

FROM TETHER TO TERRA: THE CURRENT STABLECOIN ECOSYSTEM AND THE FAILURE OF REGULATORS

*Mary Elizabeth Burke**

ABSTRACT

The Tether controversy and Terra crash have placed stablecoins in the regulatory spotlight. Stablecoins are often portrayed as posing systemic risks to financial markets, with some pundits labelling them “the villain of the finance world.” Global regulatory bodies, namely the International Monetary Fund (IMF) and the Bank of International Settlement (BIS), and political leaders, including the Biden Administration, have all called for stablecoin regulation. These officials allege that stablecoins’ structure, combined with their exponential growth, pose a unique risk to global markets. Before the May 2022 Terra crash, government reports superficially treated stablecoins by exclusively focusing on asset-backed coins. Post hoc, regulatory reports treated Terra’s collapse as inevitable, using the failure as an opportunity to push for a central bank digital currency (“CBDC”) in the United States.

Whether stablecoins should be regulated is not up for debate. Their regulation is imminent. Yet, how stablecoins should be regulated and if CBDCs can be an adequate replacement is another matter. In the words of the Commodities Future Trading Commission’s (CFTC) Dawn Stump: “As financial markets evolve and adapt to new demands, market regulators must not stifle beneficial innovations by clinging rigidly to regulatory approaches of the past that may no longer be fit for purpose.”

* J.D. Candidate, Fordham University School of Law, 2023. I would like to thank Professor Donna Redel for reviewing my work, her indispensable edits, and her thoughtful recommendations. I would also like to thank Professor Kenneth Rashbaum for his assistance. Finally, thank you to my family and friends for supporting me through the Note writing process and to the *Fordham Journal of Corporate & Financial Law* for their continued support.

INTRODUCTION	101
I. WHAT ARE STABLECOINS?	107
A. Purpose	107
B. Taxonomy	108
1. Asset-Backed Stablecoins	108
a. Fiat-Backed Stablecoins.....	108
i. Fiat-Backed Stablecoin Examples: Tether and Circle	109
b. Commodity-Backed Stablecoins	112
2. On-Chain Collateralized Stablecoins	114
a. MakerDAO's DAI	115
i. DAI and MKR Tokens	116
ii. Auction Mechanisms.....	117
iii. External Actors.....	118
b. Problems	121
3. Non-Collateralized/Algorithmic Stablecoins	122
a. Terraform Labs: UST and LUNA	123
i. Structure	123
ii. Collapse.....	126
C. Stablecoin Use Cases.....	127
II. STABLECOINS AS THE NEW PRIVATE FORM OF MONEY?	130
A. Properties of Money	131
1. Stablecoins as a Medium of Exchange, a Store of Value, and a Unit of Account.....	131
2. NQA, the Free Banking Era, and Stablecoins According to Gorton and Zhang.....	132
3. An Imprecise Analogy and the Fable of the Cats	135
B. I Say Stablecoin, and You Say CBDC? Let's Call the Whole Thing Off.....	138
III. STABLECOINS AS DEPOSITS?	141
A. Section 21 of the Glass-Steagall Act.....	141
B. Scrutiny of On-Demand Redemption	143
IV. STABLECOINS AS MONEY MARKET FUNDS?	144
A. Generally	144
B. Breaking The Buck and The Fear Of Stablecoin Runs ...	146
CONCLUSION	147

INTRODUCTION

Stablecoins are creatures of evolution. That is to say, stablecoins not only fill a niche created by other digital assets, but their advent has further allowed the digital asset space to mature. Consequently, in order to understand stablecoins, it is necessary to grasp the development of digital assets generally.

To start, Bitcoin emerged in 2009 from Satoshi Nakamoto's now famous paper *Bitcoin: A Peer-to-Peer Electronic Cash System*.¹ Then, in 2012, J.R. Willett started a new era of "cryptoeconomics" by creating a coin on top of Bitcoin, and launching the first initial coin offering ("ICO"), Mastercoin (now Omni).² This led to the ICO boom from 2018

1. Marco Dell'Erba, *Stablecoins in Cryptoeconomics: From Initial Coin Offerings (ICOs) to Central Bank Digital Currencies (CBDCs)*, N.Y.U. J. LEGIS. & PUB. POL'Y (forthcoming) (manuscript at 2), <https://ssrn.com/abstract=3385840> (citing SATOSHI NAKAMOTO, BITCOIN: A PEER-TO-PEER ELECTRONIC CASH SYSTEM (2008), <https://bitcoin.org/bitcoin.pdf>).

2. *Id.* at 2-3, (citing J.R. WILLETT, THE SECOND BITCOIN WHITEPAPER 1 (2012), <https://cryptochainuni.com/wp-content/uploads/Mastercoin-2nd-Bitcoin-Whitepaper.pdf> [<https://perma.cc/JP2J-4TG6>]).

We claim that the existing bitcoin network can be used as a protocol layer, on top of which new currency layers with new rules can be built We further claim that the new protocol layers . . . [w]ill provide initial funds to hire developers to build software which implements the new protocol layers, and . . . [w]ill richly reward early adopters of the new protocol.

Id.

to 2019.³ However, the boom featured frauds and hacks that left investors without legal recourse.⁴

In response to these scams and their corresponding Securities and Exchange Commission (SEC) enforcement actions, as well as scalability problems and a general aversion to new technologies, the cryptocurrency market became exceedingly volatile.⁵ This volatility was made worse by

3. See Cryptopedia Staff, *Ethereum and the ICO Boom*, GEMINI: CRYPTOPEDIA (May 27, 2021), <https://www.gemini.com/cryptopedia/initial-coin-offering-explained-ethereum-ico-section-initial-coin-offerings-on-ethereum> [<https://perma.cc/4453-5LCW>]. ICOs were a popular crowdfunding vehicle between 2017 and 2018, raising over 10 billion USD. *Id.* ICOs allow companies to raise capital without going through the traditional IPO process. See *ICOs vs. STOs vs. IPOs in Crypto: Key Differences Explained*, COINTELEGRAPH, <https://cointelegraph.com/funding-for-beginners/icos-vs-stos-vs-ipos-in-crypto-key-differences-explained> [<https://archive.ph/6ZhUX>] (last visited, Oct. 25, 2022). Developers sell tokens for money, and, unlike IPOs, tokenholders do not hold equity in the company. *Id.* Instead, the holders use these tokens on the blockchain or decentralized application (“dApp”) that they fund. *Id.* See also the statement of former SEC chairman Jay Clayton:

A number of concerns have been raised regarding the cryptocurrency and ICO markets, including that, as they are currently operating, there is substantially less investor protection than in our traditional securities markets, with correspondingly greater opportunities for fraud and manipulation. . . . Please also recognize that these markets span national borders and that significant trading may occur on systems and platforms outside the United States. Your invested funds may quickly travel overseas without your knowledge. As a result, risks can be amplified, including the risk that market regulators, such as the SEC, may not be able to effectively pursue bad actors or recover funds.

Chairman Jay Clayton, *Statement on Cryptocurrencies and Initial Coin Offerings*, SEC. & EXCH. COMM’N (Dec. 11, 2017), <https://www.sec.gov/news/public-statement/statement-clayton-2017-12-11> [<https://perma.cc/FCX7-2F9L>].

4. See *The Idea and a Brief History of Cryptocurrencies*, GUARDIAN NIGERIA NEWS (Dec. 26, 2021), <https://guardian.ng/technology/tech/the-idea-and-a-brief-history-of-cryptocurrencies/> [<https://perma.cc/L486-2KUU>]; see also Ana Alexandre, *New Study Says 80 Percent of ICOs Conducted in 2017 Were Scams*, COINTELEGRAPH (July 13, 2018), <https://cointelegraph.com/news/new-study-says-80-percent-of-icos-conducted-in-2017-were-scams> [<https://perma.cc/7X6G-QCV6>].

5. See Dell’Erba, *supra* note 1, at 3-4. According to Ted Livingston, CEO of Kik Interactive, a private cryptocurrency company charged with violating securities law for its ICO, the SEC’s enforcement actions have exported innovation to more welcoming nations. See Ted Livingston, *Moving Forward Boldly with Kin*, MEDIUM (Sept. 23, 2019),

cryptocurrencies structural characteristics: traditional cryptocurrencies are not backed by assets, are not any institution's liability, and face no rigid issuance rules.⁶ In response, stablecoins developed in 2014 as a less volatile alternative.⁷

The purpose of a stablecoin is to solve cryptocurrency's volatility problem by holding a constant value.⁸ Thus, the coins act as a store of value, a medium of exchange, and a unit of account.⁹ The first stablecoin was BitUSD, launched in 2014 by BitShares.¹⁰ Projects then developed in North America, Europe, Asia, the Middle East, and Oceania, making the market value grow by 700 percent in 2018.¹¹ In 2018, Tether, also established in 2014, accounted for 93 percent of the stablecoin market value.¹²

2020 was the year of Decentralized Finance ("DeFi").¹³ DeFi takes control away from traditional third-party financial institutions and allows consumers and merchants to transact directly with one another via

<https://medium.com/@tedlivingston/moving-forward-boldly-with-kin-ec6290a6453>
[<https://perma.cc/GKN4-A4TL>]:

After 18 months of working with the SEC the only choice they gave us was to either label Kin a security or fight them in court. Becoming a security would kill the usability of any cryptocurrency and set a dangerous precedent for the industry. . . . [T]he SEC [is] working to characterize almost all cryptocurrencies as securities

Id.; see also Dell'Erba, *supra* note 1, at 3-4.

6. See Dell'Erba, *supra* note 1, at 4.

7. See *id.* at 5; see also BitMEX Research, *A Brief History of Stablecoins (Part 1)*, BITMEX (July 2, 2018), <https://blog.bitmex.com/a-brief-history-of-stablecoins-part-1/> [<https://perma.cc/VRB4-BZF5>].

8. See Dell'Erba, *supra* note 1, at 5.

9. *Id.*

10. BitSpark, *What Is BitUSD? Everything You Need To Know About The First Stablecoin Ever Created*, MEDIUM: LEDGER (Aug. 22, 2019), <https://medium.com/the-ledger-by-spark/what-is-bitusd-everything-you-need-to-know-about-the-first-stablecoin-ever-created-72337c53fdfa> [<https://perma.cc/U2JQ-6G64>]. BitUSD was backed by BitShare's token BTS, so that for every BitUSD there was more than two USD worth of BTS stored in a smart contract. *Id.*

11. Dell'Erba, *supra* note 1, at 5.

12. *Id.* at 5-6.

13. *A Look Back at 2020, the Year of DeFi*, YIELD APP, <https://blog.yield.app/post/a-look-back-at-2020-the-year-of-defi> [<https://archive.ph/IHgpc>] (last visited Oct. 25, 2022).

blockchain.¹⁴ For instance, decentralized finance applications (“dApps”) allow users to trade, lend, or borrow assets.¹⁵ The first DeFi protocol, MakerDao, launched in 2017 and allows users to borrow a stablecoin, Dai, against Ether, Ethereum’s native cryptocurrency, as collateral.¹⁶ This dApp thus allows users to take out a loan without relying on a bank or other centralized entity.¹⁷

Today, DeFi protocols allow users to lend out their crypto and earn interest, trade crypto assets through an exchange, save their crypto through a savings account alternative, and buy derivatives of other cryptocurrencies.¹⁸ DeFi and stablecoins work in tandem; stablecoins act as crucial facilitators in dApps by providing a means of fixed payment through blockchain technology.¹⁹ So, DeFi’s expansion and stablecoins’ market growth are not merely correlative, but causative. 2017 was the first year of dApps.²⁰ By December 2018, the total value locked (“TVL”)²¹ of DeFi was around \$300 million.²² The end of 2020 saw a TVL of approximately \$15 billion.²³

While the stablecoin market continues to grow, regulators have been unable to keep up. So far, the SEC has generally used unclear, post hoc, regulation by enforcement in the crypto sphere, forcing companies “to pick through the breadcrumbs of the SEC’s filed actions in an attempt to

14. See Rakesh Sharma, *Decentralized Finance (DeFi) Definition*, INVESTOPEDIA, <https://www.investopedia.com/decentralized-finance-defi-5113835> [<https://perma.cc/X2VT-ZTJH>] (last updated Sept. 21, 2022).

15. See HEIKE MAI, DEUTSCHE BANK RESEARCH, STABLECOINS: DEFI, LIBRA AND BEYOND (2022), https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000522496/Stablecoins%3A_DeFi%2C_Libra_and_beyond.PDF.

16. Camila Russo, *What is Decentralized Finance?: A Deep Dive by the Defiant*, COINMARKETCAP: ALEXANDRIA (2021), <https://coinmarketcap.com/alexandria/article/what-is-decentralized-finance> [<https://perma.cc/LL8S-XFFS>].

17. *Id.*

18. *What is DeFi?*, COINBASE, <https://www.coinbase.com/learn/crypto-basics/what-is-defi> [<https://perma.cc/DA98-E94A>] (last visited Oct. 18, 2022).

19. Mai, *supra* note 15.

20. Samuel Wan, Parabolic growth puts Total Value Locked (TVL) in DeFi at record \$37.17 billion, CRYPTOSLATE, <https://cryptoslate.com/parabolic-growth-puts-total-value-locked-tvl-in-defi-at-record-35-8b/> [<https://perma.cc/373E-FZZ5>].

21. TVL is the current value of the deposits in a DeFi protocol. Benedict George, *Why TVL Matters in DeFi: Total Value Locked Explained*, COINDESK (Jan. 26, 2022), <https://www.coindesk.com/learn/why-tvl-matters-in-defi-total-value-locked-explained/> [<https://perma.cc/9ZG2-5YP7>].

22. Wan, *supra* note 20.

23. *Id.*

best ensure compliance.”²⁴ Moreover, the current federal and state regulatory landscape is a patchwork.²⁵ There is not even a uniform definition for “cryptocurrency” across jurisdictions.²⁶

More recently, the proposed bipartisan stablecoin bill from Senators Cynthia Lummis (R-WY) and Kirsten Gillibrand (D-NY) continues the larger trend of looking to central bank digital currencies (“CBDCs”) as a replacement to stablecoins.²⁷ However, the two are incongruent, and a regulation seeking to replace stablecoins with CBDCs seems likely to have limited impact. The bill moreover proposes that stablecoins be 100 percent backed by reserve-like assets, such as Treasuries or dollars, and include detailed disclosure requirements.²⁸ This proposal, however, would contract the stablecoin market to only one type of stablecoin, fiat-backed, discussed in detail later. Additionally, according to Waters and

24. Sarah Heaton Concannon et al., *Review of 2021 Trends in SEC Crypto Enforcement Actions*, JDSUPRA (Feb. 11, 2022), <https://www.jdsupra.com/legalnews/review-of-2021-trends-in-sec-crypto-8458083/> [<https://perma.cc/Q35U-43P2>] (citing Commissioner Dawn D. Stump, *We Can Do Hard Things, Remarks at Chamber of Digital Commerce* (Nov. 5, 2021), (available at <https://www.cftc.gov/PressRoom/SpeechesTestimony/opastump11> [<https://perma.cc/W787-CAGF>])). For example, the SEC’s first enforcement action against a cryptocurrency exchange, EtherDelta, provided little guidance: the SEC tried to link the EtherDelta decision with other recent ICO enforcement actions and one broker-dealer. Rather than pointing to any commonality between the actions, the statement simply emphasized that the SEC will enforce its view on the law. See Michael J. O’Connor, *Overreaching its Mandate? Considering the SEC’s Authority to Regulate Cryptocurrency Exchanges*, 11 DREXEL L. REV. 539, 567 (2019).

