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The Mirage of Decentralized Finance

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In response to new developments in financial structure and technology, and galvanized by recent eruptions of volatility, officials from Washington to London to Brussels are grappling with how to regulate the cluster of practices known as decentralized finance, or DeFi. This is a political as well as an economic question. This is to say, the outcome will involve interests in addition to considerations of efficiency. Although advocates of decentralized finance often invoke laudable goals like reduced costs and increased inclusion, it is worth examining what else rides those coattails.

To address this issue, one must first understand what DeFi is. One must then understand the nature of the economic and political stakes. The Bank of International Settlements (BIS) defines decentralized finance as “financial applications run by smart contracts on a blockchain, typically a permissionless public chain.”¹ Put another way, DeFi is the effort to build a financial system without centralized institutions. DeFi is premised on replacing existing financial institutions with automatically-functioning, self-executing protocols. Financial activities are “conducted on a peer-to-peer basis using blockchain technology.”² Computer code replaces “legacy” (bank and nonbank) financial institutions. Cryptocurrencies such as Bitcoin and Ethereum are the vehicles for making payments and settling transactions in this decentralized world. A blockchain – public, private, permissioned or permissionless – is the operational infrastructure.³

These are the premises of DeFi. As we will show, however, these premises are fundamentally flawed. *All* forms of finance require centralized institutions—including, as we will see, decentralized finance. Rather than limiting those institutions, DeFi involves replacing existing financial institutions with other institutions less responsive to regulatory and democratic oversight and better tailored to their architects’ particular needs and interests.

Consider the famous Bitcoin whitepaper in which Satoshi Nakamoto argued his invention’s key benefit was enabling internet commerce without requiring “trusted third parties to process electronic payments.”⁴ The passage in quotes is a statement about economic and financial organization. At the same time, Satoshi notes that Bitcoin will be “completely inflation free,” thereby situating the project in the longstanding politics of hard money.⁵ Fifteen years after the original white paper, Coinbase pitches cryptocurrencies as “digital alternatives to money issued by governments” and as the “first alternative to the traditional banking system.”⁶ There are many other examples of the stated politics of advocates and early adopters.⁷ The question remains to what extent these commercial projects are entangled with, or advantageously derivative of, the original political project.

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Claims that cryptocurrencies such as Bitcoin, or stablecoins such as Tether and Circle, are “the future of money” attempt to naturalize what is either—depending on one’s perspective—an effort to shift the rules of finance to someone’s commercial advantage (including to the commercial advantage of those who implement a new system), or a political project seeking to shift the rules to someone’s political advantage (including to the political advantage of those who design, operate and utilize the new system). But to borrow an observation from the literature on industrial policy, prognostications about decentralized finance from proponents and beneficiaries are not “scientifically grounded forecasts of probable futures, but political projects that aim at shaping improbable futures.”⁸ DeFi promotes a particular vision for how the financial system *should* operate. Although putatively a commercial vision, the success of DeFi would entail significant political consequences. DeFi both requires rules and avoids rules. Thus, it necessarily engages in the politics of regulation. Accordingly, there is a danger of mistaking DeFi, notwithstanding its self-presentation, as principally an economic or technological project. This would be a mistake: it is also a political project

The real goal of DeFi is to implement an alternate set of institutions that are to the benefit of those who would create or control these institutions. This commercial project is pursued under the guise of the language and collection of techniques labeled DeFi, and for some, in the name of libertarian politics. As a political project, this may be real to committed Hayekians and libertarians generally. But, for the most part, it is political cover to avoid regulation. It is cover that, in the name of protecting against risk and reducing transaction costs, generates greater risk and higher costs. Fundamentally, the commercial project is not independent of the political project. All financial innovation requires politics to shape its associated rules, regulations and procedures. All financial innovation is therefore political.

What is distinctive about DeFi is how it hinges on the belief that existing financial institutions don’t work. It turns on the belief that value can be created by circumventing and ultimately engineering the collapse of existing financial infrastructure. We question these beliefs in what follows.

Our central proposition is that so-called decentralized finance is an oxymoron. Finance, including so-called decentralized finance, is inherently rooted in institutions: rules for transactions, rules for resolving disputes, and so forth, whose formulation and enforcement inevitably entail a degree of centralization.

