling and Misuse of Customer Deposits at FTX.com," in *re FTX Trading Ltd. et al.*, United States Bankruptcy Court for the District of Delaware, Case No. 22-11068 (JTD), Docket No. 1704 (filed June 26, 2023).

We contribute to the literature on the microstructure of the cryptoasset market with some coverage of the policy contributions from regulators and policymakers on cryptoassets.³

Typical operations of exchanges

Cryptoasset exchanges can often be categorized as either centralized (CeFi exchanges or CEXs) or decentralized (DeFi exchanges or DEXs). Although DEXs' share of the market is growing, most trades occur on CEXs.⁴ For this reason, we focus on CEXs. However, we describe DEXs further in the section about [emerging trends and challenges](#).

Cryptoasset exchanges play a central role in the cryptoasset space. The share of all Bitcoin and Ether held on CEXs reached a high of 17% and 30%, respectively, in early 2020, but have since declined to about 11% and 12%, respectively.⁵ This drop was largely because of the closure of FTX and the decline in cryptoasset prices (Asgari 2022).⁶ Another reason for the declining share of cryptoassets held on CEXs is the rise of DEXs and companies that store or safeguard user cryptoassets, also known as dedicated custodians.

CEXs perform a variety of functions. In this section, we focus on a typical currency swap for illustrative purposes. CEXs also perform clearing of derivatives, which is more complicated in nature than spot exchanges because it also requires monitoring of margin requirements and collateralization of positions before settlement.

Centralized exchanges operate as infrastructures that are only partially connected to the blockchain. A user's interaction with an exchange typically begins when a user creates an account with an exchange. This usually requires the user to provide the exchange with personal information for an identity and background check, also known as a know-your-customer (KYC) check. Once the KYC check is complete, the exchange assigns a unique deposit wallet to the user for each blockchain network that the exchange connects to, such as Bitcoin or Ethereum. Users can then deposit cryptoassets or fiat currency into their wallets on the exchange. If the user deposits cryptoassets, then the transaction is settled on-chain, meaning it takes place on the blockchain and is recorded in a public ledger.⁷ Transactions with fiat currency are settled within the traditional financial system. After the funds are deposited, the user can begin trading.

³ For a recent review of cryptoasset market microstructure, see Chen, Gurrola-Pérez and Lin (2023).

⁴ According to [The Block](#), the ratio of spot volume trading on DEXs to CEXs is currently less than 15%, although it did grow from 1% in 2020 to a high of 22% in May 2023.

⁵ The data are obtained from [Glassnode](#).

⁶ See Feyen, Kawashima and Mittal (2022) for a comparison of worldwide and country-specific dynamics in the cryptoasset market.

⁷ An on-chain transaction is one that is included on a distributed ledger or blockchain. Various blockchains have different consensus mechanisms for achieving agreement among users about which transactions should be included on the distributed ledger. Bitcoin uses a proof-of-work system, while Ethereum has moved to a proof-of-stake system. For an overview of blockchain technology, see [Yaga et al \(2018\)](#).

Once a trade is completed on a cryptoasset exchange, the assets are settled on the exchange’s platform in real time—that is, on the exchange’s private ledgers that the users cannot access. By being the custodian of its users’ assets, a CEX retains the assets and updates the composition of liabilities on its balance sheet to settle transactions. From the user’s perspective, their account balances are updated immediately after a trade. However, the settlement on CEXs is not final until the assets are withdrawn into a user’s wallet or bank account. For a user to withdraw cryptoassets, another on-chain transaction needs to be sent from the exchange’s withdrawal (or “hot”) wallet to a wallet the user chooses (**Figure 1**).⁸ This act marks the final, irrevocable delivery of funds. When the user is withdrawing or depositing fiat currencies, exchanges—especially unregulated ones—typically rely on third-party payment processors to send funds to the user’s bank account.

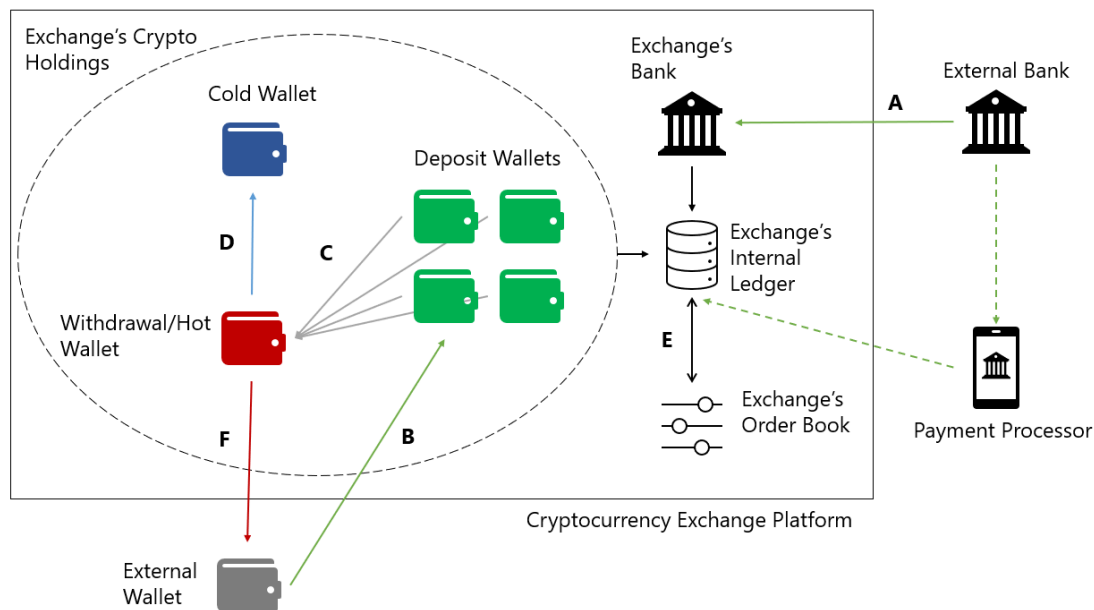
The exchange often performs additional on-chain transactions to securely store excess tokens and ensure that its users can withdraw their cryptoassets. Due to the pseudo-anonymous nature of cryptoassets, the exchange creates (and owns) “deposit” wallets, which it assigns to users. When funds appear in one of these wallets, the exchange can identify which user made the deposit and the exchange can then update its internal ledger accordingly. Typically, the exchange moves, or sweeps, funds from a deposit wallet into the exchange’s hot wallet. Occasionally, the hot wallet contains more tokens than needed for the exchange’s day-to-day operations. When that happens, the exchange can send excess tokens to a cold wallet, which is usually an offline multisignature wallet.⁹ The exchange keeps both wallets for security and operational reasons. By storing assets in a cold wallet, the exchange minimizes the potential losses from a hack. Meanwhile, the remaining funds in the hot wallet ensure that an exchange has enough liquidity to promptly meet the demand for withdrawals.¹⁰ Sometimes, the reverse transaction happens when funds are moved from a cold wallet to a depleted hot wallet, commonly referred to as a top-up.

⁸ For security reasons, the exchange holds less than between 5% and 10% of its cryptoassets in the hot wallet. An exchange can, when asked, transfer cryptoassets from this wallet to a wallet of the user’s choosing. For example, a user might request a withdrawal to a self-custody wallet or to a deposit wallet at another exchange.

⁹ A multisignature wallet requires two or more keys to send a transaction. These wallets are generally safer than a standard wallet that only requires a single key.

¹⁰ For an example, Binance provides an overview of its wallet management system [on its website](#).

