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# Stablecoins: Growth Potential and Impact on Banking

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## Abstract

Stablecoins have experienced tremendous growth in the past year, serving as a possible breakthrough innovation in the future of payments. In this paper, we discuss the current use cases and growth opportunities of stablecoins, and we analyze the potential for stablecoins to broadly impact the banking system. The impact of stablecoin adoption on traditional banking and credit provision can vary depending on the sources of inflow and the composition of stablecoin reserves. Among the various scenarios, a two-tiered banking system can both support stablecoin issuance and maintain traditional forms of credit creation. In contrast, a narrow bank approach for digital currencies can lead to disintermediation of traditional banking, but may provide the most stable peg to fiat currencies. Additionally, dollar-pegged stablecoins backed by adequately safe and liquid collateral can potentially serve as a digital safe haven currency during periods of crypto market distress.

*Keywords:* Stablecoins, Digital currencies, Credit intermediation, Banking, Systemic risk, Fintech, Financial innovation, Payment system

*JEL Classifications:* E40, E50, F33, G10, G20, O30

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Stablecoins are digital currencies that peg their value to an external reference, typically the U.S. dollar (USD). Stablecoins play a key role in digital markets, and their growth could spur innovations in the broader economy. In the past year, USD-pegged stablecoins circulating on public blockchains have seen explosive growth, with a combined circulating supply of nearly \$130 billion as of September 2021 – a more than 500% increase from one year ago.

As stablecoins gain increasing attention in public discourse, a host of issues have been raised, including the stability of their pegs, consumer protection, know-your-customer and anti-money laundering compliance, and the scalability and efficiency of settlements.<sup>1</sup> In this note, we focus our discussion on the potential impact of stablecoins on the banking system and credit intermediation.<sup>2</sup> While a range of stablecoin-related issues may be resolved with appropriate institutional safeguards, regulations, and technical advancements, sustained growth in stablecoins in circulation would ultimately impact the traditional banking system in significant ways that are important to understand.

In this note, we first discuss the basics of stablecoins, their current use cases, and their growth potential. Second, we study historical behaviors of stablecoins during past episodes of crypto and broad financial market distress. We find that dollar-pegged stablecoins have exhibited safe asset qualities in that their prices in the secondary market temporarily rise above the peg during times of extreme market distress, incentivizing the issuance of more stablecoins. We also highlight the risk of a “run” on certain stablecoins that are backed by non-cash-equivalent risky assets.

Finally, we outline possible scenarios for bank reserves, credit intermediation, and central bank balance sheets should stablecoins gain broader traction. Our research suggests the broad adoption of asset-backed stablecoins can potentially be supported within a two-tiered, fractional reserve banking system without a negative impact on credit intermediation. In such a framework, stablecoin reserves are held as commercial bank deposits, and commercial banks engage in fractional reserve lending and maturity transformation as they normally would with traditional bank deposits.<sup>3</sup> We also find that the replacement of physical cash (banknotes) with stablecoins could result in more credit intermediation. In contrast, a narrow banking framework, in which stablecoin issuers are required to back their stablecoins with central bank reserves, minimizes the risk of “runs” on stablecoins but can potentially reduce credit intermediation.

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<sup>1</sup>Among the various issues associated with stablecoin adoption and regulations, the stability and “run risk” are of primary concern. See Gorton and Zhang (2021) for a discussion of regulatory safeguards surrounding stablecoins.

<sup>2</sup>This paper does not consider all potential impacts of stablecoins on the banking system. For example, several key areas remain unexplored, such as changes to leverage ratios; liquidity coverage and the run rate of different forms of bank deposits; net stable funding ratios; the distribution of deposits and reserves across banks; the challenges of know-your-customer and anti-money laundering policies; and the transmission of monetary policy.

<sup>3</sup>This necessarily assumes that stablecoin deposits are treated similarly as transactional deposits for liquidity management, depository insurance, and regulatory purposes.

## I. The basics of stablecoins

Stablecoins are digital currencies recorded on distributed ledger technologies (DLTs), usually blockchains, that are pegged to a reference value.<sup>4</sup> The majority of outstanding stablecoins are pegged to the U.S. dollar, but stablecoins can also be pegged to other fiat currencies, baskets of currencies, other cryptocurrencies, or commodities such as gold. Stablecoins serve as a store of value and a medium of exchange on DLTs, which enable stablecoins to be exchanged or integrated with other digital assets.

Stablecoins differ from traditional digital records of money, such as bank deposit accounts, in two primary ways. First, stablecoins are cryptographically secured. This allows users to settle transactions near-instantaneously without double-spending or an intermediary that facilitates settlements. On public blockchains, this also allows for 24-hours-a-day/7-days-a-week/365-days-a-year transactions.<sup>5</sup> Second, stablecoins are typically built on DLT standards that are programmable and allow for the composability of services.<sup>6</sup> In this context, “composability” means stablecoins can function as self-contained building blocks that interoperate with smart contracts (self-executing programmable contracts) to create payment and other financial services.<sup>7</sup> These two key features underpin the current use cases of stablecoins and support innovation in both the financial and non-financial sectors.

The use of stablecoins recorded on public blockchains such as Ethereum, Binance Smart Chain, or Polygon has surged since 2020. As of the end of September 2021, the circulating supply of the largest USD-pegged public stablecoins was almost \$130 billion. In Figure 1, we show that the growth in the circulating supply of public stablecoins was especially strong in early 2021, averaging around 30% month-on-month for the first five months of the year.

### Current types of stablecoins

The stablecoin is a nascent, broadly defined technology that can potentially take many forms. This technology is currently implemented in specific forms that we describe below and summarize in Table 1. However, note that stablecoin technologies are in their infancy with a high potential for innovation. The current implementations of stablecoins discussed below, as well as their current status in the regulatory landscape, do not reflect all potential deployments of stablecoin technologies.