A corollary proposition is that decentralized finance, its vehicle currencies such as Bitcoin, and its transactions platforms such as FTX have in fact functioned as profitable appendages rather than alternatives to the traditional financial system. These arrangements have facilitated otherwise prohibited transactions and enabled new forums for speculation.

Our third proposition is that blockchain, as the core technology underlying decentralized finance, does not improve upon existing more centralized financial infrastructures.

CLAIM #1: *“Decentralized Finance” is an oxymoron.*

Definitionally, DeFi encompasses any financial arrangement that occurs without aid of a centralized institution. It often, but not exclusively, entails cryptocurrency transferred via a blockchain. The stated aim of many DeFi proponents is to reduce the rents collected by centralized intermediaries. The unofficial aim is circumventing intermediaries to enable transactions not otherwise permitted and to generate an asset providing a convenient vehicle for speculation.

The theory of decentralized finance is that the code and protocols provide necessary stability without any other institutional overhead: rules are executed automatically without the need for (indeed, without the possibility) of intervention. The ethos of DeFi is exemplified by Decentralized Autonomous Organizations (DAOs) that operate through smart contracts and blockchain technology to enable decentralized organization and decision-making. The Dai stablecoin, for instance, is maintained by the MakerDAO. The DAO is governed by a confederation of people who hold its governance token MKR. Voting weight is determined by each person's holdings of MKR, and approved governance proposals are executed as smart contracts on the Ethereum blockchain.⁹

In practice, however, decentralized finance has had little uptake. For cryptocurrencies, decentralized exchanges process only 5-10% of the transaction volumes of centralized exchanges like Coinbase and Binance.¹⁰ Among stablecoins, Dai is a distant fourth place in total capitalization, behind Tether, USDC, and BUSD (the latter two are issued by Coinbase and Binance respectively).

Why has uptake been limited? Most importantly, because of safety, or lack thereof. In the absence of institutions like deposit insurance and government-organized bank regulation, DeFi space has revealed itself to be vulnerable to hacks, “rug pulls,” and other exploits.¹¹ A leading Bitcoin developer lost millions of dollars when his private server was hacked, indicative of the inherent risks in self-custody of crypto assets.¹² Roughly 13% of the value locked in DeFi protocols has been lost to hacks according to one data source. (Imagine if 13% of traditional bank savings account balances was lost to hacks!) Cryptocurrencies become inaccessible when private keys are lost. Major institutional investors are not going to self-custody millions of dollars' worth of crypto assets any more than they would store physical stock certificates themselves.¹³ In other words, there is a need for centralized custodians and exchanges—institutions within the DeFi sphere—to make cryptocurrency an attractive for institutional investment.

In practice, DeFi has been dominated by a handful of large institutions. The naïve belief that no one entity controls DeFi, or that dominant institutions do not populate its space, is undermined by the existence of such dominant institutions. In many DeFi projects, rules are set by majorities of asset holders. Since a handful of players – not individuals but partnerships and business groups – dominate mining and/or hold the majority of the assets in question, they dominate decisions regarding the rules.

In addition, the existence of large exchanges puts DeFi back into the world of institutionalized finance. There is little differentiation from traditional finance aside from the operative rules, which in this case create advantage for its alternative institutions and assets. These outcomes—the emergence of a new set of institutions—is not mere happenstance. These institutions are

fundamental in the sense that finance – enforcement of contracts, adjudicate of disputes, and so forth – cannot be meaningfully decentralized.

Contrary to the prejudice that regulatory constraints are *ipso facto* illegitimate or undesirable, centralization is what in fact ensures stability. Accordingly, reasonable transaction costs can be viewed as the necessary price to pay for stability. Transaction costs are not simply a rent but also a fee, whose payment enables security, fraud prevention, and compliance with anti-money laundering and know-your-customer regulation. The question, of course, is at what point transaction costs end and exploitive rents begin. Be this as it may, we argue some costs are desirable: they are not all rents, but rather the price of ensuring compliance with socially-rewarding and efficiency-enhancing financial regulation. To be sure, this does not suggest that all transaction costs are fair and legitimate, only that they are not categorical harms.

CLAIM #1A: The prevalence of financial crises, including in the DeFi space, shows that finance with flawed and weak institutions doesn't work. The weaknesses created DeFi's incomplete institutionalization were clearly revealed in the sequence of events that started with the collapse of the Terra/Luna stablecoin ecosystem and culminated in the bankruptcy of FTX.