25. Connor Donevan, *There’s a New Plan to Regulate Cryptocurrencies. Here’s What You Need to Know*, NPR (June 14, 2022), <https://www.npr.org/2022/06/14/1104303982/crypto-bitcoin-stablecoin-regulation-senate> [<https://perma.cc/HY99-7V4E>] (“The industry is currently overseen by a patchwork of federal and state regulations, which haven’t always evolved as quickly as the technology has.”). See generally *Blockchain & Cryptocurrency Laws and Regulations 2022*, GLOBAL LEGAL INSIGHTS (2022), <https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/usa> [<https://perma.cc/NB3J-DGQY>] (last visited Oct. 18, 2022).

26. See *Blockchain & Cryptocurrency Laws and Regulations 2022*, *supra* note 25.

27. See Jennifer Schonberger, *Biden Administration Weighs Stablecoin Regulation Outside of Traditional Banks*, YAHOO FINANCE (June 30, 2022), <https://finance.yahoo.com/news/stablecoin-regulation-banks-biden-administration-194925029.html> [<https://perma.cc/9NQD-2V28>]; Sam Sutton, *House Punts on Stablecoin Bill After Yellen Raises Flags over Key Provision*, POLITICO (July 25, 2022), <https://www.politico.com/news/2022/07/25/house-stablecoin-bill-delay-yellen-00047728> [<https://perma.cc/NSP6-HDMK>]. Specifically, the Waters and McHenry bill “would give banks the ability to issue their own stablecoins . . . and put nonbank issuers under the oversight of the Federal Reserve.” *Id.*

28. See Schonberger, *supra* note 27.

McHenry, the impetus behind the bill is the President's Working Group report ("PWG Report").²⁹ However, this report was incomplete: it was silent about Terra and algorithmic stablecoins generally.

Regulators have so far published substandard reports while Congress has proposed reactionary laws that shoehorn a uniquely complicated market into a conventional mold. The government should instead focus on coalescing research and experts' views to fully understand the field, and only then pass appropriate legislation.

Part I of this Note identifies stablecoins' categories, their problems, and uses. Part II addresses the paper *Taming Wildcat Stablecoins*, written by Yale Economist Gary B. Gorton, Yale Economist, and Michigan Law School Professor Jeffery Zhang. This Note challenges their argument that stablecoins are the modern iteration of the 19th century private bank notes. This Note then argues that CBDCs are an inadequate replacement to stablecoins.

Part III looks at demand deposit accounts ("DDA"s) and compares them to the different stablecoin categories. DDAs are similar to one type of stablecoin issuer. Ultimately, this Note suggests that stablecoins should not be regulated as DDAs are, as the two are distinct vehicles.

Part IV examines money market funds ("MMF"s) and studies their similarities to stablecoins generally. While one stablecoin issuer is similar to a MMF, this Note draws the same conclusion as in Part III: broadly

29. Sutton, *supra* note 27. Senator Pat Toomey's bill, the Stablecoin Transparency of Reserves and Uniform Safe Transactions Act ("TRUST Act"), similarly constricts the stablecoin landscape by regulating asset-backed stablecoins. See Andrew Olmem & Ellen L. Aldin, *Senator Toomey Releases Stablecoin Regulation Legislation*, MAYER BROWN (Apr. 28, 2022), <https://www.mayerbrown.com/en/perspectives-events/publications/2022/04/senator-toomey-releases-stablecoin-regulation-legislation> [<https://perma.cc/VP4F-JBS7>]. While this proposal might seem to include other asset-backed coins, in practice it is nearly as exclusive as the Lummis and Gillibrand bill. *Id.* Specifically, the proposed bill includes that an issuer must maintain reserve of "100 percent of the par value of outstanding payment stablecoins in cash, cash equivalents, or level 1 high-quality liquid assets (as currently defined under federal regulation) denominated in US dollars." *Id.* However, this would not include any cryptocurrency. *Id.*; see also Anwar Hasan Abdullah Othman et al., *Are the New Crypto-Currencies Qualified to be Included in the Stock of High Quality Liquid Assets? A Case Study of Bitcoin Currency*, J. ISLAMIC THOUGHT & CIVILIZATION INT'L ISLAMIC U. MALAY, (Oct. 2019), https://www.researchgate.net/publication/336313181_Are_the_New_Crypto-Currencies_Qualified_to_be_Included_in_the_Stock_of_High_Quality_Liquid_Assets_A_Case_Study_of_Bitcoin_Currency.

speaking, stablecoins and MMFs are distinct creatures and stablecoins should be regulated differently.

This Note concludes that stablecoins' unique use and significant varieties do not fit into traditional regulations. This Note suggests that federal authorities should regulate stablecoins after considering the unique problems they create and risks they pose. More specifically, the issuance of CBDCs is likely an inadequate solution. And shrinking the stablecoin market to only fiat-backed coins could stifle innovation and limit economic opportunities.

I. WHAT ARE STABLECOINS?

A. PURPOSE

The cryptocurrency market is undoubtedly volatile.³⁰ This volatility limits cryptocurrency's capacity to act as a means of exchange—its intended purpose.³¹ Because some major exchanges did not permit bank transfers or other kinds of fiat money on their platform, stablecoins developed to allow traders to convert erratic digital currencies instantaneously, securely, and privately to a form that maintained a constant value.³²

Stablecoins are crypto tokens designed to maintain a constant par price to a reference asset.³³ The most recognized stablecoins are pegged

30. Indeed, there is an index devoted to tracking the crypto market's volatility. *See* CRYPTO VOLATILITY INDEX, <https://cvi.finance/> [<https://perma.cc/4MFB-LLE8>] (last visited Oct. 18, 2022). In 2017 and 2018, the volatility of cryptocurrency surpassed that of the diversified European stock and bond markets, and oil and gold prices; *see generally* EUROPEAN CENT. BANK, *Stablecoins — No Coins, but Are They Stable?*, IN FOCUS, Nov. 2019, at 1, <https://www.ecb.europa.eu/paym/intro/publications/pdf/ecb.mipinfocus191128.en.pdf> [hereinafter, EUROPEAN CENTRAL BANK].

31. *See generally* NAKAMOTO, *supra* note 1 (at least as pertains to Bitcoin, the first cryptocurrency).

32. *See* James Royal, *What Are Stablecoins and How Do They Affect the Cryptocurrency Market?*, BANKRATE: INVESTING (May 12, 2022), <https://www.bankrate.com/investing/stablecoin-cryptocurrency/> [<https://perma.cc/9K3W-CMTB>]; *Are Deflationary Stablecoins the Future?*, INVESTING.COM: COIN EDITION (Mar. 23, 2022), <https://www.investing.com/news/cryptocurrency-news/are-deflationary-stable-coins-the-future-2790139> [<https://perma.cc/MH6P-F3P4>].

33. *See* Gary B. Gorton & Jeffery Y. Zhang, *Taming Wildcat Stablecoins*, 90 U. CHI. L. REV. (forthcoming) (manuscript at 6), <https://ssrn.com/abstract=3888752>.

to the value of a fiat currency, such as the U.S. dollar (USD).³⁴ Tokens can also be pegged to other types of reserve assets, such as a cryptocurrency or a commodity.³⁵ A coin can also be backed by algorithmic mechanisms that manage the token supply to keep the market price at approximately one dollar.³⁶

B. TAXONOMY

There are three main categories of stablecoins: asset-backed stablecoins, on-chain collateralized stablecoins, and non-collateralized stablecoins. This taxonomy reveals that the stablecoin ecosystem is diverse.

1. Asset-Backed Stablecoins

a. Fiat-Backed Stablecoins

Fiat-backed stablecoins hold a value that is directly linked to an external, reference currency, such as one USD.³⁷ They are also known as tokenized funds or true stablecoins.³⁸ When a user or third party gives the issuer fiat currency, the issuer mints the equivalent amount in tokens.³⁹ To maintain the value of the coin relative to the reference currency, the issuer holds assets to back its redemption obligation (a holder's right to

34. See Dell'Erba, *supra* note 1, at 5-6. For example, Tether. See *What Are Tether Tokens and How Do They Work?*, <https://tether.to/en/how-it-works> [<https://perma.cc/3NN5-L4S9>] (last visited Oct. 18, 2022).

35. Chair Gary Gensler, President's Working Group Report on Stablecoins, SEC. & EXCH. COMM'N (Nov. 1, 2021), <https://www.sec.gov/news/statement/gensler-statement-presidents-working-group-report-stablecoins-110121> [<https://perma.cc/M5WU-8ZWW>]; Sherman Lee, *Explaining Stable Coins, the Holy Grail of Cryptocurrency*, FORBES (Mar. 12, 2018), <https://www.forbes.com/sites/shermanlee/2018/03/12/explaining-stable-coins-the-holy-grail-of-cryptocurrency/?sh=52a9a4eb4fc6> [<https://perma.cc/2B6L-ZPGU>].

36. See Lee, *supra* note 35.

37. Christian Catalini & Jai Massari, *Stablecoins and the Future of Money*, HARV. BUS. REV. (Aug. 10, 2021), <https://hbr.org/2021/08/stablecoins-and-the-future-of-money> [<https://perma.cc/XB3K-EKTS>].

38. *Id.*

39. *Id.*

redeem units of the stablecoin at par).⁴⁰ Ideally, reserve assets are denominated in the reference asset's currency, always remain liquid, and incur only minor losses in a run or in a distressed market.⁴¹

Of note, fiat-backed stablecoin issuers do not follow a standard transparency policy on the makeup of their reserve assets.⁴² Based on available information, issuers differ in their reserve assets' riskiness: assets range from deposits at insured depository institutions and treasury bills, to commercial paper and corporate and municipal bonds.⁴³ Legislators have placed this concern at the forefront of proposed regulations.⁴⁴

Finally, the President's Working Group's November 2021 Report on Stablecoins only examines fiat-backed stablecoins.⁴⁵ Before the government promulgates any regulation, it is pivotal that it considers the entire stablecoin market.⁴⁶

i. Fiat-Backed Stablecoin Examples: Tether and Circle

One of the most infamous stablecoins, Tether ("USDT"), is a fiat-backed stablecoin.⁴⁷ Tether tokens are created after the equivalent fiat

40. *Id.*; see *New York DFS Guidance on Stablecoins Issuance Establishes Requirements for Reserve Assets and Redeemability*, COOLEY (June 21, 2022), <https://www.cooley.com/news/insight/2022/2022-06-21-ny-guidance-on-stablecoins-establishes-requirements-for-reserve-assets-and-redeemability> [<https://perma.cc/FY2S-7G75>].

41. Catalini & Massari, *supra* note 37.

42. See Gensler, *supra* note 35.

43. See *id.*

44. See J.P. Koning, *New York Regulators Have Planted a Seed for Stablecoin Transparency*, COINDESK (July 6, 2022), <https://www.coindesk.com/layer2/2022/07/06/new-york-regulators-have-planted-a-seed-for-stablecoin-transparency/> [<https://perma.cc/G4H7-7M8G>]. See generally Cheyenne Ligon, *Newly Introduced Bill Aims to Bring Transparency to the Stablecoin Marketplace*, COINDESK (Mar. 31, 2022), <https://www.coindesk.com/policy/2022/03/31/newly-introduced-bill-aims-to-bring-transparency-to-the-stablecoin-marketplace/> [<https://perma.cc/8PUQ-BMUZ>].

45. See Gensler, *supra* note 35.

46. At the time of the PWG Report, stablecoin investigations were limited to fiat-backed stablecoins, mainly Tether. See Matt Stankiewicz, *The New York Attorney General's Office Reaches Settlement with Bitfinex and Tether*, JDSUPRA (Mar. 15, 2021), <https://www.jdsupra.com/legalnews/the-new-york-attorney-general-s-office-9385268/> [<https://perma.cc/ZPW2-FQ33>]; see also Press Release, Commodity Futures Trading Comm'n, No. 8450-21 (Oct. 15, 2021), <https://www.cftc.gov/PressRoom/PressReleases/8450-21> [<https://perma.cc/W3X5-4HHS>].

47. See EUROPEAN CENTRAL BANK, *supra* note 30, at 2.

reserve is placed into Tether's reserves.⁴⁸ However, coins are typically acquired through exchanges.⁴⁹ Tether works on multiple blockchains, with transfers taking from 2 to 40 minutes, depending on the blockchain.⁵⁰

Tether is one of the more controversial stablecoins. First, Tether was hacked in 2017, losing \$31 million worth of tokens.⁵¹ In 2018, the company parted with its audit firm, having never performed its audit to ensure adequate reserves, and was then issued a subpoena by regulators.⁵² The next year, the New York Attorney General ("NYAG") accused Tether's parent company, iFinex Inc., of hiding a \$850 million loss of co-mingled client and corporate funds and taking at least \$700 million from cash reserves to hide the missing money.⁵³ In fact, the NYAG settlement reveals that Tether had only 2.9 percent of its backing funds in cash.⁵⁴ And again in 2021, the U.S. Commodity Futures Trading Commission ("CFTC") found that, since 2019, the organization had misrepresented that it had sufficient U.S. dollar reserves to back every USDT in circulation, never disclosed that it included unsecured receivables and non-fiat assets in its reserves, and falsely represented that it underwent routine and professional audits.⁵⁵

48. TETHER, TETHER: FIAT CURRENCIES ON THE BITCOIN BLOCKCHAIN 4 (2018), <https://tether.to/en/whitepaper/> [<https://perma.cc/3VVQ-KRQA>] [hereinafter TETHER WHITEPAPER].

49. See Eric Rosenberg, *Tether (USDT) Explained*, BALANCE, <https://www.thebalance.com/tether-usdt-explained-5193888> [<https://perma.cc/9HSK-K94S>] (last updated May 12, 2022). Tether works on Bitcoin (via Omni), Ethereum, Tron, EOS, Liquid, Algorand, SLP, and Solana. *Id.*

50. *Id.*

51. Jake Frankenfield, *Tether (USDT): Meaning and Uses for Tethering Crypto Explained*, INVESTOPEDIA (May 12, 2022), <https://www.investopedia.com/terms/t/tether-usdt.asp> [<https://perma.cc/NUB8-5GB5>].

52. David Floyd, *Tether and Bitfinex Crypto Companies Subpoenaed by U.S. Regulators*, INVESTOPEDIA: CRYPTOCURRENCY NEWS, <https://www.investopedia.com/news/tether-and-bitfinex-subpoenaed-us-regulators/> [<https://perma.cc/ZJA3-VRAC>] (last updated June 25, 2019).

53. Stankiewicz, *supra* note 46; see also Frankenfield, *supra* note 51.

54. In *Winning DeFi, Circle's USDC Shows It Can Be the No. 1 Stablecoin*, PYMNTS (Jan. 17, 2022), <https://www.pymnts.com/cryptocurrency/2022/winning-defi-circle-usdc-shows-it-can-be-top-stablecoin/> [<https://perma.cc/SFJ5-KPAV>].

55. See Frankenfield, *supra* note 51; Stankiewicz, *supra* note 46; Press Release, Commodity Futures Trading Comm'n, *supra* note 46.