Figure 1: Deposits and withdrawals at centralized crypto exchanges



Note: All wallet icons correspond to addresses on a blockchain. The rectangular box specifies what a centralized exchange controls, and the dashed oval corresponds to the exchange's holdings of cryptoassets. Users can deposit fiat currency through traditional financial market infrastructure (arrow A). If the exchange does not have a stable banking relationship, it may use a payments processor for fiat deposits (dashed arrows) or may not accept fiat deposits. For cryptoasset deposits, users can transfer funds from their personal cryptoasset wallets to the deposit wallets the exchange assigns them (arrow B). Occasionally, the exchange moves, or sweeps, funds from deposit wallets into a hot wallet (arrow C). An exchange can transfer any excess funds in a hot wallet to a cold wallet (arrow D). After users deposit funds into an exchange, the exchange records these deposits on its private internal ledger, allowing users to trade these funds on the exchange's platform (arrow E). The exchange allows users to withdraw funds externally, for instance to an external wallet (arrow F) or to a private bank account (reverse of arrow A).

Difference from traditional financial market infrastructure

Extended functionalities

Cryptoasset exchanges have some functions and tools that are similar to those of traditional (TradFi) exchanges. For instance, users can place market and limit orders for trades, and an exchange matches traders. Like traditional exchanges, cryptoasset exchanges also help with price discovery, information exchange, elimination of arbitrages and liquidity provision.¹¹ For

¹¹ One example of how eliminating arbitrage differs between crypto and traditional exchanges is in latency arbitrage where participants can use trading algorithms to eliminate price arbitrages by front-running transactions. In traditional exchanges with a public order book, participants observe a trade order, or a pattern of orders, in submission and execute a quick trade ahead of the order. In cryptoasset exchanges, participants can also observe deposits submitted into the exchange because these transactions appear on the public blockchain. Thus, arbitrageurs can monitor the blockchain for large incoming deposits and front-run the expected trading activity. In addition to generating profits, this information can also be useful in studying anomalous trading conditions in markets (Baker et al. 2022).

cryptoasset start-ups, cryptoasset exchanges can administer initial exchange offerings (IEOs). In this process, which shares many parallels with initial public offerings (IPOs) in traditional finance, cryptoasset tokens are sold to raise capital for a project or start-up. For security reasons, exchanges may provide two-factor authentication (2FA), encryption, storage of funds and regular security audits. Some exchanges impose KYC procedures, anti-money laundering (AML) measures and other compliance requirements to ensure a secure and legally compliant environment.

Cryptoasset exchanges differ from traditional exchanges in several ways:

- They typically trade more diverse instruments, frequently changing their portfolio. An exchange may offer hundreds or thousands of market pairs for trading (**Chart 1**). This includes a broad range of cryptoassets other than Bitcoin, called altcoins, and tokens catering to diverse investment preferences. Other diverse products that exchanges may offer include leveraged trading, option contracts and exchange-traded funds (ETFs) tied to cryptoassets.
- Cryptoasset exchanges may also perform some broader crypto actions not typically found in traditional exchanges:
 - manage their own blockchain¹²
 - issue exchange native tokens on their blockchain
 - distribute fiat-referenced cryptoassets (commonly known as stablecoins), cryptoasset forks and airdrops^{13, 14, 15}
 - offer staking services for proof-of-stake (PoS) networks
- Although market fragmentation is a challenge in the crypto space (see the section about [facts about exchanges](#)), cryptoasset exchanges are interconnected to a greater degree than traditional exchanges.¹⁶ They can directly send assets to each other, typically using a combination of off- and on-chain mechanisms (**Figure 2**). Agreements or partnerships support this activity for various purposes, including market-making, liquidity provision and arbitrage opportunities.

¹²For example, Binance launched the Binance Smart Chain (now called BNB Chain) in 2020 and Coinbase launched Base on Ethereum in 2023. An exchange's off-chain trading engine still performs trades that take place on the exchange. However, by developing their own blockchain, exchanges can better control how their infrastructure operates and, potentially, integrate decentralized applications (dApps) built on their blockchain for existing users.

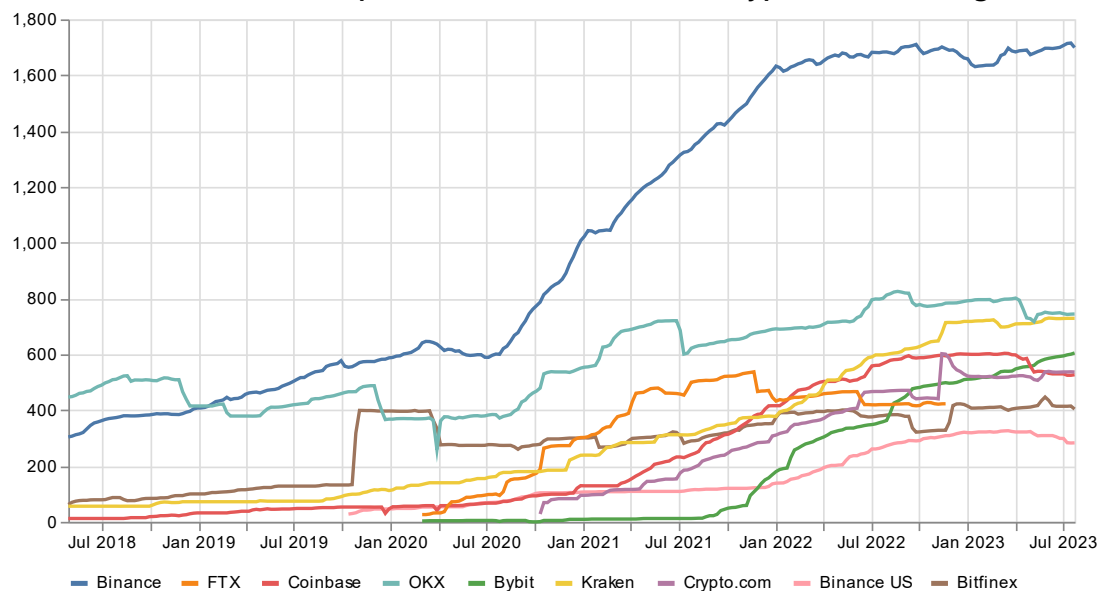
¹³ Some exchanges have also partnered with financial technology companies to issue stablecoins. The most notable examples are Binance partnering with Paxos to issue BUSD; Coinbase and Circle with USDC; and iFinex owning Bitfinex and Tether, which issues USDT, the largest stablecoin.

¹⁴ A fork happens when the source code of one cryptoasset is modified to create a new cryptoasset. An example is the Bitcoin fork known as Bitcoin Cash.

¹⁵ Airdrops promote a given cryptoasset by sending users small amounts of it for free.

¹⁶ A large fraction of exchange activity on Bitcoin is from cross-exchange flows (Makarov and Schoar 2021).

Chart 1: Number of market pairs offered on centralized cryptoasset exchanges



Note: Data include spot and derivative listings.

Source: CoinMarketCap

Last observation: July 27, 2023

Participants

Given the low entry barriers for new users, many non-professional traders participate in cryptoasset exchanges, which helps explain the large number of registered users on major platforms. Binance—the largest global exchange in terms of trading volume—has over 150 million registered users (Harold 2023). Another example is Coinbase, the largest regulated exchange. In a filing to the US Securities and Exchange Commission, Coinbase reported that it had 7.3 million monthly transacting users, accounting for US\$92 billion in trading volume.¹⁷

Market microstructure

Table 1 shows one of the main differences between traditional exchanges and cryptoasset exchanges, which is that traditional exchanges defer responsibilities for transactions to specialized institutions throughout the lifecycle of transactions.

For example, brokers and dealers typically act as intermediaries for transactions between users and securities markets in the traditional financial system. Traditional exchanges and other trading venues aggregate offers to match trades, with securities transactions typically settled by central counterparties, also known as clearing houses (McVanel 2003).¹⁸ Moreover, central securities depositories and custodian banks provide custody services for the securities and

¹⁷ Coinbase defines a transacting user as a “consumer who actively or passively transacts in one or more products at least once during the rolling 28-day period ending on the date of measurement.” The number we present is the average number of transacting users for each month in the quarter. For more, see [form 10-q for the second quarter of 2023](#).