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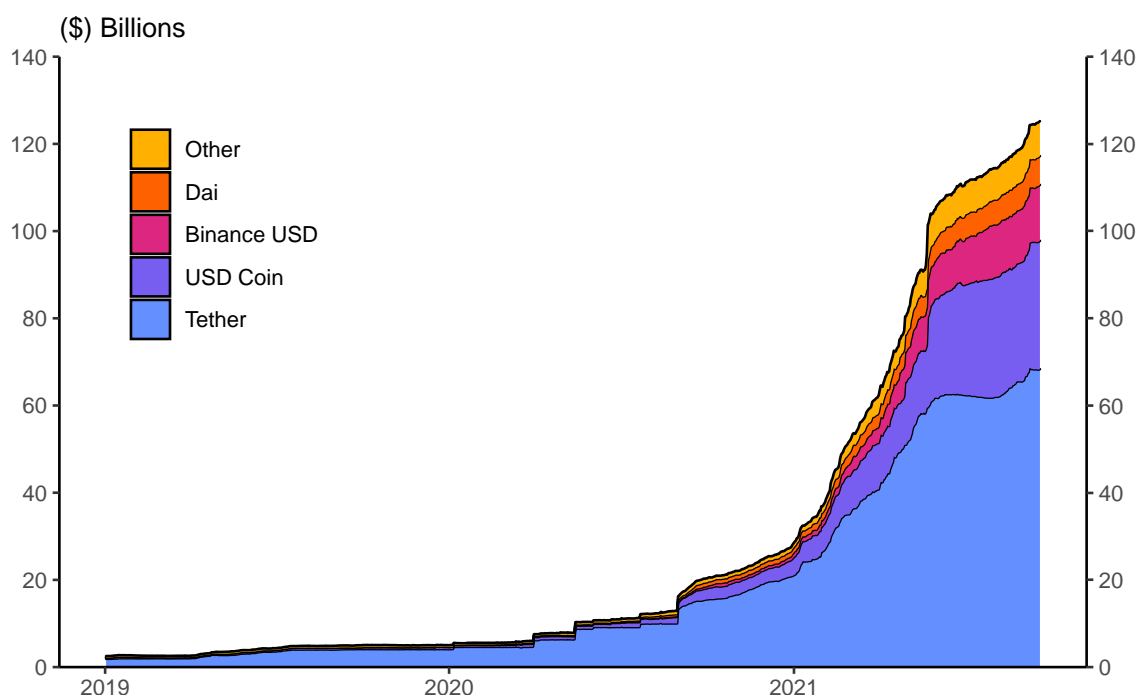
<sup>4</sup>A distributed ledger technology (DLT) is a decentralized database distributed across multiple nodes (devices). DLTs are cryptographically secured and use a consensus mechanism to synchronize the database across their nodes instead of relying on a centralized administrator. A blockchain is a form of DLT where lists of records, or blocks, are chained in sequence.

<sup>5</sup>For discussions on DLTs in payments, clearing, and settlements, see Mills et al. (2016).

<sup>6</sup>Composability is a systems design principle emphasizing interoperability of individual components in forming a more complex system.

<sup>7</sup>See Lee et al. (2021) for a discussion of “What is programmable money?” and Szabo (1994) for a discussion of smart contracts.

Figure 1: Circulating supply of USD-pegged public stablecoins



Circulating supply of the ten largest USD-pegged public stablecoins by market capitalization. Data extends from January 2019 through September 2021. Other category consists of Fei, TerraUSD, TrueUSD, Paxos Dollar, Neutrino USD, and HUSD. The legend corresponds to the position of each stablecoin in the figure. Source: Author calculations based on public blockchains.

### *Public reserve-backed stablecoins*

Most existing stablecoins circulate on public blockchains, such as Ethereum, Binance Smart Chain, or Polygon. Of these public stablecoins, most are backed by cash-equivalent reserves such as bank deposits, Treasury bills, and commercial paper. These reserve-backed stablecoins are also referred to as custodial stablecoins, as they are issued by intermediaries who serve as custodians of cash-equivalent assets and offer 1-for-1 redemption of their stablecoin liabilities for U.S. dollars or other fiat currencies.

The full backing and soundness of some public reserve-backed stablecoins have been called into question. In particular, Tether, the largest stablecoin by circulating supply, agreed to pay \$41 million to settle a dispute with the U.S. Commodity Futures Trading Commission, which alleged that Tether misrepresented the sufficiency of its dollar reserves.<sup>8</sup> Other widely used reserve-backed USD-pegged public stablecoins with varying levels of financial audits include USD Coin, Binance USD, TrueUSD, and Paxos Dollar.

<sup>8</sup>See Prentice (2021). Tether has also been investigated by the New York Attorney General's office, and the U.S. Department of Justice is reportedly investigating whether Tether committed bank fraud (Schoenberg, Robinson, & Faux, 2021).

Table 1: Current types of stablecoins

Type	Description	Examples
Public reserve-backed	Backed by cash-equivalent reserves (deposits, T-bills, commercial paper), issued by centralized firms.	Tether, USD Coin (USDC), Binance USD (BUSD), Paxos Dollar (USDP).
Public algorithmic	Backed by overcollateralized cryptocurrency and/or smart contracts that automatically defend the peg by buying or selling the stablecoin.	Dai, TerraUSD, Fei, IRON (failed), Basis (failed).
Institutional or private	Issued by financial and non-financial institutions for internal account transactions, liquidity management, and transactions between user accounts within the same private network.	JPM Coin*

\* Tokenized deposits issued on permissioned blockchain.

### *Public algorithmic stablecoins*

The remaining fraction of existing public stablecoins use other mechanisms to stabilize their price instead of relying on the soundness of underlying reserves. These stablecoins are often called algorithmic stablecoins. While reserve-backed stablecoins are issued as a liability on the balance sheet of a legally incorporated firm, algorithmic stablecoins are maintained by systems of smart contracts that operate exclusively on a public blockchain. The ability to control these smart contracts is often conferred by the possession of a governance token, a specialized token primarily used for voting on changes to protocol or governance parameters. These governance tokens can also potentially serve as direct or indirect claims on future cash flows from the usage of a stablecoin's protocols.

The public algorithmic stablecoin sector is highly innovative and difficult to categorize. However, one can generally think of the design of these stablecoins as based on two mechanisms: (1) the collateralized mechanism and (2) the algorithmic peg mechanism. Collateralized public stablecoins, such as Dai, are minted when a user deposits a volatile cryptocurrency, such as Ethereum, into Dai's smart contract protocols.<sup>9</sup> The user then receives a loan of Dai (which is pegged to the dollar) against their crypto collateral, at a greater than 100% collateralization ratio. If the value of the Ethereum deposit falls below a certain threshold, the loan is automatically liquidated.

<sup>9</sup>In practice, Dai's collateral also includes public reserve-backed stablecoins such as USD Coin. In the future, the protocol may further diversify its collateral to perform liquidity transformation. Recently, a digital currency-focused subsidiary of Société Générale submitted an application to receive \$20 million in Dai in exchange for a tokenized AAA-rated euro-denominated bond.

In contrast, the algorithmic peg mechanism uses automated smart contracts to defend the peg by buying and selling the stablecoin against an associated governance token.<sup>10</sup> However, these pegs may experience instability or design flaws that lead to de-pegging, as exemplified by the temporary collapse of Fei, a public algorithmic peg stablecoin that briefly de-pegged after its launch in April 2021.

Additionally, some algorithmic stablecoins use a blend of the collateralized and algorithmic peg mechanisms. For example, the failed IRON public algorithmic stablecoin drew elements from both mechanisms, as its peg was partially backed by USD Coin, a public reserve-backed stablecoin, and TITAN, the governance token for the IRON Finance protocol.