This meltdown was prototypical of financial crises. A usual tale involves an asset bubble bursting, taking out hyper-leveraged market participants, and creating a cascade of defaults. The episode reveals what political economists already knew, namely that institutions matter. It matters how they are structured. It matters how they are regulated. It matters who takes decisions the relevant decisions.

The relevant sequence of events ran as follows:

- The first domino in the meltdown was the collapse of the Terra/Luna stablecoin ecosystem.¹⁴ TerraUSD (UST) was an “algorithmic stablecoin” backed by its sister crypto asset Luna. As the name suggests, algorithmic stablecoins are cryptocurrencies that rely on an algorithm to manage the circulation of the stablecoin so that it maintains a specified target price (typically \$1).¹⁵ Investors could exchange 1 UST for \$1 of Luna and vice versa. UST relied on this arbitrage mechanism with Luna to maintain the peg. A key selling point of the Terra ecosystem was the Anchor Protocol that allows “yield farming.” Yield farming refers to the practice of crypto investors locking their crypto assets in a liquidity pool (essentially, lending them) in exchange for rewards. Advocates naively liken yield farming to a crypto “savings account” wherein deposited money earns interest while the pool lends out the deposited crypto-assets. But former FTX CEO Sam Bankman-Fried infamously described yield farming as a Ponzi scheme: one puts their money into a black box not because of any intrinsic value but because the new money coming in facilitates payments to those cashing out.¹⁶ In this case, the Anchor protocol paid upwards of 20% in interest and accounted for the vast majority of money entering the Terra ecosystem. A 20% rate of interest was obviously not sustainable. A run began in early May 2022 and the value of Terra/Luna fell to zero. In February 2023, Terra Labs founder Do Kwon was charged with securities fraud by federal prosecutors. On March 23, 2023, Kwon was arrested in Montenegro while attempting to travel to Dubai using a forged Costa Rican passport.¹⁷

- The second domino was crypto hedge fund Three Arrows Capital (3AC) that had amassed large leveraged positions across crypto assets and counterparties, including Terra/Luna.¹⁸ 3AC lost roughly \$500 million on its investments in Terra/Luna prompting margin calls from its lenders it could not meet. 3AC’s counterparties, in turn, could not meet their own margin calls, creating a cascade of defaults. 3AC filed for bankruptcy on July 1, 2022. Its founders are reportedly hiding in Dubai.¹⁹
- Financial distress then spread to other crypto lending platforms and exchanges. Cryptocurrency broker Voyager filed for bankruptcy in July 2022 after 3AC defaulted on a \$650 million margin loan extended by Voyager.²⁰ Voyager was acquired by Binance after a brief regulatory hold.²¹ A week later, Celsius, another cryptocurrency lending platform, filed for bankruptcy. In its post-mortem, regulators identified Celsius had an untenable business model and enabled “very ponzi like” practices of using customer assets to purchase its own token while allowing insiders to cash out.²²
- On October 2, 2022, the Financial Stability Oversight Council (FSOC), an interagency regulatory body responsible for monitoring risks to US financial stability, released a report observing that “Many crypto-asset firms or activities have sizable interconnections with crypto-asset entities that have risky business profiles and opaque capital and liquidity positions.”²³
- On November 11, 2022, FTX filed for bankruptcy. At one point, the founder of FTX had hoped to acquire Goldman Sachs and/or the Chicago Mercantile Exchange.²⁴ Instead, he was arrested for fraud. The collapse of FTX was arguably the largest single trading loss of all time (three times the size of Long-Term Capital Management and similar to the JP Morgan “London Whale” trading loss in 2012). Unsecured creditors of FTX included crypto-lending platforms BlockFi and Genesis which suspended withdrawals and ultimately filed for bankruptcy.²⁵

CLAIM #2: *In practice, DeFi is an appendage rather than alternative to the traditional financial system – an appendage whose circumvention capacity is its core selling point.*