¹⁸ These clearinghouses may be affiliates or subsidiaries of traditional exchanges, but the clearinghouses are subject to a separate regulatory regime.

payments. Integrating business activities with payments system, such as Lynx in Canada, facilitates the accumulation and netting of obligations between major financial institutions.¹⁹ Regulators supervise these specialized traditional financial institutions and market infrastructures.

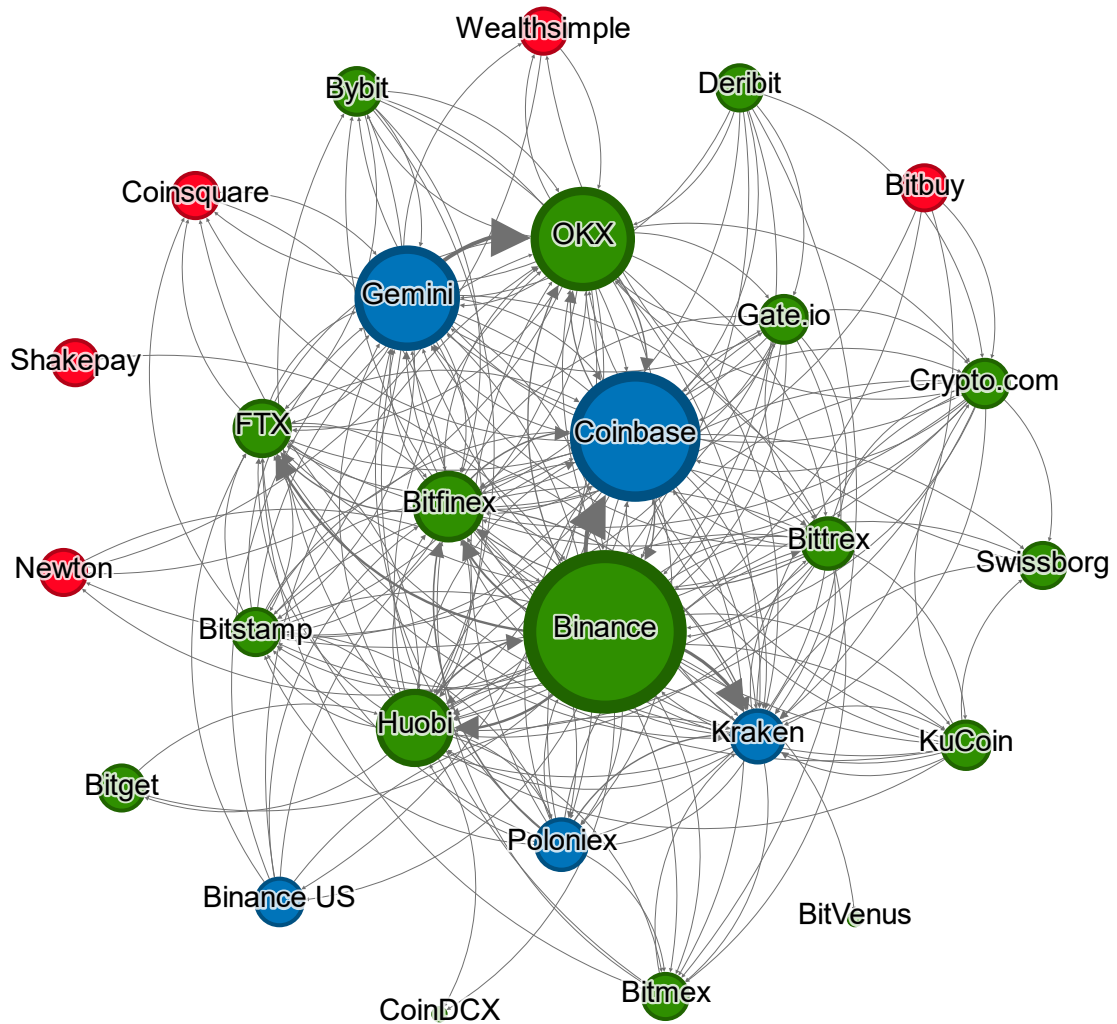
In the traditional financial system, international infrastructure has been developed to address additional risks in typical foreign exchange (FX) transactions. As with cryptoassets, foreign exchange transactions in traditional finance often go beyond borders. For instance, a special financial institution, CLS (initially called Continuous Linked Settlement), was established in 1997 to manage risk in the settlement of foreign exchange transactions. Before that, one leg of the transaction could settle while the counterparty could default.²⁰

To summarize, clearing and settlement responsibilities in traditional markets are typically deferred to specialized institutions. In contrast, cryptoasset exchanges are vertically integrated and control almost the entire lifecycle of a cryptoasset transaction on their platforms.

¹⁹ Lynx is a high-value real-time settlement payment system in Canada that replaced the Large Value Transfer System (LVTS) in 2021.

²⁰ This is known as a foreign exchange settlement risk, or Herstatt risk. CLS addresses this risk by connecting the countries' domestic payments infrastructures through accounts at domestic central banks (Miller and Northcott 2002).

Figure 2: Flows of bitcoin between exchanges



Note: A lower bound estimate of Bitcoin interexchange flows is calculated from known bitcoin addresses of major exchanges (deposit addresses are excluded for simplicity). On-chain data between 2015-August 2023 was collected from [Dune.com](https://dune.com). Labels are collected from [Dune.com](https://dune.com) (21co Bitcoin Labels) and [Dune.com](https://dune.com) (Additional Bitcoin Labels). Blue dots are regulated US entities, red dots are Canadian exchanges, and green dots are unregulated foreign exchanges. Node size corresponds to the total value of outflows in US dollars sent from that exchange over the Bitcoin network. Edge weight corresponds to the total value of US dollars sent in that direction. Due to the difficulty in identifying addresses and the graph being limited to only the Bitcoin network, some exchanges may appear to have either more or less influence than they have in reality.

Table 1: Major participants in typical transactions

	Traditional securities and foreign currency exchanges	Cryptoasset centralized exchanges
Pre-trading	Brokers and dealers	Exchanges
Execution	Regulated exchanges, over-the-counter and alternative trading systems	
Clearing	Brokers, dealers, clearing banks and central counterparties	
Settlement and custody	Large-value payment systems, central securities depositories and custodian banks	Blockchain, exchanges, payment processors and custodian banks

Facts about exchanges

Crypto exchanges vary in size, location and design

Cryptoasset exchanges have evolved considerably since first gaining prominence in 2010. Initially, exchanges functioned as simple online marketplaces to match buyers of Bitcoin with sellers accepting fiat currencies.²¹ Over time, exchanges around the world have proliferated, but activity is now concentrated in several offshore jurisdictions as advanced economies increasingly regulate crypto exchanges.²² **Table 2** lists some of the biggest cryptoasset exchanges, their trading volumes, open interest and jurisdiction. **Chart 2** further illustrates the spot volume market share of CEXs.

Some cryptoasset exchanges inflate their trading volumes by simultaneously buying and selling a cryptoasset, known as wash trading, and reporting fictitious trades.²³ Cong et al. (2022) estimate that as much as 70% of all trading volume on the 29 cryptoasset exchanges that they study is fictitious. This practice, which is illegal in regulated markets, strives to attract investors by making an exchange seem more popular than it actually is. Therefore, we focus on reputable exchanges that have a trust score of 10 from CoinGecko on July 21, 2023.²⁴

²¹ For example, LocalBitcoins was a peer-to-peer exchange network that facilitated over-the-counter services for users to trade their local currency for bitcoin. It was founded in 2012 and closed in 2023.

²² Blandin et al. (2019) report significant variety in the regulation of cryptoassets across jurisdictions. To avoid regulatory scrutiny, offshore exchanges may block access to cryptoassets that could be restricted in a user's home jurisdiction, known as geofencing. Other platforms may block access entirely for some countries. For example, users from the United States cannot officially access Binance, BitMEX, Deribit, Huobi Global and OKX.