### *Institutional or private stablecoins*

In addition to reserve-backed stablecoins that circulate on public blockchains, traditional financial institutions have also developed reserve-backed stablecoins, also known as “tokenized deposits”.<sup>11</sup> These institutional stablecoins are implemented on permissioned (private) DLTs, and they are used by financial institutions and their clients for efficient wholesale transactions. The most well-known institutional stablecoin is JPM Coin.<sup>12</sup> JPMorgan and its clients can use JPM Coin for transactions such as intraday repo settlements and to manage internal liquidity.<sup>13</sup>

These private, reserved-backed stablecoins are functionally and economically comparable to products offered by some money transmitters. For example, Paypal and Venmo (a Paypal subsidiary) allow users to make near-instant transfers and payments within their network, and balances held at these firms are backed similarly to a reserve-backed stablecoin. The key difference is the use of centralized databases rather than a permissioned DLT.

### *Other potential types of stablecoins*

As noted previously, the stablecoin is an incipient technology, and it is possible to imagine many ways stablecoins could be implemented throughout the global financial system. For example, payments companies could use an internal, permissioned DLT to settle payments efficiently, which would be conceptually equivalent to a stablecoin. One implementation

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<sup>10</sup>This is roughly analogous to how a central bank might defend a currency peg by buying and selling its currency against foreign currency reserves. The key difference is that instead of another cryptocurrency as its “foreign currency reserves”, the algorithmic peg mechanism uses the governance token.

<sup>11</sup>While these stablecoins are often described as “tokenized deposits”, they share many similarities. The main difference appears to be the private and closed nature of its network (JPMorgan, 2020).

<sup>12</sup>In a recent earnings call, JPMorgan’s CFO Jennifer Piepszak stated that JPM Coin is not a stablecoin, but rather a form of “tokenizing deposits to make payments easier for clients” (4Q20 Financial Results: Earnings Call Transcript, 2021).

<sup>13</sup>JPMorgan (2019) provides example usage of JPM Coin. See Correa, Du, and Liao (2020) and Copeland, Duffie, and Yang (2021) for in-depth discussions of internal liquidity constraints and intra-day liquidity needs in the banking sector.

of this is Visa’s B2B Connect system, a DLT-based payment system for wholesale inter-bank transactions. We may also see exchanges and clearinghouses rely on stablecoins or stablecoin-like products for transacting in tokenized financial markets.

In the following section, we discuss the current use cases that are driving the growth of existing stablecoins, as well as potential innovations that could drive further growth and more diverse implementations in the future.

## II. Use cases and growth potential of stablecoins

Robust use cases are driving the current growth in various forms of stablecoins. We summarize these use cases in Table 2. The most important current use case of stablecoins is their role in transacting in cryptocurrency on public blockchains. Investors often prefer to use public stablecoins instead of fiat balances to trade cryptocurrency, because this allows for near-instantaneous 24/7/365 trading without relying on non-DLT payment systems or custodial holdings of fiat currency balances.<sup>14</sup>

Table 2: Current stablecoin use cases

Use case	Details
Digital markets	Stablecoins are used to trade digital assets and serve as an onramp from fiat currency to digital assets recorded on blockchains.
Payments	Stablecoins are used to facilitate fast peer-to-peer and cross-border payments. They also hold the potential for new payment innovations, such as programmable money (see below).
Internal transfers and liquidity management	Institutional stablecoins facilitate transfers of funds within a firm and allow efficient movement of internal cash across subsidiaries to manage liquidity risk and regulatory requirements.
DeFi	The programmability and composability of stablecoins currently supports decentralized, blockchain-based cryptocurrency markets and services, known as decentralized finance or DeFi. Protocols allow for market making, collateralized lending, derivatives, asset management, and other services.

Besides their use in crypto trading, both public and institutional stablecoins are currently used for their near-instant, 24/7, non-intermediated payments with potentially low fees.<sup>15</sup> This is especially relevant for cross-border transfers, which ordinarily can take multiple

<sup>14</sup>Many exchanges do not allow users to convert their crypto holdings into a fiat currency balance, so the use of stablecoins on these exchanges is particularly important.

<sup>15</sup>In this context, a non-intermediated transaction does not rely on a centralized intermediary to validate the transaction and prevent double-spending.



days and demand high fees. Firms are also using institutional stablecoins to near-instantly move cash across their subsidiaries to manage internal liquidity, and to facilitate wholesale transactions in existing financial markets, such as intraday repo transactions. And finally, because public stablecoins are programmable and composable, they are used heavily in decentralized, public blockchain-based markets and services, known as decentralized finance or DeFi.<sup>16</sup> Systems of DeFi protocols allow users to use stablecoins to directly and transparently participate in a variety of cryptocurrency-related markets and services, such as market-making, collateralized lending, derivatives, and asset management, without traditional intermediaries. As of September 2021, about \$60 billion in digital assets were staked (locked) in DeFi protocols.<sup>17</sup>

## **Future growth potential**

The defining features of stablecoins, their cryptographic security and programmability, support the robust use cases that are currently driving the usage of existing public and institutional stablecoins. However, these features have the potential to drive innovation beyond current use cases, which are mostly confined to cryptocurrency markets, certain peer-to-peer payments, and institutional liquidity management by very large banks. Looking forward, stablecoin technologies may see diverse implementations and drive innovation in several growth areas: more inclusive payment and financial systems, tokenized financial markets, and the facilitation of microtransactions for technological advancements such as Web 3.<sup>18</sup>

### *More inclusive payment and financial systems*

Stablecoins have the potential to spur growth and innovation in payment systems, allowing for faster, cheaper payments. Because stablecoins can be used to transfer funds near-instantaneously peer-to-peer between digital wallets for potentially low fees, stablecoins may lower payment barriers and exert pressure on existing payment systems to provide better services.<sup>19</sup> This is especially important for cross-border transfers, which can take several days to clear and carry high fees. These fees and delays are a burden on low and middle-income countries, which receive financial support from remittances.<sup>20</sup>

Stablecoins may also support a more inclusive financial system through the growth of DeFi, which likely requires stablecoins as a necessary building block. It should be noted that DeFi faces serious challenges, including a complex user experience, a lack of consumer

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<sup>16</sup>For an overview of developments in DeFi, see *DeFi Beyond the Hype* (2021).

<sup>17</sup>Source: The Block.

<sup>18</sup>Additionally, Wong and Maniff (2020) outline further use cases of a digital currency issued by a central bank.

<sup>19</sup>As Governor Christopher Waller recently noted, "One can easily imagine that competition from stablecoins could pressure banks to reduce their markup for payment services" (Waller, 2021).

<sup>20</sup>The World Bank estimated that in 2020, low- and middle-income countries received about \$540 billion in remittances, with transaction fees averaging 6.5% – a loss of about \$35 billion in financial support (Ratha, Kim, Plaza, & Seshan, 2021).

protection, frequent hacking, protocol dysfunctions, and market manipulations. Additionally, virtually all DeFi protocols only support the trading or lending of cryptocurrencies or non-fungible tokens (NFTs). Should DeFi protocols mature beyond the current state and become integrated with the broader financial market to support real-world economic activities, DeFi could encourage a more inclusive financial system that allows investors to directly participate in markets without intermediation. This growth in DeFi would likely drive growth in the usage of stablecoins.