Tether has since settled with NYAG and the CFTC.⁵⁶ These settlements emphasize regulators' focus on transparency. Now, Tether is relatively transparent with its reserves.⁵⁷ To start, there is a public record of the deposits and withdrawals on Tether's bank account because its ledger is embedded in the Bitcoin blockchain via Omni.⁵⁸ Furthermore, Tether has a proof of reserve system ("PoR") on its website; this consists of a daily record of USDT's balances and reserves.⁵⁹ Thus, these settlements represent a positive trend in regulatory action. And they have caused a broader market impact in that other fiat and asset-backed stablecoins maintain a transparent reserve policy.⁶⁰

Circle's coin, USDC, is the second largest stablecoin, is also fiat-backed, and has a market cap of approximately \$52.4 billion.⁶¹ Rather than become compliant through enforcement actions, Circle partners with established financial institutions and works with regulators to remain compliant.⁶² More specifically, in August 2021, Circle announced its commitment to full-reserve banking under the auspices of the Federal Reserve, the U.S. Treasury, the Office of the Comptroller of the Currency,

56. Stankiewicz, *supra* note 46 ("As part of the settlement, Bitfinex and Tether agreed to pay \$18.5 million, cease trading with New York residents and entities, and will provide quarterly transparency reports to the NYAG. As part of the settlement, Bitfinex and Tether neither admit or deny any of the NYAG's findings."); see Press Release, Commodity Futures Trading Comm'n, *supra* note 46 ("The order requires Bitfinex to pay a \$1.5 million civil monetary penalty. It also prohibits Bitfinex from further violations of the CEA, as charged, and requires Bitfinex to implement and maintain additional systems reasonably designed to prevent unlawful retail commodity transactions.").

57. See TETHER, TETHER: TRANSPARENCY (last updated Nov. 7, 2022) <https://tether.to/en/transparency/> [<https://perma.cc/WV4X-HL4H>].

58. See TETHER WHITEPAPER, *supra* note 48, at 5.

59. See *id.* at 9-13.

60. See Sam Reynolds, *Tether's Settlement With the NYAG a 'Positive' For Industry*, BLOCKWORKS (Feb. 24, 2021), <https://blockworks.co/tethers-settlement-with-the-nyag-a-positive-for-industry/> [<https://perma.cc/R7TW-TCG3>] ("In a worst case scenario, Tether would have been forced to shut down, which could have had a cascading effect on the broader market.").

61. See Jeff Benson, *BlackRock to Handle Circle's USDC Cash Reserves as Part of \$400M Funding Round*, DECRYPT (Apr. 13, 2022), <https://decrypt.co/97795/blackrock-handle-circle-usdc-cash-reserves-400m-funding-round> [<https://perma.cc/8MZH-E8RY>]; Hannah Lang, *BNY Mellon Chosen as Custodian for Circle's Stablecoin Reserves*, REUTERS (Mar. 31, 2022), <https://www.reuters.com/business/finance/bny-mellon-chosen-custodian-circles-stablecoin-reserves-2022-03-31/> [<https://perma.cc/7M6P-MPLT>].

62. See Benson, *supra* note 61.

and the Federal Deposit Insurance Corporation.⁶³ The company protects its reserves by holding its assets in separate accounts, labeled for the benefit of USDC holders.⁶⁴ Circle cannot consequently lend, borrow against, or use its reserves.⁶⁵

As of February 2022, Circle's share of the stablecoin market grew to approximately 30 percent.⁶⁶ Circle's growth can largely be attributed to trust: the market views Circle as a conservative company that adheres to the law, while Tether has made misleading statements about their reserves and has faced numerous regulatory issues.⁶⁷ Circle's growth of market share (at Tether's expense) is a case for ex-ante regulations. The market has indicated its predilection for issuers that respect the law. Now, regulators must provide the law in order for issuers to respect it.

b. Commodity-Backed Stablecoins

Commodity-backed stablecoins, also known as off-chain collateralized stablecoins, are backed by physical asset classes.⁶⁸ These include commodities, such as precious metals, oil, and real estate.⁶⁹ One coin is typically worth one unit of the referenced commodity; for instance, one ounce of gold or one barrel of oil.⁷⁰ These stablecoins give investors

63. *Evolving USDC Reserves to 100% Cash and Short Duration US Treasuries*, CIRCLE: COMPANY UPDATES (Aug. 23, 2021), <https://www.circle.com/blog/evolving-usdc-reserves-to-100-cash-and-short-duration-us-treasuries> [https://perma.cc/9HZS-W6M6].

64. *See Arnold Kirimi, Circle Looks to Reaffirm Commitment to Transparency as USDC Market Share Soars*, COINTELEGRAPH (July 6, 2022), <https://cointelegraph.com/news/circle-looks-to-reaffirm-commitment-to-transparency-as-usdc-market-share-soars> [https://perma.cc/2DYF-9PCM].

65. *See id.*

66. *See Oluwapelumi Adejumo, Circle's USD Coin is silently closing the gap to Tether*, CRYPTOSLATE (Feb. 1, 2022), <https://cryptoslate.com/circles-usd-coin-is-silently-closing-the-gap-to-tether/>; *see also In Winning DeFi, Circle's USDC Shows It Can Be the No. 1 Stablecoin*, *supra* note 54. As of January 2022, USDC's market capitalization was \$45.4 billion and USDT's was \$78.4 billion. *Id.*

67. *See supra* Section I.B.1.a.

68. *See* EUROPEAN CENTRAL BANK, *supra* note 30, at 3; Cryptopedia Staff, *What Are Stablecoins?*, GEMINI: CRYPTOPEDIA, <https://www.gemini.com/cryptopedia/what-are-stablecoins-how-do-they-work> [https://perma.cc/3Q8X-FBFU] (last updated June 28, 2022) [hereinafter *What Are Stablecoins?*].

69. *See What Are Stablecoins?*, *supra* note 68.

70. *3 Things to Know About Stablecoins*, FINRA (Apr. 17, 2020), <https://www.finra.org/investors/insights/3-things-stablecoins> [https://perma.cc/5PFU-WDXT].

greater exposure and liquidity to physical assets that may be locally inaccessible.⁷¹ However, these types of tokens do require a centralized custodian for the asset's safekeeping.⁷²

Redemption rights vary across tokens. Only some commodity-backed stablecoins allow holder redemption of the underlying asset.⁷³ For example, gold-backed stablecoins, like Digix Gold ("DGX") offer redemption in physical gold or a fixed amount of the fiat currency's worth of the commodity. This is called fixed redemption.⁷⁴ Other coins have variable redemption rights: the holder receives their portion of the issuer's total commodity reserves at the time of redemption.⁷⁵

The most popular collateralized commodity is gold: Tether Gold ("XAUT") and Paxos Gold ("PAXG") are the most liquid gold-backed coins. Both stablecoins allow users to redeem their tokens for physical gold in Switzerland and England respectively.⁷⁶

Commodity-backed stablecoins can also be pegged to a bundle of currencies and/or commodities.⁷⁷ Theoretically, this would help to insulate the commodity-backed stablecoin against shocks, since commodity prices fluctuate more than fiat currencies.⁷⁸ Still, if some of the underlying assets in the batch are volatile, then the peg can waver.⁷⁹ This might explain why there are more fiat-backed than commodity-backed coins.⁸⁰

Finally, commodity-backed stablecoins share some of the problems that fiat-backed stablecoins do. Both coins are centralized, as they depend on a custodian to manage the collateral or reserves and issue new

71. See *id.*

72. See EUROPEAN CENTRAL BANK, *supra* note 30, at 3; *What Are Stablecoins?*, *supra* note 68.

73. See *What Are Stablecoins?*, *supra* note 68.

74. *What Are Stablecoins?*, CBINSIGHTS (Jan. 25, 2022), <https://www.cbinsights.com/research/report/what-are-stablecoins/> [<https://perma.cc/7PUJ-UK65>]; CLIFFORD CHANCE, STABLECOINS: A GLOBAL OVERVIEW OF REGULATORY REQUIREMENTS IN ASIA PACIFIC, EUROPE, THE UAE AND THE US 3 (2019), <https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2019/09/stablecoins-a-global-overview-of-regulatory-requirements-in-asia-pacific-europe-the-uae-and-the-us.pdf> [<https://perma.cc/V299-8NM2>].

75. See CLIFFORD CHANCE, *supra* note 74, at 3.

76. See *What Are Stablecoins?*, *supra* note 68.

77. Amani Moin et al., *A Classification Framework for Stablecoin Designs*, CORNELL UNIV. 2 (Sept. 18, 2019) <https://arxiv.org/abs/1910.10098>.

78. See *id.* at 2-3.

79. See *id.* at 3.

80. See *id.* at 2.

stablecoins.⁸¹ Therefore, reserve holdings may be stated inaccurately, which could impact the token's value.⁸²

2. On-Chain Collateralized Stablecoins

On-chain collateralized stablecoins are backed by a cryptocurrency or a basket of cryptocurrencies.⁸³ These stablecoins exist on the blockchain, usually Ethereum, and therefore employ smart-contracts instead of a central issuer.⁸⁴ A smart contract is a digital contract—that is stored on a blockchain, typically Ethereum, and is automatically executed when predetermined terms and conditions occur.⁸⁵ The smart contract's terms are governed by governance token holders, who vote via the blockchain.⁸⁶ For example, the governance token holders determine what kind of cryptocurrency will be accepted as collateral.⁸⁷ So, in order to mint an on-chain collateralized stablecoin, a user locks-in a cryptocurrency (that the governance token holders will accept via the smart contract's terms) into the smart contract.⁸⁸ Then, the smart contract gives the user stablecoins of equal representative value.⁸⁹ A user can, of course, put their stablecoin back into the same smart contract to withdraw their original collateral.⁹⁰

Finally, these stablecoins are over- collateralized, so that the reserve value – the cryptocurrency that acts as collateral - is larger than the amount of outstanding stablecoins.⁹¹ This limits the coin's potential volatility.⁹² MakerDao's DAI is a prominent stablecoin in this category and makes for a suitable case study.

81. Makiko Mita et al., *What is Stablecoin?: A Survey on Its Mechanism and Potential as Decentralized Payment Systems*, 1 INT'L INST. APPLIED INFORMATICS J. 48, 52 (2015), <https://arxiv.org/pdf/1906.06037.pdf>.

82. See *3 Things to Know About Stablecoins*, *supra* note 70.

83. See Dell'Erba, *supra* note 1, at 10.

84. *What Are Stablecoins?*, *supra* note 68.

85. *What Are Smart Contracts on Blockchain?*, IBM, <https://www.ibm.com/topics/smart-contracts> [<https://perma.cc/9VZJ-V5PG>] (last visited Oct. 18, 2022).

86. See *MKR Governance 101*, MAKERDAO, <https://makerdao.com/en/governance> [<https://perma.cc/48YQ-UF2E>] (last visited Oct. 26, 2022).

87. See *id.*

88. *What Are Stablecoins?*, *supra* note 68.

89. *Id.*

90. *Id.*

91. *3 Things to Know About Stablecoins*, *supra* note 70.

92. *Id.*

a. MakerDAO's DAI

MakerDAO issues DAI stablecoins and Maker (MKR) governance tokens on Ethereum.⁹³ DAI is designed to maintain a dollar value.⁹⁴ The MakerDAO Protocol also uses a web of smart contracts, permissioned and permissionless blockchains, oracles, and automated market makers ("AMM"s) to keep DAI at one USD.⁹⁵

93. Ki Chong Tran, *What Is MakerDAO?*, DECRYPT (Apr. 2, 2020), <https://decrypt.co/resources/makerdao-guide-learn-explained-decrypt-3-minutes> [<https://perma.cc/KD5N-FMAB>].

94. *See How DAI Stablecoin Works?*, HB WALLET (Sept. 19, 2019), <https://www.hb-wallet.com/post/how-dai-stablecoin-works> [<https://perma.cc/ZMS8-5Y78>].

95. *Id.* Permissionless blockchains are open networks that allow anyone to participate in the consensus process to validate transactions and data. *See* Toshendra Kumar Sharma, *Permissioned and Permissionless Blockchains: A Comprehensive Guide*, BLOCKCHAIN COUNCIL (Nov. 12, 2019), <https://www.blockchain-council.org/blockchain/permissioned-and-permissionless-blockchains-a-comprehensive-guide/> [<https://archive.ph/AKCHm>]. Bitcoin is a permissionless blockchain. *Id.* A permissioned blockchain, on the other hand, only allows those with access, granted by the administrator, to access the distributed ledger. *Id.* Oracles send data from the outside world to a blockchain. Alyssa Hertig, *What Is an Oracle?*, COINDESK (Dec. 22, 2020), <https://www.coindesk.com/tech/2020/12/22/what-is-an-oracle/> [<https://perma.cc/U96J-V9E5>]. A smart contract on the blockchain then uses the data, to make decisions such as whether to dispense money and to whom. *Id.* An automated market maker allows cryptocurrencies to be traded automatically through the use of liquidity pools. *See* Cryptopedia Staff, *What are Automated Market Makers?*, GEMINI, <https://www.gemini.com/cryptopedia/amm-what-are-automated-market-makers> (last updated Mar. 14, 2021). So, the AMM allows for users to exchange tokens without using a traditional market of buyers and sellers, where the user has to find a single buyer or seller, each offering a different price. *Id.* Liquidity pools are a shared pot of tokens. A user who provides tokens to a liquidity pool is called a liquidity provider. *Id.* A liquidity provider earns a fee by providing tokens. *Id.* The fee is paid by traders who use the liquidity pool. *Id.* The AMM determines the price of the tokens in the liquidity pool by applying a mathematical formula. *Id.* One common formula is $tokenA_balance(p) * tokenB_balance(p) = k$, where k means that there is a constant balance of assets that determines the prices of tokens in the liquidity pool. *Id.* Put simply:

If an AMM has ether (ETH) and bitcoin (BTC), two volatile assets, every time ETH is bought, the price of ETH goes up as there is less ETH in the pool than before the purchase. Conversely, the price of BTC goes down as there is more BTC in the pool. The pool stays in constant balance, where the total value of ETH in the pool will always equal the total value of BTC in the pool. Only when new liquidity providers join in will the pool expand in size.

i. DAI and MKR Tokens

Users receive DAI tokens by opening a Maker collateral vault (previously called collateralized debt positions (“CDPs”)).⁹⁶ These vaults are smart contracts.⁹⁷ They hold the user’s collateral in escrow.⁹⁸ A user can submit ether (ETH), USD Coin (USDC), and other coins as collateral. The collateral remains in escrow until the user returns the stablecoin, or until the collateral drops too far below to amount of DAI borrowed and the vault is liquidated.⁹⁹ To determine this later amount, DAI uses a liquidation ratio for each vault type, which is determined by the collateral’s risk profile and the Stability Fee.¹⁰⁰ The Stability Fee is an annual percentage fee, determined by MKR token holders.¹⁰¹ A liquidation ratio defines the amount of cryptocurrency collateral needed to receive a DAI coin; for example, “a 150 [percent] Liquidation Ratio means that a debt of 66.66 DAI must be supported by a collateral value of at least \$100.”¹⁰²

MKR token holders also vote on other key operative decisions through Governance and Executive voting.¹⁰³ Governance voting is accomplished weekly and is on-chain, meaning on Ethereum.¹⁰⁴ Governance voting includes matters such as the Dai Savings Rate (“DSR”), Debt Ceilings, governance processes, asset priority lists, and

Id.

96. See Cryptopedia Staff, *DAI: A Systematically Sustainable Stablecoin*, GEMINI: CRYPTOPEDIA, <https://www.gemini.com/cryptopedia/dai-stablecoin-what-is-dai-token> [https://perma.cc/E982-T9RD] (last updated Mar. 22, 2022).

97. See *id.*

98. See *id.*

99. See *id.*; see also Tran, *supra* note 93.

100. *Liquidation*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/vaults/liquidation/> [https://perma.cc/LH44-NQCD] (last visited Oct. 18, 2022).