²³ For more, see Fusaro, T. and M. Hougan, "Bitwise Asset Management, Inc. Presentation to the Securities and Exchange Commission" (March 19), attached to L. Yates, "Meeting with Bitwise Asset Management, Inc., NYSE Arca, Inc., and Vedder Price P.C." SEC memorandum, March 20, 2019.

²⁴ For details, see CoinGecko's website for its [trust score methodology](#).

Table 2: Overview of largest platforms trading cryptoassets

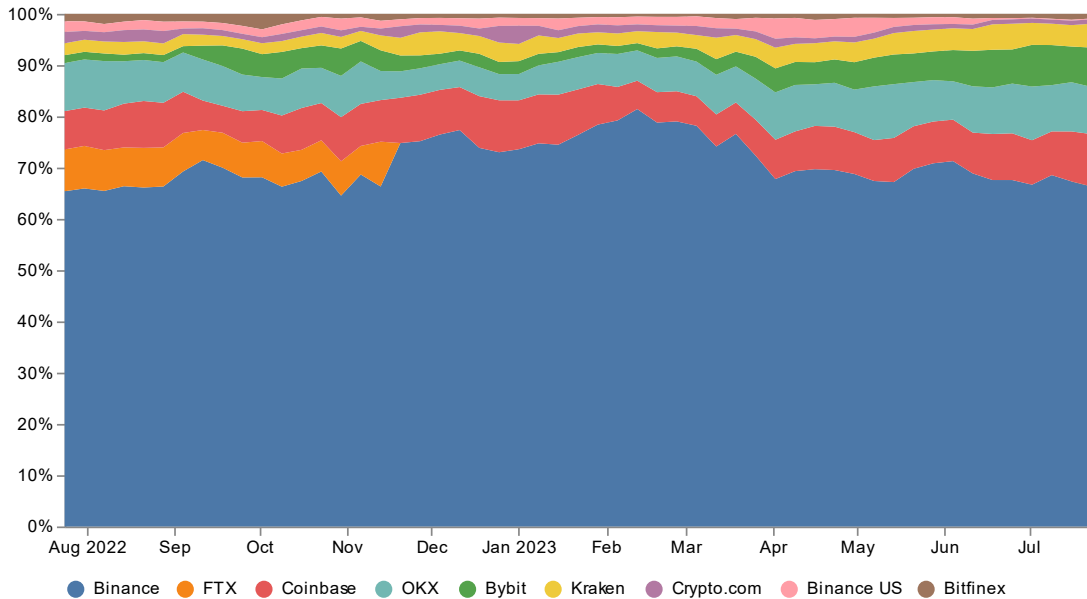
Daily average, Can\$ million (July 28, 2022, to July 27, 2023)

	Jurisdiction	Year founded	Spot volume	Derivatives volume	Open interest	Proprietary token
Binance	Unclear	2017	\$17,677	\$57,691	\$12,472	BNB
Coinbase	United States	2012	\$1,909	No trades	N/A	
OKX	Hong Kong	2013	\$1,850	\$16,732	\$4,680	OKB
Bybit	Singapore	2018	\$861	\$2,487	\$7,159	
Kraken	United States	2011	\$744	\$165	\$208	
Binance US	United States	2019	\$436	No trades	N/A	BNB
Crypto.com	United States	2019	\$354	\$507	\$22	CRO
Bitfinex	British Virgin Islands	2012	\$276	\$100	\$724	LEO
Chicago Mercantile Exchange	United States	1898	No trades	\$1,306	N/A	

Note: We list Binance’s jurisdiction as “unclear” because its terms of service do not specify any jurisdiction. Even though Binance’s holding firm is in the Cayman Islands, Binance claims to not have a headquarters and has not provided the location of its main exchange (Wilson and Lang 2023). As of July 27, 2023, Coinbase and Binance US did not offer derivative products. In August 2023, Coinbase [got approval](#) from the National Futures Association to offer leveraged and cash-settled futures to US customers. We only consider cryptoasset derivative contracts.

Source: CoinGecko

Chart 2: Spot volume market share for top centralized crypto exchanges



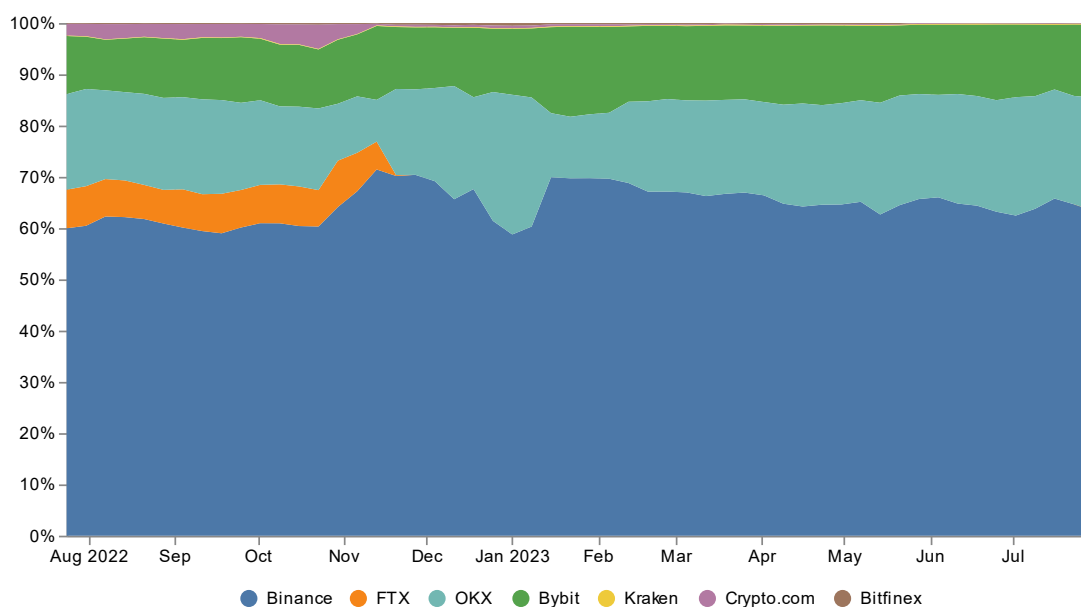
Note: Only exchanges with a Trust Score of 10 on CoinGecko are considered in addition to FTX.

Source: CoinGecko

Last observation: July 27, 2023

Presently, exchanges typically offer pairings with fiat currencies and other cryptoassets, most notably stablecoins.²⁵ Some large exchanges also offer derivative products linked to cryptoassets, including futures, options and perpetual swap contracts. At the eight crypto exchanges chosen (not including the Chicago Mercantile Exchange), derivatives accounted for three-quarters of all cryptoasset trading between July 22, 2022, and July 20, 2023. Although most trading occurs on unregulated exchanges (Blandin et al. 2019), this activity is increasingly becoming regulated (see the section on [regulation of exchanges](#)).

Chart 3: Derivatives volume market share for top centralized crypto exchanges



Note: Only exchanges with a Trust Score of 10 on CoinGecko are considered in addition to FTX. Coinbase and Binance US do not offer derivatives.²⁶

Source: CoinMarketCap

Last observation: July 27, 2023

Practitioners typically use daily volume and open interest to compare the sizes of derivatives traded on cryptoasset exchanges. Binance dominates both spot and derivatives trading markets in our subset of exchanges: Binance controls roughly 65% of total CEX spot volume. Meanwhile, the largest regulated exchange, Coinbase, controls around 10% of the spot volume (**Chart 2**). Binance also dominates market pairs, with over 1,600 listed, more than double the next exchange (**Chart 1**). For derivatives trading, Binance accounts for 60% of all derivatives transactions in our sample, while the remaining market volume is roughly split between OKX and Bybit (**Chart 3**). Bybit is among the leaders in terms of open interest of derivatives despite

²⁵ This form of cryptoasset aims to maintain price stability, typically through collateralizing the digital tokens with cryptoassets, fiat currencies or other assets. The most common examples include Tether (USDT), USD Coin (USDC), Multi-Collateral Dai (DAI), Binance USD (BUSD) and Facebook's defunct Diem (formerly Libra) project.