Consider the linkages. Stablecoins are crucial nodes between the traditional and DeFi ecosystems. Tether is the largest and most important stablecoin; Other stablecoins include USDC (issued by Coinbase) and BUSD (issued by Binance). But Tether is the de facto on-ramp and off-ramp for crypto trading. It is used as the vehicle for the majority of crypto transactions. Its use as a vehicle provides a key link between the crypto sphere and the conventional dollar sphere. It allows crypto to rely on the dollar as the common denominator (unit of account) while settling transactions in Tether.²⁶ Despite repeated promises, Tether has never provided audited financial statements of its holdings.²⁷ According to its website, Tether claims to be primarily invested in US Treasury bills. However, according to its most recent quarterly “attestation” by the accounting firm BDO, it also holds a portion of its reserves in the form of – wait for it – Bitcoin.²⁸

The case of the Greyscale Bitcoin Trust (GBTC) shows how DeFi has functioned as an appendage. GBTC was the first mechanism for individual investors to invest in Bitcoin through a traditional brokerage account. GBTC is an investment trust that now holds some 3% of all Bitcoin in existence. Investors buy shares in the trust as a way of gaining exposure to Bitcoin without directly owning it themselves. This ability to link to traditional brokerage accounts is a potential source of additional demand for Bitcoin and yet another mechanism for linking the crypto and conventional financial spheres. Without these institutional links, DeFi would operate as an entirely isolated system.²⁹

These links are costly. A comparison to the popular SPDR Gold ETF (GLD) is instructive. The sponsor of GLD provides a list of gold bars, vault locations, and assays.³⁰ GBTC, in contrast, refuses to provide proof of reserves or wallet addresses.³¹ The GLD expense ratio is 40 basis points. The GBTC expense ratio is 200 basis points. In other words, the traditional security provides proof of assets with limited expenses. The crypto asset has no evidence of actual backing and a cost basis five times the traditional asset.

CLAIM #3: *Blockchain does not improve upon existing financial infrastructure. It is a solution in search of a problem.*

Blockchain is a distributed ledger on which records or “blocks” are linked together cryptographically into “chains,” rendering them immutable and protected from tampering or alteration. Ledgers themselves are as old as the written word, of course. What is new is the ability to create distributed ledgers that function as a synchronized database, where the validity of transactions is ensured by a protocol rather than a centralized institution. In other words, every transaction is recorded irreversibly on the ledger. Hence, the argument goes, there is no need for institutions.

Blockchains take two forms. A blockchain can be “permissionless,” in which case anyone can connect and transact via the network. Or a blockchains may be “permissioned,” in which case only approved users are authorized to do so. A permissioned blockchain is necessarily institutionalized: someone must adjudicate who is inside and who is outside. Permissioned blockchains can be straightforwardly characterized as a ledger tool within an institution. Most proposed central bank digital currencies (CBDCs) rely on permissioned blockchains, where the central bank is the institution providing (or retaining) permission.

Bitcoin, on the other hand, is the leading example of a permissionless blockchain, where anyone can create a wallet, transact, and mine without the approval of a centralized authority.

While blockchain is sometimes thought to be synonymous with crypto, billions of dollars have been invested in projects seeking to deploy blockchain-based solutions for other business problems. The problems for which blockchain was seeking to be a solution include international trade, foreign exchange, and equity settlements. Skepticism arises from high-profile blockchain projects that were later abandoned after limited uptake from existing customers: Maersk, the Australian stock exchange, and the Depository Trust & Clearing Corporation’s Project Ion to use blockchain for US equity settlements.³² In each case, a significant category of potential users were

not convinced blockchain delivers on its supposed benefits in practice. Similarly, Bitcoin payments are significantly slower and more expensive to process than comparable USD-based transactions. Credit card transactions process in seconds while Bitcoin transactions take about ten minutes to validate.³³ Despite funding and the hype, blockchain has not yet found a significant application at scale beyond cryptocurrencies. Sam Bankman-Fried himself argued that blockchain has “no future as a payments network.”³⁴

China may be something of an exception. Despite enacting a total ban on cryptocurrency in 2021, China has invested heavily in blockchain ecosystem projects. The rationale of Chinese political leaders and technologists is not entirely clear.³⁵

CONCLUSION: THE POLITICAL STAKES OF DeFi

The actual goal of DeFi is to implement an alternate set of institutions that operate to the benefit of those who create and control them. The commercial project and the political project are inseparable, regardless of the specific intent or emphasis of any individual advocate. Although the political project may be central to committed libertarians, their mantras provide political cover for the commercial project.