### *Tokenized financial markets*

Additionally, stablecoins may play a key role in tokenizing financial markets. This would entail converting securities into digital tokens on DLTs and trading and servicing them with stablecoins. For delivery-versus-payment (DvP) transactions, such as security purchases, a tokenized market would allow for real-time settlement at very low costs. This could increase liquidity, transaction speeds, and transparency while reducing counterparty risk, trading costs, and other barriers to market participation. This might especially benefit certain asset classes, such as real estate, by allowing for fractional ownership of tokenized assets and more transparent price discovery. For payment-versus-payment (PvP) transactions, such as a cross-currency swap, tokenization would also allow for near-instantaneous execution instead of the market's current conventional T+2 framework, in which a swap's payments are settled two business days after the swap is struck. Moreover, for both kinds of transactions, tokenized financial markets would benefit from the programmability of DLTs, which could automate security servicing and regulatory requirements such as required holding periods. If financial markets were to become partially or completely tokenized, this would likely drive further growth in stablecoin usage.

### *Next-generation innovations*

Finally, stablecoins hold the potential to support next-generation innovations. One example of such an innovation is Web 3, a possible move away from centralized web platforms and data centers towards decentralized networks.<sup>21</sup> Under this paradigm, Internet services and social media platforms would shift their revenue from advertisements to microtransactions, facilitated by the advent of efficient, integrated online payment systems. One could imagine, for example, a search engine or video streaming platform supported by near-instant micropayments of stablecoin instead of advertising revenue and the sale of user data. If this shift in web services were to take hold, it would likely drive further growth in stablecoins.

In conclusion, the current usage of stablecoins is primarily driven by cryptocurrency trading, limited peer-to-peer payments, and DeFi. Looking forward, stablecoins may see further growth through their facilitation of more inclusive payments and financial systems,

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<sup>21</sup>For a general discussion of Web 3 and the next generation of payments, see Dixon (2018) and Dixon and Haun (2020).

the tokenization of financial markets, and possible next-generation innovations such as Web 3.

### III. Peg stability

The stability of a stablecoin's peg to its reference value is a central issue. It is not the focus of our paper, but we briefly discuss this important issue here.<sup>22</sup> In this section, we will first outline the sources of peg instability for current public reserve-backed stablecoins and discuss how those sources may be addressed. We will then review how stablecoins could serve as a potential safe asset in digital markets, and provide evidence that current public reserve-backed stablecoins may already serve that role in cryptocurrency markets.

Presently, peg instability for public reserve-backed stablecoins comes in two forms: investor redemption risk from the issuer and secondary market price dislocations. The former relates to the safety and soundness of a stablecoin's reserves. If stablecoin holders lose confidence in the soundness of a stablecoin's backing, a run dynamic could ensue. A run on a stablecoin poses a risk of spillovers to other asset classes, as stablecoin reserves are sold off or unloaded to meet the redemption demand.<sup>23</sup> Additionally, a run on a stablecoin could disrupt the markets and services that rely on the stablecoin via interoperable smart contracts, causing further distress. We think this type of instability is addressable with proper institutional and/or regulatory guardrails such as transparent financial audits and adequate requirements on the liquidity and quality of stablecoin reserves. The concerns surrounding redemption risk and the extent to which they can be addressed have been noted recently in Quarles (2021).

The second form of peg instability for public reserve-backed stablecoins arises from supply and demand imbalances in the secondary market. As these stablecoins are traded on both centralized and decentralized exchanges, they are vulnerable to demand shocks that may temporarily dislocate their peg until the stablecoin issuer adjusts the supply. In particular, because public stablecoins serve as a store of value on public blockchain-based markets, these stablecoins experience high demand during crypto market distress as investors rush to liquidate their speculative positions into stablecoins. During these episodes, the price of major public reserve-backed stablecoins tends to temporarily appreciate until the issuer adjusts the supply. To provide an example, Figure 2 displays the crypto market crashes on March 12, 2020 and May 19, 2021. The first episode occurred during a period of general market turmoil surrounding concerns with the spread of Covid-19. The second episode occurred in a crypto market downturn associated with heavy deleveraging. In both periods, as the price of the speculative cryptocurrencies Bitcoin and Ethereum crashed 30 to 50 percent, the prices of major public reserve-backed stablecoins largely spiked upwards.<sup>24</sup>

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<sup>22</sup>For discussion of the stability of stablecoins, see Lyons and Viswanath-Natraj (2020). Additionally, Gorton and Zhang (2021) outlines possible regulations that could mitigate concerns around stablecoin stability.

<sup>23</sup>As a concrete example, a "run" on Tether could conceivably force the issuer to sell off its purportedly sizable portfolio of commercial paper, which could cause distress in the short-term funding market.

<sup>24</sup>One exception is that Binance USD temporarily de-pegged on the downside.

For these episodes of extreme crypto market distress, stablecoins served as a digital safe asset, appreciating while more speculative crypto assets were temporarily in freefall, until the stablecoin issuers were able to increase their supply and purchase reserves and/or the stablecoins experienced downward price pressure from arbitrageurs.<sup>25</sup> The behaviors of these public stablecoins are unique and differentiated from prime money market funds, which experienced large outflows that prompted selling of commercial paper holdings during the height of the 2008 Global Finance Crisis and the 2020 Covid-19 market turmoil.<sup>26</sup>

Figure 2: Public stablecoins appreciate during crypto market distress



Note: Hourly prices of stablecoins, Bitcoin and Ethereum. Time is in GMT. Bitcoin and Ethereum prices are in U.S. dollars, indexed to March 11, 2020 and May 18, 2021. Source: CryptoCompare API.

These episodes demonstrate the potential for stablecoins to serve as a digital safe haven during market distress. While discussions about the financial stability risk from public reserve-backed stablecoins have largely focused on redemption risks that are unique to the form of reserves of individual stablecoins, our analysis suggests that counter-cyclical

<sup>25</sup>Griffin and Shams (2020) find an increase in Tether purchases and issuance following large declines in crypto prices through analysis of blockchain data.

<sup>26</sup>Baba, McCauley, and Ramaswamy (2009); Eren, Schrimpf, Sushko, et al. (2020)

demand for stablecoins in the secondary market can ameliorate risks of redemption runs during times of broader market downturns. With appropriate safeguards and regulations, stablecoins have the potential to provide a level of stability that is on par with traditional forms of safe value.

#### **IV. The potential impact of stablecoins on credit intermediation**

If stablecoins were to see broad adoption throughout the financial system, they could have a significant impact on the balance sheets of financial institutions. Regulators, market participants, and academics are particularly focused on the potential for stablecoins to disrupt bank-led credit intermediation.<sup>27</sup> In this section, we analyze several plausible scenarios in which reserve-backed stablecoins see widespread adoption in the financial system. We focus on reserve-backed stablecoins, rather than algorithmic stablecoins, as reserve-backed stablecoins are currently the largest and the most closely tied to the existing banking system. Using these scenarios, we highlight how the impact of stablecoin adoption on credit provision depends critically on two factors: the sources of inflow into stablecoins and the composition of a stablecoin's reserves.<sup>28</sup>

We summarize our results in Table 3. We find that in most scenarios we consider, credit provision would likely not be negatively affected. In fact, the replacement of physical currency (banknotes) by stablecoins could potentially allow for more bank-led credit provision. A notable exception that can lead to sizable credit disintermediation is the scenario in which stablecoins are required to be fully backed by central bank reserves, which we call the narrow bank framework. In this framework, redemption run risk is minimized at the expense of larger credit disintermediation.