101. See Tran, *supra* note 93.

102. *Liquidation Ratio*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/governance/param-liquidation-ratio/> [https://perma.cc/PX5L-WVC7] (last visited Oct. 29, 2022).

103. See Tran, *supra* note 93; see also *Stability Fee*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/vaults/stability-fees/> (last visited Sept. 14, 2022).

104. See *How Voting Works*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/governance/how-voting-works/> [https://perma.cc/9ENF-9NT7] (last visited Oct. 18, 2022). Voting can be accessed through the Polling Page at Active Polls. *Vote*, MAKERDAO, <https://vote.makerdao.com/polling> [https://archive.ph/qoXrR] (last visited Oct. 26, 2022).

other protocol changes.¹⁰⁵ On the other hand, Executive votes are for technical changes to the Maker Protocol.¹⁰⁶ Anyone can make proposals and competing proposals may be introduced at any time.¹⁰⁷ As with Governance voting, only MKR token holders can vote on executive votes.¹⁰⁸

MKR tokens also support the stability of DAI tokens by acting as a recapitalization source in debt auctions, discussed next.¹⁰⁹ This risk of recapitalization incentivizes MKR holders to avoid risk-taking and to responsibly govern.¹¹⁰

ii. Auction Mechanisms

The MakerDAO Protocol uses auction mechanisms when the collateralization ratio is breached.¹¹¹ Specifically, surplus, collateral, and debt auctions are utilized. A surplus auction occurs when stability fees¹¹² reach a certain limit; that surplus is auctioned off to external actors for MKR tokens.¹¹³ The MKR tokens are then burnt, thus reducing the amount of MKR in circulation.¹¹⁴ A collateral auction is when a vault's

105. See *MKR Token*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/governance/mkr-token/> [https://perma.cc/6B23-7JS2] (last visited Oct. 18, 2022). The DSR is an interest rate on Dai coins, earned by locking the stablecoin into a DSR smart contract. *Dai Savings Rate*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/Dai/dsr/> [https://perma.cc/5GYX-LWJ5] (last visited Oct. 18, 2022). *Debt Ceilings are the maximum amount of DAI that a vault can mint. Debt Ceiling*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/governance/param-debt-ceiling/> [https://perma.cc/9UB4-Z6EZ] (last visited Oct. 18, 2022).

106. See *How Voting Works*, *supra* note 104.

107. See *id.*

108. See *id.* These votes also occur on-chain and can be accessed through the Executive Page at MakerDAO. *Executive Proposals*, MAKERDAO, <https://vote.makerdao.com/executive> [https://perma.cc/UAA2-VBCW] (last visited Oct. 18, 2022).

109. See MAKERDAO, THE MAKER PROTOCOL: MAKERDAO'S MULTI-COLLATERAL DAI (MCD) SYSTEM (2020) [https://makerdao.com/whitepaper/White_Paper-The_Maker_Protocol_MakerDAO's_Multi-Collateral_Dai_\(MCD\)_System-FINAL-021720.pdf](https://makerdao.com/whitepaper/White_Paper-The_Maker_Protocol_MakerDAO's_Multi-Collateral_Dai_(MCD)_System-FINAL-021720.pdf) [https://perma.cc/49BZ-M8M3].

110. *Id.*

111. See *The Auctions of the Maker Protocol*, MAKERDAO: MAKER PROTOCOL TECH. DOCS, <https://docs.makerdao.com/keepers/the-auctions-of-the-maker-protocol> [https://perma.cc/8SA3-FSGJ] (last visited Oct. 18, 2022).

112. See *supra* Section I.B.2.a.

113. See *The Auctions of the Maker Protocol*, *supra* note 111.

114. See *id.*

collateral price drops below the requisite collateralization ratio.¹¹⁵ The vault is automatically liquidated and auctions off the collateral until the debt is covered.¹¹⁶ Finally, a debt auction happens when a vault's collateral has a sharp drop in price and the collateral auction cannot auction off the debt and the surplus from stability fees cannot cover it either.¹¹⁷ In a debt auction, "the winning bidder pays Dai to cover the outstanding debt and in return receives an amount of newly minted MKR, increasing the amount of MKR in circulation."¹¹⁸ MKR holders therefore want to avoid a debt auction, so that the value of their MKR tokens are not depreciated.

iii. External Actors

In addition, external actors—Keepers and Oracles—also help to keep Dai's price stable.¹¹⁹ Keepers are independent, usually autonomous, actors that use arbitrage to maintain market equilibrium and inject liquidity into the Maker system.¹²⁰ Keepers sell DAI when the market price is above one USD, and buy DAI when the market price is below one USD.¹²¹ The two main forms of Keepers are Market Maker Keepers and Auction Keepers.¹²²

115. *See id.*

116. *See id.*

117. *Id.*

118. *Id.*

119. *See Maker: Core Report*, CRYPTOEQ, <https://www.cryptoeq.io/coreReports/maker-abridged> (last visited Nov. 7, 2022) ("Maker requires oracles to provide real-time market price information to the system to adjust the Target Rate when needed. Oracles and Global Settlers are external actors and not native to the platform. Another key exogenous actor in the Maker ecosystem is Keepers."); *see also Oracles*, GITHUB: MAKERDAO, <https://github.com/makerdao/community/blob/master/faqs/oracles.md> [<https://perma.cc/5G9Q-NHPU>] (last visited Oct. 18, 2022).

120. *See MAKERDAO*, *supra* note 109, at 10; *See also Keepers: Incentive-Following Bots*, MAKERDAO: MAKER DEVELOPER, <https://developer.makerdao.com/keepers/> [<https://perma.cc/W52R-GFXP>] (last visited Oct. 18, 2022).

121. *See MAKERDAO*, *supra* note 109, at 10.

122. *See Market-Maker-Keeper*, GITHUB: MAKERDAO, <https://github.com/makerdao/market-maker-keeper> [<https://perma.cc/5CJ6-9YKC>] (last visited Oct. 18, 2022).

The former operates on various exchanges, where Keepers buy and sell DAI within a pre-determined minimum and maximum range(s) to keep the price at one dollar.¹²³

The Auction Keepers operate in the auctions discussed in the previous section. Because vault information is publicly available on Ethereum, Auction Keepers monitor accounts and trigger liquidation when the collateralization ratio is breached.¹²⁴ They then participate in the auctions in order to acquire collateral at attractive prices.¹²⁵

Oracles are entities that connect a blockchain to off-chain, or external, systems.¹²⁶ Here, each collateral type has a parallel oracle, that automatically updates the reference price in each vault.¹²⁷ This allows the vaults, which are smart contracts, to automatically use the price data to determine whether to liquidate or how much Dai it can generate.¹²⁸ Consequently, oracles introduce a centralized entity into the model, which arguably defeats the purpose of a decentralized currency and poses risks.¹²⁹

MakerDAO tries to minimize these risks: each oracle has a Medianizer and an Oracle Security Module (“OSM”).¹³⁰

Feeds send data to the Medianizer.¹³¹ Feeds are bots that publish the prices of assets in real time and are run by pseudonymous people and public organizations.¹³² Feed owners are compensated and thus, according to MakerDAO, are discouraged from malicious behavior.¹³³ Furthermore, MakerDAO Feeds utilize Secure Scuttlebutt: a “database protocol for

123. See *id.* (arguing that there may be multiple minimum and maximum ranges, or “bands”). Orders are automatically canceled if they fall outside the maximum range of any of the bands. *Id.* If an order falls below the minimum, a new order is created. *Id.*

124. See *The Auctions of the Maker Protocol*, *supra* note 111.

125. *Id.*

126. *What Is a Blockchain Oracle?*, CHAINLINK (Sept. 14, 2021), <https://chain.link/education/blockchain-oracles> [<https://perma.cc/7P7K-GTSK>].

127. See *Oracles: How it Works*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/Oracles/how-it-works/> [<https://perma.cc/32NS-5Z7C>] (last visited Oct. 18, 2022).

128. See *Oracles*, *supra* note 119.

129. See generally *What Is a Blockchain Oracle?*, *supra* note 126.

130. See *Oracles: How it Works*, *supra* note 127.

131. See *id.*

132. See *Introducing Oracles V2 and DeFi Feeds*, MAKERDAO: BLOG (Sept. 3, 2019) <https://blog.makerdao.com/introducing-oracles-v2-and-defi-feeds/> [<https://perma.cc/T5FZ-JZLU>].

133. *Id.*

unforgeable append-only message [F]eeds.”¹³⁴ This means, through digital signing,¹³⁵ Feed owners are the only ones who can update the Feed.¹³⁶

The Medianizer creates a collateral’s reference price by computing a median price from a whitelist of price feed contracts.¹³⁷ The Medianizer controls Feeds through permissioned logic; this is a distributed ledger that is not publicly accessible.¹³⁸ The permissioned logic determines several other parameters.¹³⁹ MakerDAO employs a median, instead of an average, since it is harder to manipulate the reference price.¹⁴⁰ This is because “control over half of the data providers is needed in order for a fraudulent price to be pushed through. Additionally, using a median naturally filters out irregular price data.”¹⁴¹

134. *Secure Scuttlebot*, GITHUB: SCUTTLEBOT, <https://scuttlebot.io/more/protocols/secure-scuttlebutt.html> [<https://perma.cc/3U6V-3RQT>] (last visited Sept. 14, 2022).

135. Digital signatures are “electronic fingerprints” that securely associate signers with a document. *See Understanding Digital Signatures*, DOCUSIGN <https://www.docusign.com/how-it-works/electronic-signature/digital-signature/digital-signature-faq> [<https://perma.cc/YP9Y-65JJ>] (last visited Oct. 18, 2022).

136. *See Secure Scuttlebot*, *supra* note 134. A digital signature is an algorithm used to validate a message’s authenticity and integrity. *See* Press Release, Cybersecurity and Infrastructure Security Agency, *Understanding Digital Signatures*, <https://www.cisa.gov/uscert/ncas/tips/ST04-018> [<https://perma.cc/2MXU-D39G>] (last updated Aug. 24, 2020). It is a virtual fingerprint that is unique to a person or entity. *Id.*

137. *Median - Detailed Documentation*, MAKERDAO: MAKER PROTOCOL TECH. DOCS, <https://docs.makerdao.com/smart-contract-modules/oracle-module/median-detailed-documentation> [<https://perma.cc/W9HC-SSV2>] (last visited Oct. 18, 2022). A whitelist is an extreme cybersecurity strategy that limits the functions a computer user can access and perform. *See* Josh Fruhlinger, *Whitelisting Explained: How It Works and Where It Fits in a Security Program*, CSO ONLINE (June 17, 2020), <https://www.csoonline.com/article/3562429/whitelisting-explained-how-it-works-and-where-it-fits-in-a-security-program.html> [<https://perma.cc/U4PD-649N>]. This means that the Medianizer can only receive information from approved computers. *Id.*; *see also Median - Detailed Documentation*, *supra* note 137.

138. Jake Frankenfield, *Permissioned Blockchain*, INVESTOPEDIA (Jan. 24, 2022), <https://www.investopedia.com/terms/p/permissioned-blockchains.asp> [<https://perma.cc/A8CJ-3U8S>].

139. *See Median - Detailed Documentation*, *supra* note 137. These parameters include: determining the minimum number of prices to create a new median value (the bar parameter); whether to add or drop whitelists (the lift and drop parameters); and updating the price from whitelist providers (the poke function). *Id.*

140. *See id.*

141. *Oracles*, *supra* note 119.

Finally, the OSM ensures an hour-long delay from when the Medianizer calculates the price, to when the oracle publishes the price in its various vaults.¹⁴² Thus, the OSM requires an external actor to call the “poke()” function on the Medianizer’s code.

b. Problems

While the MakerDAO protocol is a novel decentralized stablecoin, faults remain. Most importantly, DAI struggles to maintain a peg to USD.¹⁴³ This is likely because DAI’s stability depends on each collateral token not breaking.¹⁴⁴ And debt auctions can only work if the underlying asset has value. This connectivity poses a huge risk. No matter how interesting the underlying technology, if a stablecoin is not stable, then it is not much use.

Further, while DAI has its transactions recorded on the blockchain, transparency issues still exist. In 2020, Compound, a crypto lending platform, listed 523 million DAI in its reserves.¹⁴⁵ Meanwhile daistats.com showed only 160 million DAI in circulation.¹⁴⁶

Additionally, there is no real central repository of the MakerDAO Protocol.¹⁴⁷ Plus, the Medianizer is a black box.

While the MakerDAO Protocol is mostly decentralized, necessarily centralized elements pose obvious risks for malicious attacks.¹⁴⁸

142. See *id.*; see also *Oracle Security Module (OSM) - Detailed Documentation*, MAKERDAO: MAKER PROTOCOL TECH. DOCS, <https://docs.makerdao.com/smart-contract-modules/oracle-module/oracle-security-module-osm-detailed-documentation> [https://perma.cc/YZ9D-M87H] (last visited Oct. 27, 2022).

143. Simon Chandler, *DAI Struggles to Maintain \$1 Peg, but MakerDAO Supporters Still Believe*, COINTELEGRAPH (Apr. 26, 2019), <https://cointelegraph.com/news/dai-has-been-struggling-to-maintain-its-1-peg-but-the-makerdao-community-believes-it-will-soon-be-cryptos-default-stablecoin> [https://perma.cc/WT2Q-ACPB].

144. See Adam Cochran, *3 Reasons Why \$DAI is DeFi’s Biggest Risk*, MEDIUM (Apr. 20, 2020), <https://medium.com/@adamscochran/3-reasons-why-dai-is-defis-biggest-risk-64f1bc7e6109> [https://perma.cc/GQQ5-Q2MA].

145. Jamie Redman, *Trouble in Defi Paradise: Compound-Issued DAI Surpasses DAI in Circulation*, BITCOIN.COM: NEWS (July 3, 2020), <https://news.bitcoin.com/trouble-in-defi-paradise-compound-issued-dai-surpasses-dai-in-circulation/>.

146. *Id.*; Daistats.com provides information on Maker Protocol’s metrics. See *A Guide to Dai Stats*, MAKERDAO: BLOG (Dec. 15, 2020), <https://blog.makerdao.com/a-guide-to-dai-stats/> [https://perma.cc/7GJB-4EVR].

147. Dai’s whitepaper was incomplete and left terms undefined. The most illuminating sources were on GitHub or Medium articles.

148. See Cochran, *supra* note 144.

MakerDAO uses cybersecurity procedures, digital signing, and pseudonymity to mitigate risks from oracles and keepers.¹⁴⁹ However, in practice, other key elements of the Protocol are not decentralized.¹⁵⁰

For example, in 2020 the top 50 MKR wallet addresses held more than 50 percent of all Protocol voting authority.¹⁵¹ MKR holders' public voting history reveals decisions that are not necessarily in the best interest for the community, but are often in the best interest of MKR holders.¹⁵² MKR holders also determine what coins become collateral; because the MKR holders are pseudonymous, it is impossible to know if there is a conflict of interest in which assets are chosen as collateral. This problem is compounded by the lack of decentralization among MKR holders. Further, MakerDAO has a history of choosing assets that are highly volatile and have a strong chance of failing. This suggests that MKR holders are not voting in the interest of the community, which is an underlying assumption of the Protocol.