1. DeFi is often pitched as a response to the excesses of the traditional financial system, as revealed by the 2008 crisis. The Bitcoin “genesis block” contains a message referencing the bank bailouts of late 2008, a reference that commentators have interpreted as a protest against the financial status quo. Yet 15 years later, DeFi embodies all of the worst elements of the system it sought to replace – opacity, self-dealing, fraud, front-running, corruption, privileging of insiders over the small investors – without any of the associated benefits.
2. Crypto lacks the essential attributes of money: it is not a store of value, it is not used as a medium of exchange, and it is an unreliable unit of account. It offers limited portfolio diversification benefits because its returns are highly correlated with those on other risk assets. It is a speculative asset and facilitator of otherwise illicit transactions. As Trevor Jackson has recently written, crypto is a “unique combination of technical complexity, internationally mobile capital, and regulatory arbitrage... fueled by cheap electricity, cheap computer chips... and above all more than a decade of cheap money from central banks.”³⁶
3. It is worth considering where crypto has actually taken root. It has found uses where centralized monetary authority and institutions have collapsed or are on the verge of collapse. Bitcoin is legal tender in El Salvador and the Central African Republic, although actual take-up has been very limited. Bitcoin was used in the Donetsk province of Ukraine after former Prime Minister Petro Poroshenko ordered the central bank to halt transactions in breakaway regions.³⁷ War-torn North Kosovo has emerged as a hotbed of crypto mining.³⁸ There are widespread reports of the use of Bitcoin by drug cartels.³⁹ A recent report from the US Department of the Treasury finds that “illicit actors, including ransomware cybercriminals, thieves, scammers, and the Democratic People’s Republic of Korea cyber actors, are using DeFi services in the process of transferring and laundering their illicit proceeds.”⁴⁰ Binance is being investigated by the Department of Justice for

allowing Russian nationals avoid US sanctions.⁴¹ In these cases, cryptocurrencies are not replacing an existing set of financial institutions; rather, they are emerging from relative financial anarchy. These applications are not precursors of “financial innovation.”

4. In part as a response to the debate about decentralized finance, some one hundred countries are considering whether to issue a central bank digital currency.⁴² A CBDC is liability of the central bank recorded on a decentralized ledger. Although distinct from the issues specific to DeFi explored in this paper, there are some important throughlines. Some regard CBDC as a way of heading off in-roads into the government monopoly of money by DeFi. Others, see CBDC as a platform onto which smart contracts and other DeFi applications can be built. Either way, like DeFi, CBDC is a seemingly technical innovation that carries implicit politics.
5. A long tradition in the West equates technological development with social and indeed human progress. Greater complexity, specialization, efficiency, productivity are seen as corollaries of such progress. This is the basic story about how sustained economic growth becomes possible.⁴³ But not all technological possibilities lead to commercially and politically viable options. Technological innovation does not guarantee improvement over the status quo. In the realm of finance specifically, the institutions that structure and mediate those developments are crucial for whether or not they translate into progress (whether or not they have desirable efficiency, distribution and stability implications, in other words). Central banks and regulators should not uncritically drive adoption in the name of modernization or progress (that is to say, without consideration of these issues).
6. Fundamentally, a viable financial system rests on institutions that exhibit a degree of centralization and trust. When institutions are replaced by algorithms, the scope for redress is severely limited. Without regulation and oversight, “DeFi will be incapable of providing the investor protection and market integrity that are the hallmarks of well-functioning markets.”⁴⁴ Centralized institutions and the individuals responsible for their operation can be held accountable by customers and regulators. Decentralized autonomous organizations are designed – they are intended – to frustrate such accountability. They do so precisely because they are decentralized and autonomous.
7. The common mantra that DeFi is the “future of finance” aims to naturalize this political project as a technological *fait accompli*. The dream is to fulfill the Hayekian vision of fully privatized money free from state oversight or control.⁴⁵
8. Finally, there is a fundamental asymmetry between the problems of the “traditional” financial system identified by proponents of DeFi and the proposed solution: the purported benefits of DeFi in terms of financial inclusion and reduced transaction costs pale in comparison with the risks, which are unknown and potentially high.

¹ Sirio Aramonte, Wenqian Huang, and Andreas Schrimpf, “DeFi risks and the decentralization illusion,” *BIS Quarterly Review* December 2021, 23.