##### **Sources of inflows**

If stablecoins were to see widespread adoption, major inflows could come from three sources: physical currency (banknotes), commercial bank deposits, and cash-equivalent securities (or money market funds). These sources of inflows are summarized as rows in Table 3. First, as a form of digital currency, stablecoins stand to replace some portion of banknotes in circulation, especially as the economy becomes more digital. In some of our scenarios, as users substitute away from physical cash into reserve-backed stablecoins, we see an increase in credit provision. This is because banknotes, which are a direct liability of the central bank, are replaced by reserve-backed stablecoins, which can be instruments of credit creation via loans or security purchases, depending on the reserve framework.

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<sup>27</sup>For example, a recent Bank of England discussion paper posited a scenario in which outflows from commercial bank deposits into stablecoins led to higher interest rates (*New forms of digital money*, 2021).

<sup>28</sup>Other studies have also analyzed balance sheet impacts from the introduction of digital currencies either issued by the central bank (*Central bank digital currencies*, 2018) or the private sector (Malloy & Lowe, 2021). Relative to these studies, we analyze a greater set of possible scenarios with more focus on the general equilibrium outcome and emphasis on the impact on credit intermediation.

Table 3: Impact on credit intermediation by stablecoin reserve framework and source of inflow

	<i>Stablecoin reserve framework</i>		
<i>Source of inflow</i>	<b>Narrow bank:</b> Stablecoin deposits placed in segregated accounts with full reserves held at the central bank	<b>Two-tiered intermediation:</b> Stablecoin deposits held as transactional deposits in commercial banks	<b>Security holdings:</b> Cash-equivalent securities held as reserve collaterals for stablecoins
<b>Cash substitution</b>	<i>Neutral.</i> Physical cash is tokenized and backed with full reserves held at the central bank.	<i>Positive.</i> Physical cash is replaced with stablecoins, which are backed by deposit held at commercial banks performing fractional reserve credit intermediation.	<i>Positive.</i> Physical cash are used by stablecoin issuers to purchase securities, lowering equilibrium financing cost overall. Security sellers likely deposit proceeds in banking system.
<b>Deposit substitution</b>	<i>Negative.</i> As regular commercial bank deposits migrate to segregated stablecoin deposit accounts that hold full reserves at the central bank, the deposit-backed funding for credit intermediation is reduced.	<i>Neutral.</i> Deposits from stablecoin issuers replace deposits from households dollar-for-dollar at commercial banks. The effect is neutral if stablecoin deposits are treated the same as retail deposits.	<i>Neutral to possibly negative.</i> Commercial bank deposits are converted to stablecoin issuers' security holdings. Security seller deposits proceeds back into banks. Commercial banks partly substitute the lost deposits with other debt liabilities and may contract overall balance sheet.
<b>Security substitution</b>	<i>Neutral.</i> The conversion of cash-equivalent securities and money market fund holdings into stablecoins effectively tokenizes the securities. This conversion has minimum impact on the overall deposits held at commercial banks and bank-led credit creation.		

Second, stablecoins could see inflows from commercial bank deposits should households and firms prefer to hold stablecoins instead of a traditional balance at a commercial bank. This source of inflow is of great interest to policymakers, as there is a common concern that a significant substitution away from deposits could disrupt credit provision by commercial banks. We show that the impact of deposit substitution on credit provision can be positive, negative, or neutral, depending on the reserve framework. Finally, stablecoins could see inflows from cash-equivalent securities (or equivalently, money market funds). This would likely have no impact on credit provision, as it would entail recycling funds back into the banking system, which we discuss in a later section.

### Composition of reserves

The impact of widespread reserve-backed stablecoin adoption on credit provision also depends on the composition of stablecoin reserves. We present three plausible stablecoin reserve frameworks: narrow bank, two-tiered intermediation, and security holdings. These frameworks are summarized as columns in Table 3.

Under the narrow bank framework, stablecoins would be required to be backed by commercial bank deposits that are fully backed by central bank reserves. Equivalently, it is possible commercial banks could issue stablecoins (or tokenized deposits) that are fully

backed by central bank reserves. The narrow bank approach is roughly equivalent to a form of retail central bank digital currency where the digital currency is a liability of the central bank but accessed by households and firms through an intermediary such as a commercial bank or fintech company. This framework has been adopted by the People's Bank of China in its state-backed digital currency known as Digital Currency and Electronic Payments, the digital yuan, or e-CNY. The requirement for stablecoins to maintain reserves at the central bank has also been mentioned as a possibility in the proposed STABLE Act in the United States.<sup>29</sup>

While a narrow bank framework would guarantee the stability of a stablecoin's peg as it is effectively a pass-through central bank digital currency (CBDC), this reserve framework poses the largest risk of credit disintermediation. Periods of financial stress or panic could lead to large migrations of regular commercial bank deposits into narrow bank stablecoins, which could disrupt credit provision. Though this credit disruption effect could be mitigated by limits on stablecoin holdings and differential reserve interest rates, the overall structure of the narrow bank approach to stablecoin reserves is potentially destabilizing for the banking system. Additionally, the narrow bank approach could lead to an expansion of the central bank's balance sheet in order to accommodate the demand for reserve balances from stablecoin issuers.

These concerns about narrow bank stablecoins mirror the concerns about narrow banking more generally, which have been noted by the Federal Reserve. In a recently proposed regulation that would impact narrow banks (officially, pass-through investment entities or PTIEs), the Federal Reserve stated that it was "concerned that [narrow banks] could disrupt financial intermediation in ways that are hard to anticipate, and could also have a negative effect on financial stability" (*Regulation D: Reserve Requirements of Depository Institutions*, 2019). Additionally, the Federal Reserve outlined serious concerns about the demand for reserve balances, stating, "The demand for reserve balances by [narrow banks] could become quite large. In order to maintain the desired stance of monetary policy, the Federal Reserve would likely need to accommodate this demand by expanding its balance sheet and the supply of reserves".