Finally, over-collateralization of the stablecoin requires extra capital to sit without gathering interest, when it could be invested instead.¹⁵³

3. Non-Collateralized/Algorithmic Stablecoins

As the name suggests, non-collateralized stablecoins do not use collateral.¹⁵⁴ Instead, algorithms and smart contracts act as a central bank

149. *Id.* ("The OSM (named via acronym from 'Oracle Security Module') ensures that new price values propagated from the Oracles are not taken up by the system until a specified delay has passed. Values are read from a designated DSValue contract (or any contract that has the read() and peek() interfaces) via the poke() method; the read() and peek() methods will give the current value of the price feed, and other contracts must be whitelisted in order to call these. An OSM contract can only read from a single price feed, so in practice one OSM contract must be deployed per collateral type."); *see also Understanding Digital Signatures*, *supra* note 135; *Secure Scuttlebot*, *supra* note 144.

150. *See supra* Section I.B.2.b.

151. *See* Cochran, *supra* note 144. The largest holders are: the MakerDAO team, Maker the company, A16z (a venture capital fund), and a number of other investment groups. *Id.*

152. *See id.*

153. *See 3 Things to Know About Stablecoins*, *supra* note 70. The Lien Protocol offers a solution by adding an algorithmic layer to crypto-collateralization. This is discussed next. *See* LIEN PROTOCOL, IDOL WHITE PAPER 3 (2020), https://lien.finance/pdf/iDOLWP_v1.pdf [<https://perma.cc/MWL9-ABAC>].

154. *See What Are Stablecoins?*, *supra* note 68.

and manage the token supply to keep the price stable.¹⁵⁵ More specifically, when the number of tokens in circulation falls below the price of the peg, the number of tokens are reduced; if the token's price exceeds the peg, new tokens enter circulation.¹⁵⁶

A common structure is a two-coin system.¹⁵⁷ One coin maintains the peg. The other absorbs market volatility and is usually called a “share” or “balancer” token.¹⁵⁸ Share tokens frequently trade on secondary DeFi exchanges.¹⁵⁹

The rapid collapse of the TerraUSD stablecoin has pushed stablecoin regulation into the regulatory spotlight.¹⁶⁰ This Section describes the stablecoin and the purported reasons for its collapse in May 2022.

a. Terraform Labs: UST and LUNA

i. Structure

The Terra ecosystem created a stablecoin by deploying two tokens: Luna (“LUNA”) and TerraUSD (“UST”). UST was the fourth largest stablecoin, and seventh largest cryptocurrency, by market cap.¹⁶¹ UST

155. *See id.*

156. *Id.*

157. Ryan Clements, *Built to Fail: The Inherent Fragility of Algorithmic Stablecoins*, 11 WAKE FOREST L. REV. 131, 137 (2021).

158. *Id.*

159. *Id.*

160. Sutton, *supra* note 27.

161. Krisztian Sandor, *What Is LUNA and TerraUSD (UST)? A Guide to the Terra Ecosystem*, COINDESK (Mar. 21, 2022), <https://www.coindesk.com/learn/what-is-luna-and-ust-a-guide-to-the-terra-ecosystem/> [<https://perma.cc/4M3B-XG6A>]; Mark Brennan, *Terra (Luna) Overtakes Cardano To Become 7th Largest Crypto By Market Cap*, THE CRYPTO BASIC (Mar. 1, 2022) <https://thecryptobasic.com/2022/03/01/terra-luna-overtakes-cardano-to-become-7th-largest-crypto-by-market-cap/> [<https://perma.cc/CY97-XATV>].

maintained its peg through minting and burning Terra and Luna and by incentivizing arbitrage.¹⁶² Luna was also a governance token.¹⁶³

Luna absorbed Terra's volatility through a protocol that mimicked a central bank.¹⁶⁴ However, instead of a centralized entity, arbitrage stabilized the price. For instance, when Terra's demand was high and there was a limited supply, its price increased.¹⁶⁵ Consequently, Luna was burned, which minted more Terra and increased the UST supply to bring the price back down to its peg.¹⁶⁶ In turn, when Terra's demand was low and its supply was too large, its price decreased.¹⁶⁷ Then, Luna was minted and Terra was burned.¹⁶⁸ This lessened the supply and increased the price back to its peg.¹⁶⁹

Thus, because LUNA and UST could always be swapped for one USD, users were incentivized to arbitrage price discrepancies.¹⁷⁰ When UST's price rose above one USD, users could swap one USD worth of LUNA to create one UST token and make an easy profit.¹⁷¹ Conversely, when UST's price dropped below one USD, users could swap one USD worth of UST to create one LUNA token.¹⁷² During the swap, a

162. See Robert Stevens & Liam J. Kelly, *What Is Terra? The Algorithmic Stablecoin Protocol Explained*, DECRYPT (May 11, 2022) <https://decrypt.co/resources/what-is-terra-algorithmic-stablecoin-protocol-explained> [<https://perma.cc/T6VT-K7WD>]; see also *About the Terra Protocol*, TERRA: DOCS, <https://docs.terra.money/docs/learn/protocol.html> [<https://perma.cc/FS5C-JY73>] (last visited Oct. 27, 2022). Minting means that new tokens are issued; burning means that token are permanently removed from circulation. See Benedict George, *What Does It Mean to Burn Crypto?* COINDESK (Jan. 26, 2022) <https://www.coindesk.com/learn/what-does-it-mean-to-burn-crypto/> [<https://perma.cc/BUN6-XQEJ>].

163. See generally Stevens & Kelly, *supra* note 162.

164. See generally *id.*; see also Sanjeeb Basi, *Terra's Luna Is the Holy Grail of Cryptocurrency. Here's Why It Is Going To Be Extremely Valuable*, MEDIUM (Jan. 31, 2022) <https://medium.datadriveninvestor.com/terras-luna-is-the-holy-grail-of-cryptocurrency-here-s-why-it-is-going-to-be-extremely-valuable-cd881f315c98> [<https://perma.cc/VPD8-85NY>].

165. See generally Stevens & Kelly, *supra* note 162.

166. See generally *id.*

167. See generally *id.*

168. See generally *id.*

169. See generally *id.*

170. See Sandor, *supra* note 161.

171. *Id.*

172. *Id.*

percentage of LUNA or UST was burned and the rest was deposited into a treasury for investments towards the Terra ecosystem.¹⁷³

Luna's independent value in Terraform Labs' ecosystem made it valuable, and therefore helped incentivize arbitrage.¹⁷⁴ Terra and Luna were used as payment within this ecosystem.¹⁷⁵ This included the Mirror protocol, which created synthesized assets that tracked U.S. stocks, futures, and exchange-traded funds performance; the Anchor platform, a lending and savings platform; and Chai, a partner payments platform.¹⁷⁶ Terra also planned to "add DeFi asset management, additional lending protocols, and decentralized levered insurance protocol" to its network.¹⁷⁷

In sum, Terra and Luna's viability largely depended on Terra's financial ecosystem to drive demand.¹⁷⁸ And Terra's financial ecosystem depended on Terra and Luna to function.¹⁷⁹ This logic was both circular and risky.¹⁸⁰

Even before its fatal crash, UST had deviated from its peg, proving that the Protocol was imperfect.¹⁸¹ Financial writer J.P. Koning argues that algorithmic stablecoins' circular relationship makes them "prone to permanent breakage" because of their delicate dependance on conflicting actors: those who desire stability and those who seek "high-return opportunities."¹⁸² Further, these coins rely on individual market actors to remain interested through arbitrage.¹⁸³ Arbitrage is notoriously unreliable and historically fragile.¹⁸⁴ And work on exchange-traded funds reveals that "market discipline can fail when it is most needed."¹⁸⁵ Algorithmic stablecoins are arguably bubbles waiting to pop.

173. *Id.*

174. Clements, *supra* note 157, at 142.

175. *Id.* at 142-43.

176. *Id.* at 142.

177. *Id.*

178. *Id.*

179. *See id.*

180. *See id.* at 143.

181. *Id.* at 143-44.

182. *Id.* at 143 (citing J.P. Koning, *Algorithmic Stablecoins*, AM. INST. ECON. RSCH. (Feb. 1, 2021), <https://www.aier.org/article/algorithmic-stablecoins/>).

183. *Id.* at 140.

184. *See* Claire Boyte-White, *Arbitrage Mutual Funds: Benefits and Drawbacks*, INVESTOPEDIA (Jan. 26, 2022), <https://www.investopedia.com/articles/investing/100515/what-exactly-are-arbitrage-mutual-funds.asp> [<https://perma.cc/TA66-4U4E>]; Clements, *supra* note 157, at 140.

185. Clements, *supra* note 157, at 140.

ii. Collapse

As the previous section explains, the network incentives of the Terra ecosystem were circular and flawed. From around November 2021 to May 2022, investors were buying UST from Terra's liquidity pool, Anchor, as it was offering a 20 percent yield to anyone who lent UST to the pool.¹⁸⁶ However, users who lent UST into Anchor could not remove their UST if the token failed.¹⁸⁷ And as much as 72 percent of UST was deposited into Anchor.¹⁸⁸ Because of this, there was a high demand for UST.¹⁸⁹

On May 7, 2022, either a coordinated group of actors, or a singular actor, performed a major sell-off (approximately \$85 million) of UST on the Curve protocol.¹⁹⁰ This caused UST's peg to drop to \$0.98.¹⁹¹ Then, over the next 5 days, UST and LUNA's price plummeted.¹⁹² And the auction mechanisms to sell-off bitcoin reserves were not enough to

186. Andrew R. Chow, *The Real Reasons Behind the Crypto Crash, and What We Can Learn from Terra's Fall*, TIME (May 17, 2022), <https://time.com/6177567/terra-ust-crash-crypto/> [<https://perma.cc/5SK8-6Z9T>].

187. Elizabeth Lopatto, *How the Anchor Protocol Helped Sink Terra*, VERGE (May 20, 2022), <https://www.theverge.com/2022/5/20/23131647/terra-luna-do-kwon-stable-coin-anchor> [<https://perma.cc/6QW2-KU5B>].

188. *Id.*

189. See *Anchor Protocol: What Is it, and How Did it Destroy the Terra-Luna Stablecoins*, INDIAN EXPRESS (May 23, 2022), <https://indianexpress.com/article/technology/crypto/what-is-anchor-protocol-that-took-terra-luna-down-7931324/> [<https://perma.cc/Q8TB-DX6E>]. Some called this system a Ponzi scheme, where money was transferred to earlier investors from later investors as a form of "interest." Lopatto, *supra* note 187. Others called it an acquisition strategy for new customers, and that the APY would be lowered. *Id.*

190. Lawrence Wintermeyer, *From Hero to Zero: How Terra Was Toppled in Crypto's Darkest Hour*, FORBES (May 25, 2022), <https://www.forbes.com/sites/lawrencewintermeyer/2022/05/25/from-hero-to-zero-how-terra-was-toppled-in-cryptos-darkest-hour/?sh=7fc545b2389e> [<https://perma.cc/4VB3-Y2Z8>]; see also Krisztian Sandor & Ekin Genç, *The Fall of Terra: A Timeline of the Meteoric Rise and Crash of UST and LUNA*, COINDESK, <https://www.coindesk.com/learn/the-fall-of-terra-a-timeline-of-the-meteoric-rise-and-crash-of-ust-and-luna/> [<https://perma.cc/6YWP-VQVL>] (last updated Aug. 19, 2022). Curve is a decentralized exchange liquidity pool built on Ethereum that is focused on stablecoins. *What is Curve?*, KRAKEN, <https://www.kraken.com/en-us/learn/what-is-curve-crv> [<https://perma.cc/U9Z2-97ML>]. Curve allows users to trade stablecoins without a centralized entity. *Id.*

191. Wintermeyer, *supra* note 190.

192. *Id.*

reinstate the peg.¹⁹³ Moreover, because the Anchor platform locked-in lenders' UST, many lost all of their savings.¹⁹⁴

As the value of UST and LUNA plummeted, many of the Terra blockchain's functions were disabled.¹⁹⁵ The stablecoin and its blockchain ecosystem are effectively dead.¹⁹⁶

Terra's collapse is a lesson to regulators: there needs to be an industry standard for stablecoins that accounts for coins that are not collateralized, or—in the case of on-chain and commodity-backed stablecoins—are collateralized by illiquid assets.¹⁹⁷ Parameters must be set for how these platforms can be marketed; Terra's high annual percentage yield (APY) schemes, discussed next, and comparisons to a safe savings account led to a loss of billions of dollars by hundreds of thousands of people.¹⁹⁸ Stablecoin issuers need to be transparent and accessible with how their platforms work.¹⁹⁹

C. STABLECOIN USE CASES

How stablecoins are used, and how they might be used, informs the discussion on how they might be regulated.

As mentioned earlier, stablecoins developed to allow traders to convert erratic digital currencies to a form that maintained a constant value.²⁰⁰ In other words, the initial use for stablecoins was to facilitate trades on crypto exchanges and mitigate trading fees.²⁰¹

193. *Id.*

194. *See* Lopatto, *supra* note 187.

195. Olga Kharif, *A Crypto First? What Happens When a Blockchain Like Terra Dies*, BLOOMBERG (May 16, 2022), <https://www.bloomberg.com/news/articles/2022-05-16/crypto-s-first-what-happens-when-a-big-blockchain-dies> [https://perma.cc/9KZL-JBQE].

196. *Id.*

197. Wintermeyer, *supra* note 190.

198. *Id.* *See infra* Section I.C.

199. The Terra protocol was not written to be accessible to users: terms were often left undefined or required reading linked posts or Reddit forums.

200. Royal, *supra* note 32; *Are Deflationary Stablecoins the Future?*, *supra* note 32; *see supra* Section I.A.

201. *See* Julian Dossett, *What Are Stablecoins and Are They Less Risky? The Details Crypto Investors Should Know*, CNET (May 31, 2022), <https://www.cnet.com/personal-finance/crypto/what-are-stablecoins-and-are-they-less-risky-the-details-crypto-investors-should-know/> [https://perma.cc/M27H-VKXC]. Most exchanges do not charge trading fees when converting between digital currencies but do when converting to fiat currency. *Id.*

Stablecoins are also used for lending.²⁰² Like traditional savings accounts, crypto lending allows holders of cryptocurrency to provide their coins to another for a fee.²⁰³ Cryptobanks, a type of DeFi platform, or exchanges act as the intermediary and forward lenders their share of the interest for lending.²⁰⁴ Stablecoin savings accounts permit customers to earn an APY of up to 12 percent.²⁰⁵ The yield for stablecoins is so high because stablecoins are in demand, lenders pump up the yields by offering reward tokens and other bonuses, and market inefficiencies give traders arbitrage opportunities to capitalize on wide pricing discrepancies.²⁰⁶ This kind of lending comes with many risks, however. For instance, the value of the underlying stablecoin could plummet overnight. Or regulators could shut down lending services, which has happened in certain states.²⁰⁷ Furthermore, the Federal Deposit Insurance Corporation's (FDIC) bank insurance and the Securities Investor Protection Corporation's ("SIPC") brokerage insurance is unavailable.²⁰⁸ Finally, the industry is not as tightly regulated as banks or brokerages, meaning that cryptobanks' disclosures are usually opaque.²⁰⁹

Smart contracts are another case for stablecoins.²¹⁰ Smart contracts are agreements on a blockchain that automatically execute after preset terms and conditions are met.²¹¹ Smart contracts offer transparency and

202. *Stablecoins 101: What Are Crypto Stablecoins, and How Do They Work?*, COINTELEGRAPH, <https://cointelegraph.com/altcoins-for-beginners/stablecoins-101-what-are-crypto-stablecoins-and-how-do-they-work> [https://perma.cc/B4RB-HR2Y] (last visited Oct. 18, 2022).

203. *What Is Crypto Lending and How Does It Work?*, BINANCE: ACADEMY (Mar. 2, 2022), <https://academy.binance.com/en/articles/what-is-crypto-lending-and-how-does-it-work> [https://perma.cc/8YJH-KDTE].