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- ² Campbell Harvey, Ashwin Ramachandran, and Joey Santoro, *DeFi and the Future of Finance* (Hoboken, NJ: Wiley, 2021), 161.
- ³ We might provisionally define a “cryptocurrency” as a digital token (e.g. Bitcoin, Ethereum, Litecoin) whose ownership is recorded on a blockchain.
- ⁴ Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System,” <https://bitcoin.org/bitcoin.pdf>
- ⁵ *Ibid.*, 6.
- ⁶ <https://www.coinbase.com/learn/crypto-basics/what-is-cryptocurrency>
- ⁷ See David Golumbia, *The Politics of Bitcoin* (Minneapolis: University of Minnesota Press, 2016).
- ⁸ Tommaso Pardi, Martin Krzywdzinsky, Boy Luethje, “Digital manufacturing revolutions as political projects and hypes: evidence from the auto sector,” *ILO Working Paper* 3 April 2020.
- ⁹ For a detailed description, see <https://makerdao.com/en/whitepaper>.
- ¹⁰ OECD, “Why DeFi Matters,” 37.
- ¹¹ For a running list, see <https://web3isgoinggreat.com>.
- ¹² <https://cointelegraph.com/news/bitcoin-core-developer-claims-to-have-lost-200-btc-in-hack>
- ¹³ Andy Mukherjee, “Will Crypto Ever Be a Safe Investment?” *Bloomberg Opinion* January 4, 2023, <https://www.bloomberg.com/opinion/articles/2023-01-04/crypto-can-custodian-services-make-it-a-safe-investment>.
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- ¹⁵ See Ganesh Viswanath-Natraj and Amit Chaudhary, “Algorithmic stablecoins and devaluation risk,” *Centre for Economic Policy Research* May 13, 2022, <https://cepr.org/voxeu/columns/algorithmic-stablecoins-and-devaluation-risk>.
- ¹⁶ <https://www.bloomberg.com/news/articles/2022-04-25/sam-bankman-fried-described-yield-farming-and-left-matt-levine-stunned>
- ¹⁷ David Yaffe-Bellany, “Crypto Fugitive Do Kwon Is Charged With Fraud by U.S. Prosecutors,” *New York Times* March 23, 2023, <https://www.nytimes.com/2023/03/23/business/do-kwon-arrested-crypto.html>.
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- ¹⁹ Jen Wiczner, “The Crypto Geniuses Who Vaporized a Trillion Dollars,” *New York Magazine* August 15, 2022.
- ²⁰ The margin loan was for 15,250 BTC (worth approximately \$300 million) and \$350 million of USDC.
- ²¹ <https://www.cnbc.com/2022/12/19/binance-to-acquire-voyager-assets-weeks-after-ftx-deal-fell-through-bankruptcy.html>.
- ²² Joshua Oliver and Kadhim Shubber, “Crypto lender Celsius misused customer funds for years, examiner finds,” *Financial Times* January 31, 2023, <https://www.ft.com/content/0f2c97de-9c71-4e0c-8848-b5d25eb96599>.
- ²³ Financial Stability Oversight Council, “Report on Digital Asset Financial Stability, Risks and Regulation,” October 2, 2022.
- ²⁴ Eva Szalay, “Crypto exchange FTX sets sights on blue-chip acquisitions,” *Financial Times* July 13, 2021, <https://www.ft.com/content/c8ffb228-1dbe-4e8a-b30b-be7203d71e7d>.
- ²⁵ David Yaffe-Bellany, “Genesis, a Crypto Lending Firm, Files for Bankruptcy,” *New York Times* January 20, 2023, <https://www.nytimes.com/2023/01/20/technology/genesis-bankruptcy-crypto.html>.
- ²⁶ <https://www.bloomberg.com/news/features/2021-10-07/crypto-mystery-where-s-the-69-billion-backing-the-stablecoin-tether>
- ²⁷ Ben Foldy, Ada Hui, and Peter Rudegeair, “The Unusual Crew Behind Tether, Crypto’s Pre-Eminent Stablecoin,” *Wall Street Journal*, February 2, 2023, <https://www.wsj.com/articles/tether-ownership-and-company-weaknesses-revealed-in-documents-11675363340>. The accounting firm BDO provides quarterly “attestation reports” of Tether’s reserves, but attestations are not audits, and quarterly reports are not always timely. See Barry Eichengreen, My Nguyen and Ganesh Viswanath-Natraj, “Stablecoin Devaluation Risk,” *SSRN* (June 2023).
- ²⁸ <https://tether.to/en/transparency/#reports>
- ²⁹ The SEC recently ruled against Greyscale’s proposal to convert GBTC into an exchange-traded fund (ETF). Greyscale has appealed the decision and the case is currently pending before the DC Circuit Court of Appeals. See Hannah Lang, “US court questions SEC’s rejection of Greyscale’s bitcoin fund proposal,” *Reuters* March 7, 2023, <https://www.reuters.com/legal/court-set-hear-arguments-grayscales-lawsuit-against-sec-over-bitcoin-fund-2023-03-07>.
- ³⁰ <https://www.spdrgoldshares.com/usa/gold-bar-list/>
- ³¹ <https://cointelegraph.com/news/grayscale-cites-security-concerns-for-withholding-on-chain-proof-of-reserves>
- ³² https://www.theregister.com/2022/11/30/ibm_and_maersk_tradelens_shutdown/