In contrast to the narrow bank framework, under the two-tiered intermediation framework, stablecoins would be backed by commercial bank deposits that are used for fractional reserve banking. Equivalently, it is possible that commercial banks issue stablecoins or provide tokenized deposits that are used for fractional reserve banking. To be clear, this does not mean that the stablecoins are not fully backed. Rather, the stablecoin issuers rely on commercial bank deposits as assets, and the commercial banks practice fractional reserve banking with the stablecoins and/or stablecoin deposits, meaning the stablecoins are ultimately backed by a mix of loans, assets, and central bank reserves. It would ef-

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<sup>29</sup>STABLE Act of 2020 (H. R. 8827), for instance, sets forth a requirement for central bank reserve backing of stablecoins, "Any issuer of stablecoins shall deposit reserves with the applicable Federal reserve bank in a segregated account in an amount equal to the nominal redemption value of all outstanding stablecoins issued by the issuer, and such reserves shall serve as collateral for such stablecoins."

fectively relabel some portion of regular deposits as stablecoin deposits. Importantly, for bank intermediation to remain the same, the treatment of stablecoin deposits has to be the same as non-stablecoin deposits in terms of the required reserve ratio, liquidity coverage and other regulatory and self-imposed risk limits.<sup>30</sup>

Finally, stablecoin issuers could hold cash-equivalent securities such as Treasury bills and high-quality commercial paper instead of depositing their funds at commercial banks. These securities could be purchased directly or indirectly through money market funds. This is the main framework adopted by current issuers of public reserve-backed stablecoins, such as Tether, which Federal Reserve Chair Jerome Powell recently noted are “like money market funds” (*Oversight of the Treasury Department’s and Federal Reserve’s Pandemic Response*, 2021).

### Scenario construction

In our scenarios, we consider the impact if one or several fiat-reserve backed stablecoins were to gain broad adoption within a stylized version of the banking system. The baseline balance sheet of this banking system is displayed in Table 4. Specifically, we consider a scenario in which households and firms substitute \$10 away from banknotes, commercial bank deposits, or securities, and we then conduct an accounting exercise to determine how the stablecoin’s adoption impacts the balance sheets of the central bank, commercial banks, and households and firms. We analyze how this impact differs depending on the stablecoin’s reserve framework and its source of inflows.

Table 4: Baseline balance sheet

Central bank				Commercial banks				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
Securities	18	Reserves	8	Reserves	8	Deposits	80	Deposits	80	Debt & equity	200
		Physical cash	10	Loans & securities	92	Debt & equity	20	Physical cash	20		
								Securities & other	100		

It is important to note that in constructing these scenarios, we are making several key assumptions. The first is that we are agnostic on the specific form of the stablecoin that is adopted. Our scenarios are not intended to analyze, for example, the specific impact of the widespread adoption of existing stablecoins such as Tether. We do not distinguish whether the adopted stablecoin is an institutional tokenized deposit, or a stablecoin circulating on a public blockchain, or some other form. Second, we are only presenting illustrative edge

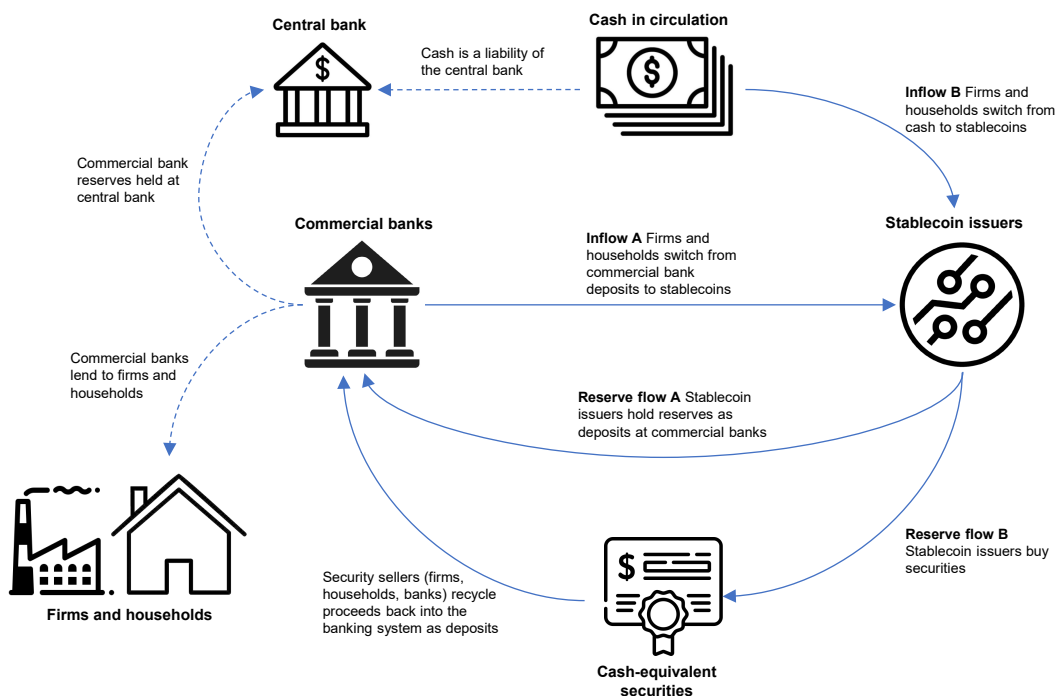
<sup>30</sup>It is conceivable that deposits associated with stablecoin issuance are categorized as either transactional or brokered deposits. The former type has a lower assumed “run rate” in assessments of liquidity coverage. To achieve full equivalence to retail deposits, stablecoins would also require FDIC insurance.



cases that are not exhaustive. In reality, stablecoins can see inflows from multiple sources and hold a variety of assets as reserves. Third, these scenarios do not capture secondary knock-on effects or feedback loops, and they do not address heterogeneous within-sector impacts. Finally, we assume that traditional deposits at commercial banks have a 10% required reserve ratio.

To illustrate the complex flows between the various parts of the banking system that underpin our edge case scenarios, we visualize in Figure 3 a subset of the stablecoin inflows and reserve allocations we have discussed. Specifically, we use a diagram to show the flows of commercial bank deposits (Inflow A) and banknotes (Inflow B) into stablecoins, as well as the allocation of those funds into reserves in the form of commercial bank deposits (Reserve flow A) and securities (Reserve flow B).<sup>31</sup>

Figure 3: Illustration of stablecoin inflows and reserves



In Figure 3, we see how stablecoin inflows and reserve flows are interconnected. In the diagram, firms and households substitute away from deposits (Inflow A) and banknotes (Inflow B) into stablecoins. The stablecoin issuer deposits some of these funds back into the commercial banking system to hold reserves as commercial bank deposits (Reserve flow A), and also uses the funds to purchase securities for reserves (Reserve flow B). These security purchases also recycle funds back into the banking system, because the sellers of the securities ultimately take the proceeds of the security sales and deposit them back into the banking system. As illustrated in Figure 3, these flows impact the central bank, which

<sup>31</sup>In Figure 3, we separate stablecoin issuers from commercial banks, but it is plausible that commercial banks directly issue stablecoins.

maintains cash and central bank reserves as liabilities, as well as firms and households, which receive loans from commercial banks. While this diagram does not capture the full set of flows between these entities, it is emblematic of how the widespread adoption of stablecoins could reshuffle complex financial relationships within the banking system.

## Scenario analysis

### *Narrow bank framework*

As discussed earlier, the narrow bank framework poses the largest risk to credit provision, depending on the source of inflow. In our narrow bank scenarios, depicted in Table 5, we find that physical cash inflows into narrow bank stablecoins would have a neutral effect on credit provision, while commercial bank deposits would disrupt credit provision.