204. *Id.*; Matthew Shillito, *Crypto Banks' Savings Rates Are Ten Times Greater than High Street, but Are They Safe?*, CONVERSATION (June 18, 2021), <https://theconversation.com/crypto-banks-savings-rates-are-ten-times-greater-than-high-street-but-are-they-safe-163026> [https://perma.cc/T4GJ-4XZ3].

205. Shillito, *supra* note 204; *What Is Crypto Lending and How Does It Work?*, *supra* note 203.

206. Daren Fonda, *Lending Your Crypto Could Generate Attractive Yields. But How Safe Is It?*, BARRON'S (Dec. 12, 2021), <https://www.barrons.com/articles/crypto-lending-yields-51639123201> [perma.cc/LAH9-43R7].

207. *Id.*

208. *Id.*

209. *See id.*

210. *Stablecoins 101: What Are Crypto Stablecoins, and How Do They Work?*, *supra* note 202.

211. *What Are Smart Contracts on Blockchain?*, *supra* note 85.

trust through automation in traditional areas that depended on third-party intermediaries.²¹² These intermediaries come with costly and time-consuming manual processes, with an increased risk of errors and fraud.²¹³ Tokens are used to represent assets, such as real property, an employee offer letter, a loan agreement, or intellectual property.²¹⁴ Stablecoins thus allow parties to use smart contracts without the fear of price volatility that comes with other types of cryptocurrency.²¹⁵

Stablecoins likewise have use in remittance.²¹⁶ Remittance involves money transfers, of usually \$1,000 or less, from people living in diaspora to family members at home.²¹⁷ The market is currently valued at \$589 billion.²¹⁸ In 2022 alone, one crypto exchange processed \$1 billion in crypto remittances just from the United States to Mexico.²¹⁹ Further, in the last decade, remittance payments have grown with the emergence of the microwork market: a \$1 billion jobs market that uses technology to split activities into tasks to be completed by people over the internet.²²⁰ A pilot program in Nairobi observed that cryptocurrency payment cuts transaction fees by 93 percent and thus drastically reduces the costs of

212. OpenLaw Team, *Blockchain-Based Lending*, MEDIUM (July 11, 2018), <https://media.consensys.net/blockchain-based-lending-1eee5edabe8a> [<https://perma.cc/8V5A-LKAB>].

213. *Id.*

214. OpenLaw Team, *Making Smart Contracts Stable and Legally Sound*, MEDIUM (Nov. 12, 2018), <https://medium.com/@OpenLawOfficial/making-smart-contracts-stable-and-legally-sound-d36b11c878db> [<https://perma.cc/H6PM-AFAX>].

215. *See id.*

216. Rosenberg, *supra* note 49.

217. J.P. Koning, *Should Western Union Worry About Stablecoins?*, COINDESK (Jan. 3, 2022), <https://www.coindesk.com/layer2/2022/01/03/should-western-union-worry-about-stablecoins/> [<https://perma.cc/5RKN-RKC6>].

218. *Id.*

219. Andrés Engler, *Bitso Processed \$1B in Crypto Remittances Between Mexico and the US so far in 2022*, COINDESK (Jun. 16, 2022) <https://www.coindesk.com/business/2022/06/16/bitso-processed-1b-in-crypto-remittances-between-mexico-and-the-us-in-first-half-of-2022/>.

220. Annie Njanja, *Cryptocurrency Payments Key to Lowering Cross-Border Remittance Charges and Boosting Microwork Uptake in Africa, Study Shows*, TECHCRUNCH (Feb. 23, 2022), <https://techcrunch.com/2022/02/23/cryptocurrency-payments-key-to-lowering-cross-border-remittance-charges-and-boosting-microwork-uptake-in-africa-study-shows/> [<https://perma.cc/R46U-4VYY>] (“In the last one decade, a \$1 billion jobs market—microwork—has emerged around technologies that split activities into piecemeal tasks to be completed by many people over the internet, mostly using mobile devices.”).

cross-border payments.²²¹ Stablecoins thus allow cross-border transactions to settle faster than the traditional financial system allows.²²²

Of course, different types of stablecoins are used for different purposes. For example, fiat-backed stablecoins are naturally used in remittance payments, since the receiver transfers the token into their fiat currency, for use in their home country. And commodity-backed stablecoins are used in smart contracts that require them to represent that contract's asset. On the other hand, any kind of stablecoin can be used for lending and other crypto trading activities.

II. STABLECOINS AS THE NEW PRIVATE FORM OF MONEY?

This Note next looks to Gorton and Zhang's seminal article to determine whether stablecoins are a private form of money.²²³ First, it applies and elaborates on Gorton and Zhang's framework on money's properties.²²⁴ Money must be a store of value, a unit of account, a medium of exchange, and satisfy the no-questions-asked ("NQA") principle: money is accepted in a transaction without due diligence on its value.²²⁵ Then, it looks at the analogy of stablecoins as wildcat banks in the Free Banking Era.²²⁶ Finally, this Part considers whether CBDCs can act as an adequate replacement to private stablecoins, as Gorton and Zhang assert.

This Part concludes that stablecoins may be a private form of money, despite their questionable satisfaction of NQA. Nonetheless, the analogy between stablecoins and wildcat banks is imprecise. Accordingly, stablecoins should not be regulated out of existence through a CBDC.

221. *Id.* This program specifically used Celo dollars (cUSD), which is a Celo-native stablecoin that tracks the US dollar with fees around \$0.01. *Id.*

222. *Stablecoins 101: What Are Crypto Stablecoins, and How Do They Work?*, *supra* note 202.

223. *See* Gorton & Zhang, *supra* note 33.

224. *Id.* at 3, 9.

225. *Id.* at 3-4, 9.

226. *Id.* at 25.

A. PROPERTIES OF MONEY

1. Stablecoins as a Medium of Exchange, a Store of Value, and a Unit of Account

Gorton and Zhang assume that stablecoins meet the three traditional properties of money without much discussion.²²⁷ Ultimately, stablecoins do meet these properties.²²⁸ However, the analysis is nuanced, as the conversation around their regulation should be.

A medium of exchange is “an intermediary instrument . . . used to facilitate the sale, purchase, or trade of goods [and services] between parties.”²²⁹ A medium of exchange then allows money to be used as a unit of account, since it can be used to track gains and losses across multiple transactions and compare values of different combinations and quantities of goods and services.²³⁰ Finally, “[a] store of value is an asset, commodity, or currency that maintains its value without depreciating.”²³¹

Stablecoins act as a medium of exchange. They generally developed to allow traders to convert erratic digital currencies instantaneously.²³² Their use in remittance, specifically the microwork market, is also an instance of satisfying this principle, since stablecoins are used to facilitate services.²³³ Stablecoins are also used for lending, but the high APY accounts for the potential volatility risk.²³⁴

However, commodity-backed stablecoins are not necessarily used as a medium of exchange because one of their purposes is to provide greater

227. See generally *id.*

228. See *infra* Section II.A.1.

229. James Chen, *Medium of Exchange*, INVESTOPEDIA (Nov. 30, 2020), <https://www.investopedia.com/terms/m/mediumofexchange.asp> [<https://perma.cc/NPH8-BBJ6>].

230. The Investopedia Team, *Understanding Money: Its Properties, Types, and Uses*, INVESTOPEDIA (Feb. 4, 2021), <https://www.investopedia.com/terms/m/money.asp> [<https://perma.cc/U8N6-SA5E>].

231. Lucas Downey, *Store of Value*, INVESTOPEDIA (Aug. 25, 2021), <https://www.investopedia.com/terms/s/storeofvalue.asp> [<https://perma.cc/7HRW-N2DX>].

232. Royal, *supra* note 32; *Are Deflationary Stablecoins the Future?*, *supra* note 32.

233. Njanja, *supra* note 220; see *supra* Section I.C.

234. *Stablecoins 101: What Are Crypto Stablecoins, and How Do They Work?*, *supra* note 202.

exposure and liquidity to physical assets that may otherwise be inaccessible.²³⁵ Practically, a commodity-backed stablecoin could be used as a medium of exchange, since it could be used for trade. Still, stablecoins in smart contracts can represent assets that are not necessarily money, such as real property.²³⁶ Nonetheless, in a smart contract, stablecoins are used to facilitate an exchange, which *ipso facto* is a medium of exchange. Therefore, stablecoins likely satisfy the medium exchange prong of money.

Stablecoins also act as a unit of account because they are valued as another currency or asset, which then allows them to be used as a unit of comparison. In practice, their use to convert other digital currencies fundamentally allows for a price comparison.²³⁷ The same applies to lending and smart contracts, as both allow users to measure the value of the underlying contract. And stablecoins in the microwork remittance market act as a unit of account since employers are valuing services.²³⁸

Finally, stablecoins act as a store of value, given that their sole purpose is to maintain a stable peg.²³⁹ Yet, a regulatory concern is stablecoins' capacity to maintain their peg and how a break from their peg could have market-wide repercussions. This will be discussed in the following Section.

2. NQA, the Free Banking Era, and Stablecoins According to Gorton and Zhang

This Section discusses Gorton and Zhang's NQA theory and its application to stablecoins. Gorton and Zhang explain that the NQA principle requires that both parties to a transaction accept money at par, without having any assurances.²⁴⁰ They conclude that stablecoins do not satisfy the NQA principle.²⁴¹ The authors describe the Free Banking Era, where private banks issued notes backed by gold and silver, as a time where money did not satisfy the NQA principle and caused market

235. 3 Things to Know About Stablecoins, *supra* note 70.

236. Stablecoins 101: What Are Crypto Stablecoins, and How do They Work?, *supra* note 202; OpenLaw Team, *supra* note 214.

237. Royal, *supra* note 32.

238. Njanja, *supra* note 220 (describing the \$1 billion microwork jobs market).

239. Gensler, *supra* note 35.

240. Gorton & Zhang, *supra* note 33, at 4.

241. *Id.* at 6.

instability from bank runs.²⁴² They then argue that stablecoins parallel wildcat banks and pose identical risks.²⁴³

Generally, short-term debt – such as private bank notes or demand deposits – is purposefully information-insensitive; money is accepted at par because all parties know that it is too expensive for due diligence to be desirable.²⁴⁴ In other words, the more opaque a bank's assets, the costlier it is to produce information, the more information-insensitive the debt is, and the stronger the peg is, making the NQA principle applicable.²⁴⁵

However, this principle does not apply to unregulated assets. If an asset's backing is not credible, agents have an incentive to produce private information on the assets' collateral.²⁴⁶ Or, agents avoid this production, and trade “at a price that is less than the fundamental value of the debt.”²⁴⁷ In the case of a bank run, the price adjusts to zero.²⁴⁸

Gorton and Zhang reason that stablecoin issuers face a catch-22. Stablecoins with opaque backing should satisfy NQA since no one would find it profitable to produce information.²⁴⁹ However, if the backing is opaque *and* unreliable, then the market will produce information, and thus destroy the NQA standard.²⁵⁰ Because stablecoins are not regulated and cannot rely on bank examiners, transparency is thus in their best interest to avoid a price adjustment or run.²⁵¹ Thus, the authors conclude,

242. *Id.* at 25.

243. *Id.* at 46.

244. *Id.* at 9. Information-insensitivity is further increased when private money is backed by debt that does not change, which is best achieved by backing debt with debt (e.g., backing private bank notes with state bonds or backing demand deposits with portfolios of loans). *See id.*

245. *See id.*

246. *Id.* at 10. This is also what happens in a financial crisis: when investors lose confidence in the market, those that are capable of producing information on collateral do so, or trade at a lower price than the collateral is actually worth, causing “fire sale” prices. Tri Vi Dang et al., *Ignorance, Debt and Financial Crises* (Apr. 2015) (manuscript at 22), <https://spinup-000d1a-wp-offload-media.s3.amazonaws.com/faculty/wp-content/uploads/sites/20/2021/02/Ignorance-Debt-and-Financial-Crises.pdf> [<https://perma.cc/LH9D-46JS>]; Gorton & Zhang, *supra* note 33, at 10. This leads to an inefficient amount of trade, but recovers information insensitivity. *Id.*

247. Dang et al., *supra* note 246, at 22.

248. Gorton & Zhang, *supra* note 33, at 10.

249. *Id.*

250. *See id.*

251. *Id.*

stablecoins do not satisfy NQA because they must have transparent assets to remain at par.²⁵²

The authors contend that money that does not satisfy the NQA principle results in an inefficient market. For example, bank notes during the Free Banking Era were private money that did not satisfy the NQA principle.²⁵³ During this period, banks could be opened as long as notes were backed one-for-one with state bonds, which were deposited with the state treasurers.²⁵⁴ However, notes did not trade at par between different banks.²⁵⁵ These differences, or discounts, made it hard to transact.²⁵⁶ Wildcat banks, which were dishonest banks that sought to defraud the public, would either not deposit the requisite bonds, or would issue notes that would not be redeemed.²⁵⁷ Notes were also uninsured.²⁵⁸ In sum, transactions were inefficient because “varying discounts made actual transactions (and legal contracting) very difficult.”²⁵⁹ Private bank notes were then regulated out of existence in the 1800s, which Congress has the authority to do.²⁶⁰

252. *Id.*

253. *Id.* at 25.

254. *Id.* The Free Banking Era lasted from 1837 to 1863 and each state specified what eligible bonds were. *See id.* at 25, 43.

255. *Id.* at 27. Discounts were also published in bank note reporters, weekly newspapers in major cities, and in secondary markets. *Id.* at 27-28. A secondary market that developed during this time were note brokers, who would buy notes from stores. *Id.*

256. *See* Sebastian Sinclair, *Stablecoins Risky Like ‘Wildcat’ Bank Practices of 19th Century*, Gorton and Zhang Write, COINDESK: POLICY (Sept. 14, 2021), <https://www.coindesk.com/policy/2021/07/19/stablecoins-risky-like-wildcat-bank-practices-of-19th-century-gorton-and-zhang-write/> [<https://perma.cc/8FGW-M8MB>].

257. *See* Gorton & Zhang, *supra* note 33, at 28 (citing Arthur J. Rolnick & Warren E. Weber, *Free Banking, Wildcat Banking and Shinplasters*, FED. RSRV. BANK MINNEAPOLIS Q. REV. at 10 (Fall 1982) <https://www.minneapolisfed.org/research/quarterly-review/free-banking-wildcat-banking-and-shinplasters>).

258. *See* Sinclair, *supra* note 255.

259. *See* Gorton & Zhang, *supra* note 33, at 29. Legislation also imposed a prohibitively high tax on bank notes other than national bank notes, ending the Free Banking Era. *Id.*

260. U.S. CONST. art. I, § 8. Article I, Section 8 of the Constitution gives Congress the power to “coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures.” *Id.* Further, Congress can tax privately created currencies out of existence, as it did during the Civil War with a 10 percent tax on banks for payments in private currency notes. *See* Gorton & Zhang, *supra* note 33, at 31-32. In *Veazie Bank v. Fenno*, 75 U.S. 533 (1869), the Court determined that Congress has the authority to issue a uniform currency and to impose a tax on competing currencies to

Gorton and Zhang conclude that, since stablecoins do not satisfy the NQA principle, transactions with them will be inefficient and costly, as happened in the Free Banking Era.²⁶¹ Therefore, stablecoins are not an economically efficient form of money.²⁶²

3. *An Imprecise Analogy and the Fable of the Cats*

While Gorton and Zhang offer an interesting economic perspective, they overlook stablecoins' fundamental purposes and varieties. The authors assume that private bank notes and stablecoins are directly comparable. Gorton and Zhang also assume that private notes automatically result in market inefficiency.