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- ³³ Eswar Prasad, “The Brutal Truth about Bitcoin,” *New York Times* June 14, 2021, <https://www.nytimes.com/2021/06/14/opinion/bitcoin-cryptocurrency-flaws.html>. Some have tried to circumvent the problem of slow and costly transaction processing by creating “Layer 2” systems that sit on top of an existing blockchain system. Layer 2 systems are secondary protocols built on top of an existing blockchains system like Bitcoin or Ethereum to enhance throughput by redirecting a portion of the transaction processing away from the primary blockchain. They enable faster transactions by redirecting the load away from the primary blockchain while preserving its security guarantees. In essence, Layer 2 systems net multiple off-chain transactions into a single Layer 1 transaction on the primary blockchain. As of May 2023, daily Layer 2 transaction volume was roughly 5% of Layer 1 volume, suggesting limited adoption.
- ³⁴ Joshua Oliver, “Bitcoin has no future as a payments network, says FTX chief,” *Financial Times* May 15, 2022, <https://www.ft.com/content/02cad9b8-e2eb-43d4-8c18-2e9d34b443fe>
- ³⁵ There is, of course, a the distinction between how transactions are recorded and how they are validated. The proof of work vs. proof of stake distinction applies to how transactions are validated.
- ³⁶ Some speculate that the Blockchain Services Network might serve as a potential platform for the launch of the e-CNY, since Blockchain as a transaction mechanism is not inherently decentralized. Trevor Jackson, “The Price of Crypto,” *New York Review of Books* June 8, 2023. Also see Trevor Jackson, “The Crypto Crisis,” *Dissent* August 8, 2022.
- ³⁷ <https://cointelegraph.com/news/kievs-economic-blockade-boosts-bitcoin-usage-in-separatist-east>
- ³⁸ Alexander Clapp, “Electric Crypto Balkan Acid Test,” *The Baffler* July 2020, <https://thebaffler.com/salvos/electric-crypto-balkan-acid-test-clapp>
- ³⁹ “Mexican cartels turn to bitcoin, internet, e-commerce,” *Associated Press* March 10, 2022, <https://apnews.com/article/business-caribbean-mexico-crime-drug-cartels-1bb5ebf84fbf71baf6a845648bad4990>
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- ⁴¹ <https://www.bloomberg.com/news/articles/2023-05-05/binance-faces-us-probe-of-possible-russian-sanctions-violations>
- ⁴² <https://www.atlanticcouncil.org/cbdetracker/>
- ⁴³ Robert E. Lucas Jr., “On the Mechanics of Economic Development,” *Journal of Monetary Economics* 22 (1988), pp.3-42; J.Bradford DeLong, *Slouching Towards Utopia* (New York: Basic Books, 2022), chapter 1.
- ⁴⁴ Jonah Crane, Jonathan Everhart, and Antonio Weiss, “Deep Dive: Enhancing Market Integrity and Investor Protection in Crypto Asset Markets,” *The Bretton Woods Committee*, https://www.brettonwoods.org/sites/default/files/documents/BWC-Brief6-Crypto-Integrity_FNL2lo.pdf
- ⁴⁵ Stefan Eich, “Old Utopias, New Tax Havens” in *Regulating Blockchain: Techno-Social and Legal Challenges* (New York: Oxford University Press, 2019).