In Panel A, the cash inflows scenario, we see stablecoins replacing cash on the household and firm balance sheet. This influx of cash results in a pass-through increase in the commercial bank balance sheet and the commercial bank's reserves. The central bank's balance sheet is reshuffled, with reserve liabilities replacing cash liabilities. The net effect is that the commercial bank balance sheet expands, but there is no change in credit provision. This scenario assumes that banks are not balance-sheet size constrained. That is, narrow bank deposits and associated reserve holdings are exempt from leverage ratio calculation. This type of leverage ratio exemption for central bank reserve holdings has been previously applied by regulators in different jurisdictions.<sup>32</sup>

Panel B presents the narrow bank scenario with deposits migrating into stablecoins. As stablecoin deposits are fully reserved on commercial banks' balance sheets, banks must reduce asset holdings to accommodate the decline in non-stablecoin deposit funding. The central bank balance sheet then expands to accommodate the increased demand for reserve balances without an offsetting decline in cash liabilities. In this scenario, we assume the central bank will accommodate the increased demand for reserves by purchasing securities. This assumption of central bank accommodation is informed by previous Federal Reserve proposed rulings on narrow banks as discussed above relating to *Regulation D: Reserve Requirements of Depository Institutions* (2019). However, should the central bank fix the size of its balance sheet, we present two alternative scenarios in Table A1 in the appendix. In the first alternative scenario, the commercial banks significantly contract their balance sheets to compensate for the lack of deposit funding. In the second scenario, the commercial banks compensate for the lost deposit funding by issuing debt securities. The result is an even larger reduction in bank-led credit creation.<sup>33</sup>

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<sup>32</sup>For instance, the Federal Reserve and the European Central Bank both exempted central bank reserves in the calculation of supplementary leverage ratio in 2020 due to the influx of deposits and expansion in bank balance sheets.

<sup>33</sup>As illustrations, these scenarios might not capture the full spectrum of scenarios and secondary effects stemming from stablecoin growth. For instance, an expansion of the central bank balance sheet requires asset purchases that might spur security issuance by households or commercial banks. This could lead to a lower cost of financing and credit expansion. The central bank could also source the security purchases from the asset holdings of commercial banks leaving the banks' loan portfolios and household debt unchanged.

Table 5: Changes from baseline for narrow bank stablecoins

Panel A: Physical cash inflows

Central bank		Commercial banks				Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities		
	Reserves +10	Reserves +10	Stablecoin deposits +10	Stablecoins +10			
	Physical cash -10				Physical cash -10		
Net	0	+10	+10	0			

Panel B: Commercial bank deposit inflows

Central bank		Commercial banks				Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities		
Securities +9	Reserves +9	Reserves +9	Stablecoin deposits +10	Stablecoins +10	Debt (loans)* -9		
		Loans -9	Retail deposits -10	Deposits -10			
				Securities <sup>†</sup> -9			
Net +9	+9	0	0	-9			-9

\* The households and firms sector could possibly experience credit contraction as commercial banks' loan books are reduced.

<sup>†</sup> Households would have to sell assets to meet repayment of loan obligations. These asset sales are illustrated as security sales, matching central bank security purchases. Though in reality, household assets could take other forms (e.g. real estate) that are securitized as mortgages. A decline in the household sector's securities holdings is similar to a reduction in real assets under this example.

We do not visualize the scenario in which narrow bank stablecoins see large inflows from security holdings. In this scenario, the impact on credit provision would likely be neutral. Under the same assumption as above in which the central bank accommodates the increased demand for reserves by purchasing securities (from households), the net impact on credit provision should be minimal. Instead of holding securities directly, a migration to stablecoins would see households owning stablecoins backed by central bank reserves, which are in turn backed by securities. This scenario also makes the assumption that the added narrow bank reserves are exempted from leverage ratios as discussed earlier.

*Two-tiered intermediation framework*

For the two-tiered intermediation framework, presented in Table 6, we find that large inflows into stablecoins would have a neutral to positive impact on credit provision. Panel A shows the case in which cash is exchanged for stablecoins. As commercial banks engage in fractional-reserve banking with stablecoin deposits, their balance sheet expands with expansions in credit and security holdings accounting for most of the expansion. The central bank shrinks its balance sheet on the net, as reserves increase slightly while cash liabilities decrease significantly. Households accumulate more assets, funded by the expansion

in bank loans. The effect on credit provision is positive. Panel B shows the two-tiered intermediation scenario with deposit substitution. The overall balance sheets and asset holdings of commercial banks and the central bank are unchanged. The only shift is in the composition of commercial bank liabilities, as regular deposits are shifted into stablecoin deposits. As noted earlier, this scenario assumes the treatment of stablecoin deposits is the same as non-stablecoin deposits in terms of the required reserve ratio, liquidity coverage, and other regulatory and self-imposed risk limits.

Table 6: Changes from baseline for two-tiered intermediation stablecoins

Panel A: Physical cash inflows

Central bank				Commercial banks				Households/Firms			
Assets		Liabilities		Assets		Liabilities		Assets		Liabilities	
Securities	-9	Reserves	+1	Reserves	+1	Stablecoin deposits	+10	Stablecoins	+10	Debt (loans)	+9
		Physical cash	-10	Loans	+9			Physical cash	-10		
								Securities & other*	+9		
Net	-9		-9		+10		+10		+9		+9

Panel B: Commercial bank deposit inflows

Central bank		Commercial banks				Households/Firms	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
			Stablecoin deposits	+10	Stablecoins	+10	
			Retail deposits	-10	Deposits	-10	
Net				0		0	

\* Households/firms use the added bank loan funding to purchase more assets, possibly in the form of securities from the central bank. Alternatively, households/firms can increase real asset holdings (e.g. houses and factories).

*Security holdings framework*

The impact of widespread adoption of security-backed stablecoins, presented in Table 7, is the most difficult to anticipate. Many scenarios are possible. In Panel A, we present a scenario in which security-backed stablecoins see inflows from commercial bank deposits. We assume the stablecoin issuer is sourcing securities from the commercial banks, not the households and firms sector. In this scenario, as households exchange deposits for stablecoins, commercial banks make up the lost deposit funding by conducting their own security issuance.<sup>34</sup> Additionally, commercial banks can reduce their security portfolio to accommodate the loss in deposit funding. The size of banks' loan portfolios can possibly

<sup>34</sup>Issuing of debt securities by commercial banks might affect the banks' regulatory metrics such as Net Stable Funding Ratio. We assume here that these effects are second order.

remain unchanged if banks adjust the asset side of the balance sheet primarily by changing security holdings. In this scenario, the central bank balance sheet also shrinks slightly due to loss in banking reserves.