²⁶ The National Futures Association approved Coinbase to operate a futures commission merchant and offer eligible US customers access to crypto futures from their platforms on August 16, 2023.

its relatively small spot volume due to its central role in the options market. Finally, some traditional exchanges also allow for crypto-related derivatives trading, such as the Chicago Mercantile Exchange, which is the largest regulated marketplace listing futures linked to cryptoassets.²⁷

The number of cryptoasset exchanges and the many differences between them make market fragmentation a significant problem in the cryptoasset industry.²⁸ Because exchanges are mainly connected through each other's blockchain, the flow of funds between exchanges is settled on-chain. As a result, during periods of high price volatility and network use, delays in on-chain settlement can amplify the mispricing between exchanges (Salmani 2020).

Cryptoasset exchanges often are custodians of user funds

As described in the section on typical operations of crypto exchanges, the exchanges act as custodians of user assets. The total value of cryptoassets held on an exchange primarily consists of assets stored securely offline in cold wallets. A small portion, typically less than 5% of an exchange's total funds, are held online in hot wallets, which fulfill withdrawals. Hackers wishing to steal cryptoassets from an exchange typically target hot wallets. Traditional markets have established best practices to safeguard user assets against cyber attacks (CPMI and IOSCO 2016). For cryptoassets, no such established best practices exist, exposing users to increased risk.

Funds custodied by cryptoasset exchanges may be at risk of theft from hackers

Cryptoassets are an attractive target for hackers who can attack users remotely and use the private nature of cryptoassets to hide their identity. Anonymizing technology, such as mixing, helps conceal the source of the assets and improves their fungibility.²⁹ For these reasons, hackers often target the largest cryptoasset holders—cryptoasset exchanges.³⁰

A cyber incident at a cryptoasset exchange typically involves an external actor gaining unauthorized access to an exchanges' computer systems. Once the private keys to the exchanges' cryptoasset wallets are compromised, the external actor steals the cryptoassets by sending them to a crypto address that the hacker controls.

Other types of incidents are also common. These include theft by an internal actor or an

²⁷ The Chicago Board Options Exchange received approval from the US Commodity Futures Trading Commission to issue Bitcoin and Ether futures on June 6, 2023.

²⁸ Fragmentation in the cryptoasset industry also arises naturally from the lack of interoperability of different blockchains. See, for example, Boissay et al. (2022).

²⁹ For instance, see I. Allison, "Bitcoin tumbler: The business of covering tracks in the world of cryptocurrency laundering," *International Business Times* (February 11, 2015).

³⁰ Exchanges face a trade-off between convenience and safety in aggregating their balances either in a few wallets or in many wallets. Kahn, Rivadeneyra and Wong (2021) provide an economics perspective on this trade-off.

exchange operator, disruption of services from a denial-of-service attack and the unauthorized release of users' personal information.³¹ The exchange can also socialize its losses by charging its users a fee to recover from unexpected losses.³² **Table 3** lists some of the most prominent incidents that occurred in the past decade. These incidents underscore the operational and credit risks users face when an exchange acts as the custodian of their assets.

Table 3: Major incidents involving cryptoasset exchanges, 2014–22

Priced in Can\$ millions at the time of the incident

	Location	Year	Incident type	Total losses
Mt. Gox	Japan	2014	Theft by external actor; fraud	\$730
Bitstamp	Slovenia	2015	Theft by external actor	\$5.7
Bitfinex	Hong Kong	2016	Theft by external actor	\$89.7
Bithumb	South Korea	2018	Theft by internal actor	\$31
Coincheck	Japan	2018	Theft by external actor	\$530
BitGrail	Italy	2018	Theft by external actor	\$210
OKX	Republic of Seychelles	2018	Socialized losses	\$12
Binance	Republic of Seychelles	2019	Theft by external actor	\$54
Cryptopia	New Zealand	2019	Theft by external actor	\$4
CoinBene	Singapore	2019	Theft by external actor	\$130
QuadrigaCX	Canada	2019	Fraud	\$169
BitMEX	Republic of Seychelles	2020	Denial-of-service attack	Not reported
Kucoin	Republic of Seychelles	2020	Theft by external actor	\$375
BitMart	Cayman Islands	2021	Theft by external actor	\$192
Deribit	Panama	2022	Theft by external actor	\$38
FTX	Bahamas	2022	Fraud	\$11,500

Note: The source of most of the information in this table is [ChainSec's list of incidents](#).

Regulation of exchanges

International framework and recommendations

The development of regulations for cryptoasset exchanges has increased with overall growth in the industry but often followed the collapses of exchanges. As a result, the responsiveness and direction of regulation have varied across countries. Due to these differences, international organizations have proposed comprehensive guidance to help standardize regulations across different jurisdictions. These organizations include:^{33, 34}

³¹ For examples, see Zhao (2019), Hayes (2020), Shen (2018), Jagati (2019) and OSC (2020).

³² For example, as noted in **Table 3**, OKX performed a "socialized clawback" on unrealized profits of many of its users after it liquidated a large bitcoin futures position, sustaining significant losses (Robertson, Tan and Nakamura 2018).

³³ See FSB (2019) for a comprehensive list of national and international cryptoasset regulators.

³⁴ See also Aquilina, Frost and Schrimpf (2023), Adrian et al. (2023), ECB (2023) and Bains et al. (2022).

- the Financial Stability Board (FSB) (2023a, 2023b, 2023c, 2023d)
- the Financial Action Task Force (FATF) (2021, 2023)
- the Basel Committee on Banking Supervision (BCBS) (2019, 2022)
- the International Organization of Securities Commissions (IOSCO) (2020, 2023)
- the Committee on Payments and Market Infrastructures (CPMI) and the IOSCO (2016, 2022)
- the International Monetary Fund (IMF and FSB 2023)
- the Organisation for Economic Co-operation and Development (OECD 2022, 2023)

Proposals from international organizations intend to help national authorities bring cryptoassets under the umbrella of existing regulation (following the principle of “same activity, same risk, same regulation”) and create new regulatory mechanisms where needed. These proposals include:

- establishing governance and risk management frameworks for crypto firms and exchanges, based on regular and accurate collection, storage, safeguarding and reporting of on- and off-chain data by these firms to regulators
- requiring all virtual asset service providers, including exchanges, to comply with established AML and counter-terrorist financing (CTF) obligations, which includes reporting detailed personally identifiable information related to cryptoasset transactions—known as the crypto travel rule
- providing guidance from regulators and financial supervisors to cryptoasset exchanges about governance, settlement and protecting information
- identifying, reporting and minimizing conflicts of interest arising from vertically integrating the activities of crypto exchanges to protect participants from expropriations by the affiliates of these exchanges in the form of better prices and execution times, front-running of orders and insider trading
- having exchanges disclose their business practices and conflicts of interest, and align disclosure requirements with existing regulations to guarantee investor protection and efficient price discovery³⁵
- requiring exchanges to publish rules on how they list and remove tokens, guaranteeing that the identities of token issuers are disclosed according to all applicable laws
- mitigating fraud risks related to managing clients’ wallets and private keys when assets

³⁵ In addition to displaying detailed market books and historical trade data, exchanges would also disclose specifics about how orders are routed and prices are determined, to which degree and in which order personal and trade information is disclosed to various parties, and whether the services offered by the exchanges differ significantly from those offered in the jurisdictions of their clients.

are under the custody of the exchange, or being transferred to financial institutions or different blockchains

- removing ambiguity in the tax treatments of exchanges
- conducting independent audits of exchanges' internal processes
- limiting the participation of regulated banks in crypto exchanges by imposing higher capital requirements on some of their cryptoassets and treating other crypto holdings under existing capital regulations
- identifying sources of financial instability related to crypto exchanges in coordination with regulators abroad and providing recommendations on how to monitor risks and reduce vulnerabilities
- establishing cross-border cooperation between regulators, lawmakers and consulting agencies to address international spillovers in the crypto market, reduce regulatory arbitrage across the globe and improve information, expertise and data-sharing
- allowing for the healthy development of financial innovations and technologies by continuously speaking with the crypto industry and sequentially implementing regulations and sandboxes