To start, banknotes and stablecoins have different uses. Private banknotes were held by nearly everyone, while stablecoins are predominantly used by traders in crypto-asset markets, or by other users for specific transactions.²⁶³ While stablecoins do have other uses, such as in lending, smart contracts, and in remittance, these uses are still not close to private banknotes' general use.²⁶⁴ And while stablecoins' use may grow, regulators should not regulate solely for potential and stymie innovation.²⁶⁵

Additionally, stablecoins and banknotes have core structural differences. Stablecoins that publish their collateral on the Blockchain, as Tether does on Bitcoin via Omni, make it easy for actors to find

ensure that its uniform currency is successfully adopted. Gorton & Zhang, *supra* note 33, at 32 (citing *Veazie Bank*, 75 U.S. 533).

261. See Gorton & Zhang, *supra* note 33, at 29.

262. See *id.* at 4. Economically efficient money has a convenience yield, or a nonpecuniary return, such as keeping money around for ease of use. *Id.* Stablecoins do not have this trait, according to Gorton and Zhang, because their questionable value makes them impractical to transact with. *Id.*

263. See *supra* Section 1.A. For example, Tether's website states that it's "[d]esigned with Tether's professional investor audience in mind," of "minimal issuance and redemption requirements equal to 100,000 USD and \$100,000 USDT, respectively." TETHER, *Tether Reopens Account Verification and Direct Redemption of Fiat from Its Platform*, TETHER (Nov. 27, 2018), <https://tether.to/en/tether-reopens-account-verification-and-direct-redemption-of-fiat-from-its-platform> [https://perma.cc/2Z6F-NGDV] (quoted in Larry White, *Should We Fear Stablecoins?*, ALT-M (June 24, 2021), <https://www.alt-m.org/2021/06/24/should-we-fear-stablecoins/> [https://perma.cc/W4KP-4QLX]).

264. See *supra* Section I.C.

265. *Id.*

information.²⁶⁶ Furthermore, on-chain collateralized coins, in the case of MakerDao's DAI, place their smart contracts with borrowers published on the blockchain.²⁶⁷ The NQA principle does not seem to apply if the information is neither private nor costly.

On the other hand, Tether's recent controversy might lend weight to the unsuitability of NQA. However, while Tether's opaque backing led to lawsuits and controversy, its dollar peg remains.²⁶⁸ This suggests that the NQA principle works with stablecoins, particularly considering how long Tether was able to maintain its opaque backing. Yet, because of this controversy, Tether is now more transparent with its collateral²⁶⁹, which suggests that, even if NQA was applicable to stablecoins, it is now inapplicable. In addition, USDC's growth rate and emphasis on transparency, coupled with the general call for increased transparency and regulation indicates that the NQA principle is not met.²⁷⁰

Finally, algorithmic stablecoins are not backed by collateral at all.²⁷¹ Perhaps the NQA principle applies most strongly here: how can users transact without knowing how these coins work? But this presupposes that NQA accounts for more than due diligence on collateral and value and, instead, includes investigation on the overall structure of the currency. This would stretch NQA beyond recognition, making it questionable if the principle is appropriate for stablecoins.

Gorton and Zhang also mischaracterize free banking and presume that because the United States Free Banking Era was an inefficient era, free banking systems necessarily create inefficient markets.²⁷² First, "Scotland, Northern Ireland, and Hong Kong today have a predominance of private monies' in circulation without any ill effects for consumers or

266. See *supra* Section I.B.1. Tether's ledger is embedded in the Bitcoin blockchain via Omni, so that there is a public record on the blockchain that corresponds to deposits and withdrawals on Tether's bank account. See TETHER WHITEPAPER, *supra* note 48, at 6.

267. See *supra* Section I.B.2.

268. See Elizabeth Lopatto, *The Tether Controversy, Explained*, VERGE (Aug. 16, 2021), <https://www.theverge.com/22620464/tether-backing-cryptocurrency-stablecoin> [<https://perma.cc/ZKE7-5945>].

269. See TETHER WHITEPAPER, *supra* note 48, at 17.

270. See *In Winning DeFi, Circle's USDC Shows It Can Be the No. 1 Stablecoin*, *supra* note 54; see also Ligon, *supra* note 44.

271. See *supra* Part I.

272. See George Selgin, *The Fable of the Cats*, ALT-M (July 6, 2021), <https://www.alt-m.org/2021/07/06/the-fable-of-the-cats/> [<https://perma.cc/3JNZ-8HAW>].

financial stability.”²⁷³ Historically too, countries have had robust free bank economies. Specifically, Canada offers a good example: the country operated an efficient market with a gold-based dollar, and without a central bank or a centralized currency arrangement.²⁷⁴ Likewise Scottish banks were hardly regulated, except by contract law, until 1845, and were stable and efficient.²⁷⁵ Moreover, they did not have to secure notes with specific assets or specie reserves.²⁷⁶

Additionally, banks during the Free Banking Era in the United States were regulated. Banks could not establish nationwide branches, so banks could not diversify their assets, leading to bank failures.²⁷⁷ Free Banking laws instituted “minimum capital requirements, regular reporting requirements and inspections, and (in many instances) specie reserve requirements” in certain states.²⁷⁸ And free banks all had to secure their notes with specific collateral.²⁷⁹ Wildcat banks were also relatively rare and mostly specific to Michigan.²⁸⁰ Free banking was likely thus not the sole cause for market inefficiencies during this era.

In conclusion, stablecoins likely satisfy the traditional properties of money. Further, if NQA is inapplicable—which is debatable—it is irrelevant since it is unclear that stablecoins are comparable to private bank notes. And even if NQA is inapplicable and stablecoins are

273. White, *supra* note 263.

274. See Selgin, *supra* note 272. Canada avoided the U.S. panics in 1884 and 1893 and was left unscathed by the Panic of 1907. *Id.*

275. See *id.*

276. See *id.*

277. See Nic Carter, *Why Central Bankers Invoke Free Banking to Attack Stablecoins*, COINDESK (July 19, 2021), <https://www.coindesk.com/markets/2021/07/19/why-central-bankers-invoke-free-banking-to-attack-stablecoins/> [https://perma.cc/HC9N-7AZN] (citing Selgin, *supra* note 272).

278. Selgin, *supra* note 272.

279. See Carter, *supra* note 277 (citing Selgin, *supra* note 272).

280. See Selgin, *supra* note 272:

That most antebellum banks weren’t “free” itself means that most weren’t wildcats, for all authorities agree that wildcat banking only occurred where Free Banking laws were in effect. But wildcats were rare even in those places. Outside of the (Old) West, it was entirely unknown, and in the West itself it wasn’t all that common. Because different scholars have emphasized different criteria, careful estimates put the total number of wildcats as low as several dozen and no higher than 173, with no more than 90 or so ever present during any one year.

analogous to private bank notes, it is unclear that market inefficiency automatically results.

These distinctions are critical to understand because they inform how stablecoins should be regulated. Specifically, by Gorton and Zhang's logic, the Government should tax stablecoins out of existence and create CBDCs to replace them, as was done through the National Bank Act in 1863 and subsequent legislation in 1866.²⁸¹ In fact, CBDCs are an inadequate replacement to stablecoins as the two are distinct organisms.

B. I SAY STABLECOIN, AND YOU SAY CBDC? LET'S CALL THE WHOLE
THING OFF

A CBDC is a "digital liability of a central bank that is widely available to the general public."²⁸² It is pegged to the value of a country's fiat currency.²⁸³ Critically, CBDCs are not cryptocurrencies. They are controlled by a central bank and are therefore not decentralized.²⁸⁴ They can exist on blockchain, but studies have found that distributed ledgers could impede their efficiency and scalability.²⁸⁵

CBDCs enable the public to make digital payments safely, with no credit or liquidity risk.²⁸⁶ In the United States, Federal Reserve notes are the only type of central bank money available.²⁸⁷ The use of Federal Reserve notes has drastically decreased in developed countries, particularly during the COVID-19 pandemic.²⁸⁸ In the United States alone, 5 percent of adults do not have a bank account; a total of 13 percent that have bank accounts use expensive alternative services, such as money

281. See Gorton & Zhang, *supra* note 33, at 29.

282. BD. OF GOVERNORS FED. RSRV. SYS., CENTRAL BANK DIGITAL CURRENCY (CBDC) (2022), <https://www.federalreserve.gov/central-bank-digital-currency.htm> [<https://perma.cc/78CF-QM9B>].

283. See Shobhit Seth, *Central Bank Digital Currency (CBDC)*, INVESTOPEDIA (Mar. 9, 2022), <https://www.investopedia.com/terms/c/central-bank-digital-currency-cbdc.asp> [<https://perma.cc/Y94B-342P>].

284. See *id.*

285. See *id.* (citing FED. RSRV. BANK BOS., PROJECT HAMILTON PHASE 1 EXECUTIVE SUMMARY (2022), <https://www.bostonfed.org/publications/one-time-pubs/project-hamilton-phase-1-executive-summary.aspx>).

286. See BD. OF GOVERNORS FED. RSRV. SYS., *supra* note 282.

287. See *id.*

288. See Seth, *supra* note 283.

orders, payday loans, and check-cashing services.²⁸⁹ Thus, CBDCs can laudably “provide businesses and consumers with privacy, transferability, convenience, accessibility, and financial security,” and “reduce cross-border transaction costs, and provide those who currently use alternative money transfer methods with lower-cost options.”²⁹⁰ CBDCs also offer a path to financial inclusion where geography is an impediment to physical banking.²⁹¹

Of existing CBDCs, there is no uniform issuance model.²⁹² The Eastern Caribbean implements an account-based model, whereby consumers hold deposit accounts directly with the central bank.²⁹³ On the other hand, China’s CBDC pilot uses private-sector banks to distribute and maintain accounts.²⁹⁴ Meanwhile, the European Central Bank is considering using a permissioned blockchain, where each financial institution operates a node on the network.²⁹⁵ Finally, a fourth, untested, model would issue fiat currency as anonymous fungible tokens to protect user privacy.²⁹⁶

Many other governments, the United States included, are launching, or at least considering launching, CBDCs for the purpose of reducing cryptocurrency use.²⁹⁷ The International Monetary Fund (IMF) has gone so far as to call cryptocurrencies a private form of digital money, and that CBDCs offer a better alternative than “the better managed and regulated

289. See *id.* (citing BD. OF GOVERNORS FED. RSRV. SYS., REPORT ON THE ECONOMIC WELL-BEING OF U.S. HOUSEHOLDS IN 2020 39 (2021), <https://www.federalreserve.gov/publications/2021-economic-well-being-of-us-households-in-2020-banking-and-credit.htm>).

290. *Id.*

291. See Kristalina Georgieva, *The Future of Money: Gearing up for Central Bank Digital Currency*, Speech at the Atlantic Council (Feb. 9, 2022) (transcript available at <https://www.imf.org/en/News/Articles/2022/02/09/sp020922-the-future-of-money-gearing-up-for-central-bank-digital-currency>). CBDCs can also work in emergencies. *Id.* For instance, the Eastern Caribbean Central Bank extended its CBDC pilot to areas struck by a volcanic eruption in 2021. *Id.*

292. See Ian De Bode et al., *CBDC and Stablecoins: Early Coexistence on an Uncertain Road*, MCKINSEY & COMPANY (Oct. 11, 2021), <https://www.mckinsey.com/industries/financial-services/our-insights/cbdc-and-stablecoins-early-coexistence-on-an-uncertain-road>.

293. *Id.*

294. *Id.*

295. *Id.*

296. *Id.*

297. See Seth, *supra* note 283.

stablecoins.”²⁹⁸ The IMF’s report further declares one of CBDC’s goals to be to “increase competition in a country’s payments sector . . . by competing with existing forms of payments.”²⁹⁹

This rationale is also seen in President Biden’s Executive Order on Ensuring Responsible Development of Digital Assets.³⁰⁰ Section 4 of that Order “places the highest urgency on research and development efforts into the potential design and deployment options of a United States CBDC.”³⁰¹ The Order also states that a United States CBDC would offer “fewer of the risks posed by private sector-administered digital assets.”³⁰²

The Federal Reserve continues to explore the benefits and risks of implementing a central bank digital currency.³⁰³ Most recently, in June 2022, the Federal Reserve released a report on how CBDCs could help the economy function more effectively.³⁰⁴ However, the Report’s discussion on stablecoins is rather shallow as it merely cites previous reports, namely the PWG Report, none of which cover the full stablecoin ecosystem.³⁰⁵ And while stating that “a full discussion of stablecoin arrangements is outside the scope of this paper,” the Report nonetheless recommends that a CBDC could provide a safe alternative for private-sector innovations.³⁰⁶ Finally, the Federal Reserve’s report presupposes

298. Georgieva, *supra* note 291.

299. Gabriel Soderberg, *Behind the Scenes of Central Bank Digital Currency Emerging Trends, Insights, and Policy Lessons*, IMF FINTECH NOTES, at 7 (Feb. 2022), <https://www.imf.org/en/Publications/fintech-notes/Issues/2022/02/07/Behind-the-Scenes-of-Central-Bank-Digital-Currency-512174>.

300. Exec. Order No. 14,067, 87 Fed. Reg. 14, 143 (Mar. 9, 2022), <https://www.whitehouse.gov/briefing-room/presidential-actions/2022/03/09/executive-order-on-ensuring-responsible-development-of-digital-assets/> [<https://perma.cc/AZZ9-JABD>].

301. *See id.*

302. *See id.*

303. BD. OF GOVERNORS FED. RSRV. SYS., *supra* note 282.

304. BD. OF GOVERNORS FED. RRSV. SYS., MONEY AND PAYMENTS: THE U.S. DOLLAR IN THE AGE OF DIGITAL TRANSFORMATION (2022), <https://www.federalreserve.gov/publications/january-2022-cbdc.htm>.

305. *See id.*

306. *See id.* at 17, 14-15:

A CBDC could spur innovation by banks and other actors and would be a safer deposit substitute than many other products, including stablecoins and other types of nonbank money. . . .

A U.S. CBDC would offer the general public broad access to digital money that is free from credit risk and liquidity risk. As such, it could

that stablecoins are a private form of money.³⁰⁷ As the previous section illustrates, this conclusion is far from certain.³⁰⁸ And even if stablecoins are private bank notes, an inefficient market does not necessarily result. Thus it does not follow that the Federal Reserve should disseminate CBDCs to the exclusion of stablecoins.³⁰⁹ Stablecoins indeed should and *need* to be regulated; they do not need to be eliminated, however.

III. STABLECOINS AS DEPOSITS?

This section examines how stablecoins compare to Demand Deposit Accounts (“DDA”s). DDAs allow funds to be withdrawn at any time, without notice.³¹⁰ Checking accounts and savings accounts are a popular type of DDA.³¹¹ This Part considers two interpretations on deposits, one by the Department of Justice (DOJ) and the other by the Supreme Court. The first interpretation pertains to the Federal Reserve Board of Governors’ (“the Board of Governors”) attempt to expand the definition of deposits to include money market funds (“MMF”s). The second focuses on the Board of Governors efforts to include negotiable order of withdrawal (“NOW”) accounts as demand deposits. This Part looks to the different structures of stablecoins to argue that a blanket regulation as demand deposits would be inappropriate.