Panel B of Table 7 presents a scenario in which households exchange holdings of cash-equivalent securities for stablecoins. This would lead to effective tokenization of cash-like securities without a direct impact on credit provision by the banking system. We also consider an alternate scenario (not shown) in which security-backed stablecoins experience deposit inflows from households and firms sector that simultaneously sells security holdings to the commercial banks. The security seller is the households and firms sector instead of commercial banks as depicted in Table 7 Panel A. The net impact on credit provision is neutral, as the commercial bank deposit balances held by the households and firms that purchase stablecoins are ultimately recycled back into the banking system by transferring them to other households and firms that sell securities to the stablecoin issuer. This reshuffling of security holdings is illustrated in Figure 3 by Inflow A and Reserve flow B. The end result is a balance sheet shift that is the same as Table 7 Panel B.

Finally, we do not depict the scenario where security-backed stablecoins see inflows from physical cash. However, this could have a neutral or positive impact on credit creation. If the stablecoin issuers use the banknotes to purchase existing securities, and those banknotes are ultimately not deposited into the banking system, this would have no impact on credit provision as it would constitute a direct exchange of banknotes for securities. However, if the banknotes from purchases of existing securities are deposited into the banking system, or if the banknotes are used to fund the issuance of new securities, this could increase credit provision by increasing loans and security purchases by commercial banks or by lowering the equilibrium cost of issuing securities. Altogether, the likely impact would be a modest increase in credit provision.

## V. Conclusion

Stablecoins have grown tremendously over the past year as digital assets gain broader adoption and the use cases of programmable digital currencies are clarified. This rapid ascension has raised concerns that there might be negative impacts on banking activities and the traditional financial system. In this note, we discuss the current use cases and potential growth of stablecoins, analyze historical episodes of peg instability, and illustrate different scenarios of stablecoins' impact on the banking system. As noted in the introduction, this paper does not consider all the potential impacts of stablecoins on financial stability, monetary policy, consumer protection, and other important unexplored issues. We focus on the balance sheet effects and credit intermediation under a set of plausible assumptions.

We examine reserve-backed stablecoins and find the impact of stablecoins' adoption on traditional banking and credit provision can vary depending on the source of inflow and the composition of stablecoin reserves. Among the various scenarios, a two-tiered banking

system can support both stablecoin issuance and maintain traditional forms of credit creation. In contrast, a narrow-bank stablecoin framework can bring the most stability but at the potential cost of credit disintermediation. Finally, dollar-pegged stablecoins can serve as a safe haven relative to other crypto-assets during times of market distress if they are perceived to be sufficiently collateralized.

Table 7: Changes from baseline for security-backed stablecoins

Panel A: Deposit substitution

Central bank		Commercial banks				Stablecoin issuers		Households/Firms							
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities						
Securities	-1	Reserves	-1	Reserves	-1	Security issuance	+5	Securities	+10	Stablecoins	+10	Stablecoins	+10		
				Securities	-4	Retail deposits	-10					Deposits	-10		
Net	-1		-1		-5		-5		+10		+10		0		

Panel B: Household security substitution

Central bank		Commercial banks				Stablecoin issuers		Households/Firms							
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities						
						Securities	+10	Stablecoins	+10	Stablecoins	+10				
										Securities	-10				
Net							+10		+10		0				

## References

- 4Q20 financial results: Earnings call transcript.* (2021). JPMorgan Chase & Co.
- Baba, N., McCauley, R. N., & Ramaswamy, S. (2009). US dollar money market funds and non-US banks. *BIS Quarterly Review, March.*
- Central bank digital currencies.* (2018). Bank for International Settlements.
- Copeland, A. M., Duffie, D., & Yang, Y. D. (2021). Reserves were not so ample after all. *FRB of New York Staff Report(974).*
- Correa, R., Du, W., & Liao, G. Y. (2020). *US banks and global liquidity* (Tech. Rep.). National Bureau of Economic Research.
- Defi beyond the hype.* (2021). Wharton Blockchain and Digital Asset Project and the World Economic Forum.
- Dixon, C. (2018). *Introducing a16z crypto.* Andreessen Horowitz.
- Dixon, C., & Haun, K. (2020). *Crypto fund II.* Andreessen Horowitz.
- Eren, E., Schrimpf, A., Sushko, V., et al. (2020). *US dollar funding markets during the covid-19 crisis-the money market fund turmoil.* Bank for International Settlements.
- Gorton, G. B., & Zhang, J. (2021). Taming wildcat stablecoins. *SSRN.*
- Griffin, J. M., & Shams, A. (2020). Is bitcoin really untethered? *The Journal of Finance.*
- JPMorgan. (2019). *Corporate investment bank.* Retrieved from <https://www.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/invest>
- JPMorgan. (2020). *Blockchain, digital currency and cryptocurrency: Moving into the mainstream?*
- Lee, A., et al. (2021). What is programmable money? *FEDS Notes.*
- Lyons, R. K., & Viswanath-Natraj, G. (2020). What keeps stablecoins stable? *NBER Working Papers.*
- Malloy, M., & Lowe, D. (2021). Global stablecoins: Monetary policy implementation considerations from the US perspective. *FEDS Working Papers.*
- Mills, D. C., Wang, K., Malone, B., Ravi, A., Marquardt, J., Badev, A. I., ... Kargenian, V. (2016). Distributed ledger technology in payments, clearing, and settlement. *FEDS Working Papers.*
- New forms of digital money.* (2021). Bank of England.
- Oversight of the Treasury Department's and Federal Reserve's Pandemic Response.* (2021). House Financial Services Committee, 116th Congress.
- Prentice, C. (2021). *Crypto firms Tether, Bitfinex to pay \$42.5 mln to settle U.S. CFTC charges.* Reuters.
- Quarles, R. (2021). *Parachute pants and central bank money.* Speech at the 113th Annual Utah Bankers Association Convention, Sun Valley, Idaho.
- Ratha, D., Kim, E., Plaza, S., & Seshan, G. (2021). *Migration and development brief 34.* KNOMAD-World Bank.
- Regulation D: Reserve Requirements of Depository Institutions.* (2019). Board of Governors of the Federal Reserve System.



- Schoenberg, T., Robinson, M., & Faux, Z. (2021). *Tether executives said to face criminal probe into bank fraud*. Bloomberg.
- Szabo, N. (1994). *Smart contracts*.
- Waller, C. J. (2021). *CBDC: A solution in search of a problem?* Speech at the American Enterprise Institute.
- Wong, P., & Maniff, J. (2020). Comparing means of payment: What role for a central bank digital currency? *FEDS Notes*.

Table A1: Alternate narrow bank scenarios

Panel A: Commercial bank balance sheet shrinks

Central bank		Commercial banks				Households/Firms			
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities				
		Loans	-45	Stablecoin deposits	+5	Stablecoins	+5	Debt (loans)	-45
				Retail deposits	-50	Deposits	-50		
Net			-45		-45		-45		-45

Panel B: Commercial banks issue debt securities

Central bank		Commercial banks				Households/Firms			
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities				
				Stablecoin deposits	+5	Stablecoins	+5		
				Retail deposits	-50	Deposits	-50		
				Debt securities	+45	Securities	+45		
Net					0		0		