Regulation in Canada

QuadrigaCX was the first high-profile exchange to collapse in Canada after it misled customers about how it was using their assets. In response, the Canadian Securities Administrators (CSA) and the Investment Industry Regulatory Organization of Canada (IIROC) published a joint framework paper in 2019 to provide exchanges with more clarity on regulatory requirements (CSA and IIROC 2019). IIROC has since amalgamated with the Mutual Fund Dealers Association of Canada and is now the Canadian Investment Regulatory Organization (CIRO). One of the views expressed in this framework was that if a cryptoasset exchange retains customers' cryptoassets instead of immediately delivering the funds, then regulators would likely treat those assets as securities and the exchange would be subject to securities regulation.³⁶

These regulatory decisions were implemented through a regulatory sandbox set by a framework setter like the CSA.³⁷ Canada has offered a regulatory sandbox environment for exchanges to operate in since 2017. The sandbox allows firms to run their businesses with exemptive relief from securities laws for a limited time.³⁸ The sandbox offers a flexible approach

³⁶ Although some exchanges argue that particular cryptoassets are commodities, the CSA views exchanges that provide the investor a contractual right or claim to the cryptoasset, rather than immediate delivery of the asset, as generally subject to securities regulation. For more information, please consult the CSA's [website](#).

³⁷ Cryptoasset exchange regulation primarily rests with each province's securities regulator. However, the CSA has provided guidance to ensure a harmonized set of policies.

³⁸ Crypto exchanges are expected to follow the requirements and obligations under National Instrument: NI 31-103 - Registration Requirements and Exemptions, with some differences introduced through conditions to the prospectus

to balance the need for regulatory clarity and the need for firms to innovate.

Since 2017, the CSA has set standards for authorized participants as the industry has evolved.³⁹ In 2021, the CSA and the IIROC jointly published a notice for provincial regulators stating that exchanges must submit a pre-registration undertaking (PRU) to their principal regulator (CSA and IIROC 2021).⁴⁰ This undertaking:

- includes enhanced commitments for the custody and segregation of clients' cryptoassets
- precludes exchanges from pledging and rehypothecating clients' assets
- restricts the use of proprietary tokens issued by exchanges

These conditions are modelled largely on existing requirements for restricted dealers through their prospectus relief. Currently, 12 cryptoasset exchanges are authorized, 11 have signed PRUs and 3 are banned.⁴¹

More recently, after the collapse of FTX, the CSA issued an enhanced PRU requirements targeting unregistered exchanges, prohibiting them from offering or providing margin to clients and mandating stricter requirements for the custody of client assets, among other changes (CSA 2023a).⁴² Exchanges and other cryptoasset providers that register or sign a PRU are prohibited from allowing clients to trade or enter into contracts with cryptoassets that are securities or derivatives. However, the CSA has recently allowed for continued trading of some existing value-referenced cryptoasset (VRCA), commonly known as stablecoins. Crypto exchanges must first obtain written permission from the CSA to do so and, along with issuers of VRCAs, fulfill certain requirements (CSA 2023b). Additionally, the Canadian Investment Regulatory Organization (CIRO) conducts stress-tests and provides advice to crypto firms about, among other things, how to inform investors about the risk they face and how to establish a corporate structure that discourages fraud and conflicts of interests.

Furthermore, crypto exchanges in Canada are subject to comprehensive AML regulations, which are outlined in the *Proceeds of Crime (Money Laundering) and Terrorist Financing Act* and its associated regulations. Since June 2021, crypto exchanges operating in Canada must collect and report transaction data based on the crypto travel rule. The Financial Transactions and Reports Analysis Centre of Canada (FINTRAC) enforces these requirements. Canada's AML and

relief. In most cases, this means subjecting exchanges to more stringent (or, at least, more prescriptive) requirements than under NI 31-103.

³⁹ Three types of firms are currently permitted to offer crypto as an exchange in Canada: restricted dealers that are subject to provincial securities commission and must become a CRO member within a specific period, exchanges registered and regulated as a CIRO member and unregistered exchanges that have signed PRUs.

⁴⁰ A cryptoasset exchange submits a PRU to a regulator while awaiting approval for their registration. The PRU allows the exchange to operate subject to it complying with specific terms.

⁴¹ See the CSA's [website](#) for more details.

⁴² Existing exchanges registered as restricted dealers were already subject to these rules.

CTF regulations appear to be evolving: the Department of Finance Canada consulted the public in 2023 on ways to update the regulatory regime.⁴³

Alternative approaches to regulation

We provide stylized facts about the regulatory responses in Japan, the European Union, the United Kingdom and the United States to illustrate differences across other jurisdictions.

Japan

Japan was among the first countries to adopt Bitcoin and to become a financial hub for cryptoassets. However, Japanese regulators did not shape their views about the cryptoasset industry until the collapse of Mt. Gox in 2014 (Ishikawa 2017). Since then, Japan amended its laws—chiefly the Payment Services Act and the Financial Instruments and Exchange Act—to regulate cryptoassets. The Japanese Financial Services Agency (FSA) primarily implements these laws together with two self-regulating organizations, the Japan Virtual and Crypto assets Exchange Association and the Japan Security Token Offering Association. Cryptoasset exchanges operating in Japan must register with the FSA, hold no more than 5% of deposits in hot wallets (Amaya 2022) and submit annual compliance reports to the FSA, among other requirements. Moreover, the exchanges must comply with AML regulations, including the crypto travel rule, outlined in the Act on the Prevention of Transfer of Criminal Proceeds and that the Japan Financial Intelligence Center implements.

European Union

In June 2023, the Markets in Crypto Assets Act (MiCA) came into force in the European Union (ESMA 2023a, 2023b). This is currently the most comprehensive regulatory framework in the world. MiCA harmonizes a previous patchwork of regulatory regimes within individual EU countries and was developed to assist EU member states. The framework will gradually come into effect until December 2024. During this time, the European Securities Markets Authority (ESMA) and the European Banking Authority (EBA) will finalize the remaining regulatory technical standards (Hallak and Salén 2023).

Under MiCA, a financial regulator from an EU country will have to authorize crypto exchanges operating within the 27-member bloc. As well, most exchanges will need to publish white papers to inform prospective cryptoasset holders about the characteristics, functions and risks of the specific cryptoassets being traded. Trading stablecoins will carry additional regulatory requirements and constraints. For example, overall trades of a stablecoin will be limited to 1 million transactions per day if it is not pegged to the euro.

A key component in MiCA related to crypto exchanges is a prohibition on manipulating markets. MiCA defines market manipulation as any order that gives a false or misleading signal

⁴³ For more information, see Department of Finance Canada, [Consultation on Strengthening Canada's Anti-Money Laundering and Anti-Terrorist Financing Regime](#).

to the supply, demand or price of a cryptoasset. This definition would consider front-running and wash trading to be manipulation practices, for example. As well, crypto exchanges are subject to the crypto travel rule. Unlike in many other jurisdictions, MiCA requires exchanges to report all cryptoasset transactions because the law does not set a minimum value threshold for reporting these transactions.

United Kingdom

The United Kingdom introduced an AML and CTF regime for crypto exchanges and custody wallet services in 2020. In 2023, the Financial Services and Markets Act 2023 received royal assent in June and crypto travel rule requirements came into force in September. Current regulations require cryptoasset exchanges to register with the Financial Conduct Authority (FCA) if they have business activities in the United Kingdom or advertise their services to UK customers (FCA 2023). A cryptoasset exchange may not need to register if it does not have offices, agents or crypto automated teller machines in the United Kingdom but allows UK customers to trade cryptoassets on its platform. The FCA makes a final determination on a case-by-case basis.⁴⁴

However, further regulation is coming. The FCA and the Bank of England will supervise a new regulatory sandbox, the Digital Security Sandbox, to test the use of distributed ledger technology to perform the roles of trading venues and central counterparties, among other use cases. Eventually, the UK government is expected to require all crypto exchanges to set up a UK branch to operate in the country (Shumba 2023).