A. SECTION 21 OF THE GLASS-STEAGALL ACT

Section 21 of the Glass-Steagall Act makes it unlawful for anyone “to engage, to any extent whatever[,]. . . in the business of receiving

provide a safe foundation for private-sector innovations to meet current and future needs and demands for payment services. All options for private digital money, including stablecoins and other cryptocurrencies, require mechanisms to reduce liquidity risk and credit risk. But all these mechanisms are imperfect. In our rapidly digitizing economy, the proliferation of private digital money could present risks to both individual users and the financial system as a whole. A U.S. CBDC could mitigate some of these risks while supporting private-sector innovation.

307. *See id.*

308. *See supra* Section II.A.3.

309. *See supra* Section II.A.3.

310. James Chen, *Demand Deposit*, INVESTOPEDIA (May 25, 2022), <https://www.investopedia.com/terms/d/demanddeposit.asp> [<https://perma.cc/TK2N-QJMN>].

311. *See id.*

deposits.”³¹² The text and legislative history of Section 21(a)(2) give deposits a broad definition.³¹³ An interpretive letter, issued by Assistant Attorney General Philip Heymann, addressed the issue and has become “the best known illustration” of Section 21’s “functional approach to defining deposits.”³¹⁴

According to Professor Howell E. Jackson, the letter did not focus on the absence of the word deposit.³¹⁵ And it “proceeded on the assumption that Section 21 should be applied to novel financial innovations, even if not offered by traditional depository institutions.”³¹⁶ Thus, according to Jackson, federal authorities should take a similar functional approach with respect to stablecoins because “stablecoin issuers are attempting to produce a deposit-like product, with a value tied to the U.S. dollar.”³¹⁷

Yet, Jackson’s analysis misses two key elements. First, while this famed interpretive letter did take a functional approach, it also did not recommend expanding the definition of deposit to include MMFs. The letter actually emphasizes that on-demand redemption is not a sufficient condition to find deposits.³¹⁸

312. 12 U.S.C. § 378.

313. Howell E. Jackson, *Locating Stablecoins Within the Regulatory Perimeter*, HARV. L.F. ON CORP. GOVERNANCE BLOG (Aug. 5, 2021), <https://corpgov.law.harvard.edu/2021/08/05/locating-stablecoins-within-the-regulatory-perimeter/> [<https://perma.cc/A344-4SJB>].

314. *Id.*

315. *See id.*

316. *Id.*

317. *Id.*

318. Letter from Assistant Attorney General Philip Heymann, Criminal Division, to Martin Lybecker, Associated Director, SEC Division of Marketing Management (Dec. 18, 1979):

Availability of particular mechanisms for an investor to transfer his ownership is a mere formality and serves in no way to alter the substance of his status as owner. As between him and the fund, the potential for capital gain or loss on his investment remains unaffected by the means he may select to realize his investment, and he is not, by his selection of the mechanism of a combined order to sell and pay over [check] to realize his investment, converted into a mere creditor of the fund with no expectation of capital gain or loss from the fund upon realization.

Second, Jackson assumes that stablecoin issuers are deposit-like, without analyzing different coins.³¹⁹ Even coins in the same category differ in their analogy to deposits. Circle's redemption process most closely resembles a demand deposit: "The issuer sends USD from its reserves to the user's bank account."³²⁰ On the other hand, Tether's contractual relationship with its holders resembles that of MMFs, discussed later.³²¹ And MakerDAO's vaults are closer to loan agreements than demand deposits.³²² Finally, it is difficult to see how Terra and other algorithmic coins fit into a demand deposit framework because they do not have reserves by design.

B. SCRUTINY OF ON-DEMAND REDEMPTION

Finally, even when redemption is relevant to the deposit analysis, as with Circle, the Court will scrutinize if it is on-demand. In *Federal Reserve System v. Dimension Financial Corp.*, the Supreme Court struck down the Board of Governors' attempt to expand the demand deposit definition to include NOW accounts.³²³ The Fed argued that NOW

319. See Jackson, *supra* note 313. The author does state that "federal authorities should engage in a more systematic review of the range of stablecoin products entering the market and determine which of these products pose the kinds of policy concerns that Section 21(a)(2) was designed to police." *Id.* However, this part of the analysis is critical to determine if Section 21(a)(2) is the correct regulation for stablecoins, which Jackson argues. *See id.*

320. *What Does It Mean to Tokenize USD and Redeem USDC?*, CIRCLE: SUPPORT, <https://support.usdc.circle.com/hc/en-us/articles/4418161704212-What-does-it-mean-to-tokenize-USD-and-redeem-USDC-> [<https://archive.ph/hDXC2>].

321. See *Legal: Terms of Service*, TETHER (Sept. 22, 2022), <https://tether.to/en/legal/> ("Tether reserves the right to redeem Tether Tokens by in-kind redemptions of securities and other assets held in the Reserves.").

322. See *Borrow Dai*, MAKERDAO: COMMUNITY PORTAL, <https://makerdao.world/en/learn/Dai/borrow-dai/>. In *Federal Reserve System v. Dimension Financial Corp.*, "the Court adopted a very narrow view of the term 'commercial loan,' stating that the term is used in the financial community to describe the direct loan from a bank to a business customer." Gorton & Zhang, *supra* note 33, at 17 (citing *Fed. Rsrv. Sys. v. Dimension Fin. Corp.*, 474 U.S. 361, 370 (1986)). So, despite MakerDAO's claim that it provides lending, it might still not be considered a commercial loan. *See id.* at 18.

323. Gorton & Zhang, *supra* note 33, at 13-14. The regulatory text in question was Section 2(c) of the Bank Holding Company Act of 1956, which defined a bank as any institution "which (1) accepts deposits that the depositor has a legal right to withdraw on demand, and (2) engages in the business of making commercial loans." *Dimension Fin. Corp.*, 474 U.S. at 361.

accounts were “as a matter of practice” payable on demand.³²⁴ Nonetheless, the Court did not find this interpretation reasonable because NOW accounts required prior notice of withdrawal.³²⁵ This requirement, according to the Court, impeded the depositor’s “legal right” to withdraw on demand.³²⁶

In light of these interpretations, there could be a strong argument that a collateral-backed stablecoin is a demand deposit if (1) its holder contract resembles a debt contract and (2) if it offers unencumbered redemption. Circle might meet this first prong. And the company claims to meet the second prong in its USDC Express account, advertising on its website that “USDC can seamlessly flow from the crypto exchange of your choice into US Dollars in a bank account.”³²⁷

Ultimately, because only one account of one stablecoin issuer fits the demand deposit structure, stablecoins generally should not be regulated as demand deposit accounts.

IV. STABLECOINS AS MONEY MARKET FUNDS?

This section looks at Money Market Funds (“MMF”s), their parallel to Tether, and public discourse surrounding Tether’s capacity to break the buck and cause market-wide panic.

A. GENERALLY

A MMF invests in highly liquid short-term instruments, including cash, cash-equivalent securities, and U.S. Treasuries.³²⁸ Collectively, they hold trillions of dollars on behalf of individuals, pension funds, municipalities, businesses, etc.³²⁹ They are not insured by the Federal

324. Gorton & Zhang, *supra* note 33, at 13.

325. *See id.* at 14.

326. *Id.* (citing *Dimension Fin. Corp.*, 474 U.S. at 368).

327. *USDC Express: The Fastest Way to Get USDC*, CIRCLE, <https://www.circle.com/en/usdc-express> [<https://perma.cc/SWZ4-Z6DN>] (last visited Oct. 27, 2022).

328. *See* Troy Segal, *Money Market Funds: What They Are, How They Work, Pros and Cons*, INVESTOPEDIA, <https://www.investopedia.com/terms/m/money-market-fund.asp> [<https://perma.cc/LH2S-G2N2>] (last updated Apr. 7, 2022). MMFs are alternatively known as money market mutual funds (“MMMFS”s). *See id.*

329. BD. OF GOVERNORS FED. RESRV. SYS., ASSET-BACKED COMMERCIAL PAPER MONEY MARKET MUTUAL FUND LIQUIDITY FACILITY (AMLF) (2020) <https://www.federalreserve.gov/regreform/reform-amlf.htm>.

Deposit Insurance Corporation (FDIC).³³⁰ A MMF aims to sustain a net asset value of one USD per share.³³¹ Excess earnings are distributed to investors through dividends.³³² This is a principal reason why MMFs are attractive: fund managers make regular dividend payments to investors.³³³ Funds are typically redeemable on demand.³³⁴

The interpretive letter discussed above provides an interesting parallel between MMFs and stablecoins.³³⁵ The letter did not focus on the ease of redemption, but rather on “the technical distinctions between debt and equity” to find that MMFs were not deposit-like instruments, because “one who invests in a money market fund is an owner pro tanto of the fund” and is subject to market fluctuation.³³⁶

Tether’s contractual relationship with its holders resembles that of MMFs and their investors: both are not obligated to exchange one share or coin for one dollar but can sell an underlying measure of assets and give the investor or holder proceeds.³³⁷

On-chain collateralized stablecoins, like MakerDAO’s DAI, pose interesting parallels to MMFs. As it is unlikely that stablecoins will be regulated as commercial loans, they could perhaps be regulated as MMFs.³³⁸ DAI is issued to holders who stake their own crypto collateral, which is subject to market fluctuation. Thus, holders of DAI, like investors in MMFs, remain partial owners of the vault’s assets. However, this analogy is not exact because DAI holders are not passive actors, like MMF investors; DAI holders make the decision to stake a specific type of crypto collateral while MMF investors give bankers the discretion on

330. James Chen, *Breaking the Buck*, INVESTOPEDIA, <https://www.investopedia.com/terms/b/breaking-the-buck.asp> [<https://perma.cc/N64U-GZAR>] (last updated Sept. 27, 2022).

331. See Segal, *supra* note 328.

332. See *id.*

333. See *id.*

334. Rebecca Baldrige, *Introduction To Money Market Mutual Funds*, INVESTOPEDIA, <https://www.investopedia.com/investing/introduction-to-money-market-mutual-funds/> [<https://perma.cc/DC9M-72X8>] (last updated Apr. 29, 2022).

335. See Gorton & Zhang, *supra* note 33, at 11.

336. *Id.*

337. *Legal: Terms of Service*, *supra* note 321.

338. Gorton & Zhang, *supra* note 33, at 17. In *Federal Reserve System v. Dimension Financial Corp.*, “[t]he Court adopted a very narrow view of the term ‘commercial loan,’ stating that the term is used in the financial community to describe the direct loan from a bank to a business customer.” *Id.* (discussing *Fed. Rsv. Sys. v. Dimension Fin. Corp.*, 474 U.S. 361 (1986)). See also *Borrow Dai*, *supra* note 322.

investments. Because of this difference, the reasons for protecting MMF investors with regulations do not necessarily apply to DAI holders.

MMFs are not necessarily a proper comparison to other stablecoins. As discussed in the previous section, Circle is closer to a DDA than a MMF. Commodity-backed stablecoins more naturally fall under the Commodity Exchange Act.³³⁹ Finally, algorithmic stablecoins are dissimilar to MMFs because they do not have reserves.

Even though only one stablecoin issuer truly fits the MMF mold—and admittedly Tether is the largest issuer—regulators fear that a run on stablecoins mirrors breaking the buck and could have market-wide repercussions.

B. BREAKING THE BUCK AND THE FEAR OF STABLECOIN RUNS

Breaking the buck occurs when a MMF's share price deviates more than 0.5 percent from its one USD net asset value.³⁴⁰ When this happens, investors can no longer redeem one share for one USD.³⁴¹ This can—and in 2008, did—lead to market-wide panic where investors run to sell their shares.³⁴² Regulations are now in place to help prevent MMF runs.

The SEC enacted Rule 2a-7 in 2008.³⁴³ This regulation requires MMFs to have more conservative maturities and credit rankings: an investment's average dollar-weighted portfolio maturity cannot exceed 60 days and only 3 percent of assets can be in securities that do not fall within the first or second-highest credit ranking tier.³⁴⁴ Rule 2a-7 also requires more stringent liquidity requirements.³⁴⁵

Rule 2a-7 makes sense in the context of fiat-backed stablecoins. Because they make up the bulk of the stablecoin market, have a large

339. CONG. RSCH. SERV., IFI1968, STABLECOINS: BACKGROUND AND POLICY ISSUES 2 (NOV. 10, 2021), <https://sgp.fas.org/crs/misc/IFI1968.pdf>.

340. See Gorton & Zhang, *supra* note 33, at 22; see also Segal, *supra* note 328.

341. See Gorton & Zhang, *supra* note 33, at 22.

342. *Id.*

343. See *id.* at 21-22; 17 C.F.R. § 270.2a-7(2022); Lisa Smith, *How Money Market Funds Got Safer With Rule 2a-7*, INVESTOPEDIA, <https://www.investopedia.com/articles/mutualfund/10/a-safer-money-market-2a7.asp> [https://perma.cc/99TD-8EC4] (last updated July 12, 2022).

344. *Id.*

345. Smith, *supra* note 343. For example, at least 10 percent of taxable funds' investments must be cash convertible within one day; at least 30 percent of investments must be cash convertible within five business days; and at most 5 percent investments can take more than one week to be converted into cash. *Id.*

market capitalization, and companies are moving towards this direction already, it would be helpful to mandate Rule 2a-7 requirements across the board to ensure investor safety. However, other, more specific ex ante regulations need to take place given the variety of stablecoins.

CONCLUSION

Stablecoins are a unique and exciting area in Fintech. One of the most fascinating aspects of stablecoins is their diversity. And the community's commitment to creating decentralized stablecoins is laudable. However, as seen with Terra, such coins come with risks, and investors should be adequately educated on these risks. Some other features, such as automatic market makers, need to be regulated to protect investors. Terra's collapse underlines the need for regulators to scrutinize coins that use imperfect, and therefore risky, methods to maintain a peg. The centralized elements of stablecoins—the reserves in off-chain collateralized stablecoins—should also meet certain liquidity and transparency requirements to help prevent runs.

However, it does not follow that stablecoins should be regulated out of existence, as private bank notes were in the 1800s.

At the very least, regulators must understand the full stablecoin ecosystem before passing any regulations. This is because, as seen with 19th century private bank notes, DDAs, and MMFs, stablecoins do not fit any mold. Also, while CBDCs have the potential to help with financial inclusion, they will likely not replace stablecoins because they are simply distinct creatures.

The current body of research published by different government offices is inadequate. The statements made by government officials are lacking in depth. The government should not pass stablecoin regulations merely because it is politically expedient to do so. First and foremost, the Government needs to continue to partner with the crypto community. And they already have: SEC Commissioner Hester Peirce regularly reaches out to the crypto community for their opinions.³⁴⁶

346. Hester M. Peirce, Comm'r, Sec. Exch. Comm'n, *Running on Empty: A Proposal to Fill the Gap Between Regulation and Decentralization*, Speech Before the International Blockchain Congress (Feb. 6, 2020) (transcript available at <https://www.sec.gov/news/speech/peirce-remarks-blockress-2020-02-06> [<https://perma.cc/BZL5-NMED>]):

For now, the text of the proposed safe harbor is available for viewing as an appendix to this speech at [sec.gov](https://www.sec.gov) and will be posted on social

Federal authorities could over-extend old law, as has been done with ICOs. But stablecoins offer an opportunity for regulators to start from scratch. And they should.

media so that unfiltered critics can apply their editorial hacksaws to it. You also can give me a call, send me an email, stop by my office, or provide feedback at FinHub. After all, I am very much a believer in the value of drawing on the creativity and ingenuity of as many people as possible. That is why I find decentralized networks such a powerful phenomenon, and one that will allow society to benefit from the talents of people who—because of societal or geographic barriers—have heretofore been excluded.