United States

The United States does not yet have a uniform regime across states to regulate cryptoassets. Instead, individual US states have adopted a variety of regulatory approaches, ranging from the friendliest regime in Wyoming to the strictest in New York. At the federal level, individual agencies enforce current regulations, including the Financial Crimes Enforcement Network (FinCEN), the Securities Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC). Under federal regulations, cryptoasset exchanges must register with FinCEN as money service businesses and are subject to the crypto travel rule. Additional regulations from the SEC apply to crypto exchanges trading cryptoassets deemed to be securities (the Howey test determines whether a given cryptoasset is a security). Meanwhile, the CFTC also regulates trading cryptoasset commodities.⁴⁵ However, supervisory ambiguity remains. For example, authorities have yet to say whether Ether should be regulated as a

⁴⁴ See FCA [website](#) for more information about whether cryptoasset services must register under UK anti-money laundering regulations.

⁴⁵ The SEC uses the conclusions of the US Supreme Court's in *SEC v. W.J. Howey Co.*, 328 U.S. 293 (1946) to determine whether a financial instrument is a security. The *Howey* ruling and subsequent case law say that an investment contract exists when there is "the investment of money in a common enterprise with a reasonable expectation of profits to be derived from the efforts of others." For more details, please see SEC [Framework for "Investment Contract" Analysis of Digital Assets](#).

security or a commodity (Hallak and Salén 2023). Such ambiguity has, for instance, led the cryptoasset exchange Coinbase to petition the SEC to develop new rules and to appeal the SEC’s refusal to do so in the US Third District Courts of Appeals (Prentice, Price and Scarcella 2023).

After the collapse of FTX in November 2022, US federal institutions increased their cryptoasset enforcement activities. This eventually led the SEC to charge Coinbase, Gemini and Binance with trading unregistered securities, and the CFTC to charge Binance with violating the Commodities Exchange Act.⁴⁶ Although cryptoasset bills have been drafted or introduced in the US Congress, a comprehensive federal regulatory regime is not expected to be enacted into law soon (Hamilton 2023).⁴⁷

Emerging trends and challenges

The cryptoasset industry is beginning to address the issues we highlight above. In particular, the industry is making progress in safeguarding user assets and improving integration between exchanges and traditional payments infrastructure.

To better safeguard user assets, the market is becoming more resilient by relying more on dedicated custodians. Since cryptoassets entrusted to these custodians are not stored in wallets controlled by exchanges, these cryptoassets cannot be stolen during a hack of the exchange (Huang 2023). Custodians typically serve institutional clients such as CEXs, maintaining cold wallets based on the custodian’s proprietary private key management system. Some of the largest crypto custodians are also exchanges. For example, Coinbase launched its dedicated custodian service, Coinbase Custody, in 2018, and Gemini followed with Gemini Custody in 2019. Both received a Limited Purpose Trust Charter from New York State’s Department of Financial Services.⁴⁸ In a letter to its shareholders, Coinbase reported that its custody business held an average of US\$59.6 billion in cryptoassets for the second quarter of 2023 (Coinbase Global, Inc. 2023). The other large crypto custodian is BitGo, which has over 1,500 institutional clients and processes around 20% of the value of all bitcoin transactions globally (BitGo Editor 2023).

⁴⁶ Binance and its CEO have since pleaded guilty to violating anti-money laundering rules and failing to register as a money transmitted business, resulting in a US\$4.3 billion fine and a possible prison sentence for the CEO (Prentice, Lawder and Stempel 2023).

⁴⁷ Two examples of proposed crypto legislation include the [Lummis-Gillibrand Responsible Financial Innovation Act](#), S. 4356, 117th Congress (2021–22), and [a draft bill](#) before the US House of Representatives Financial Services Committee.

⁴⁸ Gemini originally received a Limited Purpose Trust Charter in 2015 but didn’t create Gemini Custody until 2019. Both [Coinbase Custody](#) and [Gemini Custody](#) have passed their Systems and Organization Controls (SOC) examinations: SOC 1 Type 2 and SOC 2 Type 2.

Of the 12 authorized crypto exchanges in Canada, 11 of them use Gemini Custody, Coinbase Custody or BitGo.^{49, 50} The outlier is Fidelity Clearing Canada, which uses its own custodial service called Fidelity Digital Asset Services. In fact, CSA’s approval of Fidelity Clearing Canada in 2021 highlights an emerging trend of traditional financial institutions entering the cryptoasset custodian space. In 2020, the US Office of the Comptroller of the Currency started allowing chartered banks and thrifts to become custodians of cryptoassets (OCC 2020). One recent example is BNY Mellon, which launched its custodian business in late 2022 (BNY Mellon 2022).

However, dedicated custodians are mainly available only to institutional participants and not retail clients. Moreover, the party and counterparty to a trade both need to be integrated with the same dedicated custodian to reap the full benefits of a trade.

A different development aimed at the problem of custody is the rise of DEXs, such as Uniswap, Curve and PancakeSwap (Lo and Medda 2021; Xu et al. 2023).⁵¹ In contrast to CEXs, DEXs do not rely on a central entity to facilitate trades. Instead, DEXs allow for peer-to-peer transfers of tokens from a pool of funds by using smart contracts on a blockchain—the most common being an automated market maker (AMM). This decentralized nature provides users with greater control over their funds and reduces the reliance on a central entity because clearing and settlement of trades happens directly on the blockchain rather than on the private ledger of a CEX. However, trading directly on the blockchain lengthens execution times. Whereas most CEXs allow for split-second trades, transactions on DEXs may require seconds or minutes to settle, especially during periods of congestion.⁵² Similarly, settling transactions on the blockchain can be expensive due to the explicit transaction cost, also known as gas fees.⁵³

⁴⁹ Five of the companies authorized by the CSA—Bitbuy, Coinsquare, CoinSmart, Bitvo and Coinberry—are subsidiaries of WonderFi, a Canadian crypto company. WonderFi acquired Coinsquare and CoinSmart in July 2023 and Bitvo in November 2023. See [WonderFi, “WonderFi, Coinsquare and CoinSmart Announce Closing of Business Combination” \(press release, July 10, 2023\)](#), and WonderFI, [“Bitbuy Announces Acquisition of Bitvo Client Accounts and Bitvo.com” \(press release, November 13, 2023\)](#).

⁵⁰ Accessed from the [CSA’s website](#) on July 27, 2023. Although 12 different decisions have been made, we consider Fidelity Digital Asset Services and Fidelity Clearing Canada ULC the same. Coinsquare uses both Coinbase Custody and Tetra Trust, a digital asset custody company regulated in Canada by Alberta’s Ministry of Treasury Board and Finance.

⁵¹ We focus on Uniswap, the largest DEX, and its two most recent versions (V2 and V3). Since the Uniswap smart contracts are persistent and non-upgradeable, older versions will function in perpetuity. Uniswap V1 was launched in November 2018, Uniswap V2 in May 2020 and Uniswap V3 in May 2021. The main difference between V2 and V3 is the addition of concentrated liquidity in V3, which allows liquidity to be allocated within a custom price range compared with earlier versions distributing liquidity uniformly along the AMM price curve between 0 and infinity.

⁵² Although we focus on Ethereum, a newer class of blockchains—which includes Solana, Sei, Injective, Aptos and Sui—have transaction finality times and fees that are lower than Ethereum, making a user’s DEX experience similar to that of a CEX. Some of the DEX protocols on these blockchains are Orca (Solana), Jupiter (Solana), Cetus (Aptos and Sui) and Astroport (Injective and Sei).

⁵³ Gas, which is priced in ETH, is typically the largest cost component of swapping tokens on-chain and can fluctuate greatly due to network congestion. Another component is the fees paid to the liquidity providers in an AMM pool. However, these fees tend to be very small in comparison. For example, Uniswap’s newest version, called Uniswap V3, allows liquidity providers to create pools with swapping fees of either 0.01%, 0.05%, 0.30% or 1%.

As a result of these scalability issues, some Layer 1 blockchains (L1) such as Ethereum are starting to use speedy, parallel blockchains—known as Layer 2 blockchains (L2)—to reduce network congestion and transaction fees. One common approach is to aggregate, or roll up, a large batch of payments into a single transaction. These L2s process the transaction on their blockchains before recording the results on the L1 blockchain. This way the entire batch of payments only incurs a single transaction fee.⁵⁴ As a result of these innovations, the transaction volume on DEXs has risen significantly. For example, the largest DEX, Uniswap, now settles around the same spot volume as the largest US-regulated exchange, Coinbase (**Chart 4**). An increasing amount of Uniswap’s volume is coming from L2s, such as Arbitrum’s Ethereum rollup blockchain called [Arbitrum One](#).

However, DEX users continue to experience issues that CEX users do not. DEX users need to be more sophisticated, such as by being custodians of their cryptoassets, which includes managing a password (typically a 12-word seed phrase) and using a blockchain’s native tokens, such as ETH, to pay for gas.⁵⁵ In addition, DEXs are not perfect substitutes for CEXs. Almost all DEXs use AMMs that are susceptible to large price impacts, or slippage, instead of the order book model that CEXs use. Moreover, since CEXs operate off-chain, they make it possible to swap fiat currency for cryptoassets and vice-versa. Most DEXs lack this functionality since they operate only on-chain.⁵⁶ Finally, no large DEX natively trades Bitcoin, the largest cryptoasset.⁵⁷

⁵⁴ Typically, fees are between 10 and 50 times cheaper on L2s compared with Ethereum. Current estimates of L2 fees can be found at <https://l2fees.info/>. See [Ethereum’s website](#) for a more complete discussion of rollups and their benefits and trade-offs.

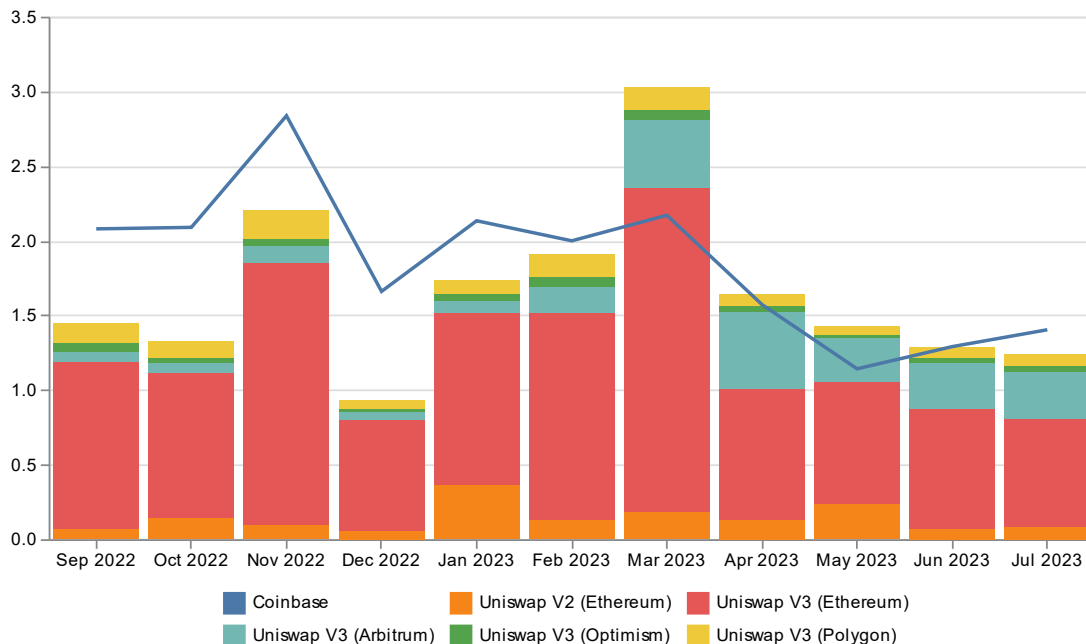
⁵⁵ One solution to some of these problems are smart wallets, also known as account abstraction. For more, see Visa’s paper on [using smart wallets to pay for transactions](#) using fiat-referenced cryptoassets.

⁵⁶ Uniswap uses MoonPay, a fintech company, [to allow fiat on-ramps](#) (fiat to crypto) but doesn’t yet offer off-ramps (crypto to fiat).

⁵⁷ Derivative versions of Bitcoin can be traded on Ethereum. The most popular is a wrapped version called wrapped bitcoin (WBTC). But custodial issues can arise. At the time of writing, [THORChain](#), has been a recent solution to facilitate DEX trading of native bitcoins.

Chart 4: Average daily spot volumes for Coinbase and Uniswap

Can\$ billion



Note: We only consider newer Uniswaps deployed on Ethereum and Uniswaps deployed on L2 scaling solutions such as Arbitrum, Optimism and Polygon. Volume is calculated as the daily average across each month.

Source: Coingecko

Last observation: July 27, 2023

Regarding reducing market fragmentation, one development is the creation of services that connect exchanges and custodians within shared trading environments, such as Copper's [ClearLoop](#). For example, a user might want to send funds held in exchange A to exchange B. Without using traditional financial institutions, they would need to send an on-chain transaction from their account at exchange A to their deposit wallet at exchange B. Instead, ClearLoop does this transaction off-chain, but the tokens are held in a trust. In July 2023, ClearLoop had seven exchanges linked to its service, including OKX and Bitfinex.

Finally, crypto exchanges have attempted to integrate with traditional payments infrastructure. For example, Silvergate Bank and Signature Bank created the Silvergate Exchange Network and the Signet Network, respectively. These networks allowed their members, including cryptoasset exchanges, to gain access to liquidity in US dollars by settling fiat payments in real time. Historically, this was a big challenge because banks were reluctant to offer their services to cryptoasset exchanges (Vigna 2019). However, both banks failed during the banking crisis in March 2023. Without the services of these two banks, many exchanges reverted to using payment processors for fiat transactions. Some exchanges escaped this fate. Coinbase and Gemini have relationships with JPMorgan Chase & Co. (Davis and Kharif 2020), while Kraken possesses Wyoming's special purpose depository institution (SPDI) charter, which state

legislatures originally created for crypto-oriented firms (Brett 2020).⁵⁸ Many others, especially unregulated crypto exchanges, have become unbanked in the United States. Since most exchanges are subject to lax regulation, they will likely remain outside traditional payments infrastructure for the foreseeable future.

Conclusion

The global cryptoasset industry has matured significantly over the past decade. However, important gaps—including in regulation and oversight—remain between cryptoasset exchanges and the infrastructure that supports traditional financial markets. Understanding these gaps and the risks that result from them are important for protecting social welfare.

Further innovations and improvements in regulatory oversight, including implementation and enforcement, are underway globally to better safeguard users' assets, strengthen integration with traditional payments systems and reduce market fragmentation. In the meantime, cryptoasset exchanges will continue to have custody over vast amounts of cryptoassets on their users' behalf, exposing users to continued losses from hacks, price dislocations and the whims of exchanges and third-party processors. Despite these risks, CEXs remain popular and provide value to private investors and financial institutions. Therefore, any new regulatory requirements should aim to maintain the innovative value of such exchanges for their participants.

⁵⁸ Both exchanges have obtained a BitLicense from New York State's Department of Financial Services. This license has a high regulatory standard, which offers assurance to banks providing services. Since very few exchanges have this type of certification, traditional financial institutions are not likely to onboard many exchanges in the near-term.

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