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Making Stablecoins Stable

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Prepared by Bo Li, Tommaso Mancini Griffoli, Marcello Miccoli, Brandon Tan, and Longmei Zhang *

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ABSTRACT: Payment stablecoins are privately issued digital money with the potential to enhance payment efficiency, foster innovation, and improve financial inclusion. At the same time, they are vulnerable to runs and associated welfare losses. One way to lower run risk is to require stablecoin issuers to hold safe assets. But doing so may lower issuers' profitability and thus their incentive to provide stablecoins, hampering payment innovation and product variety. This paper offers a theoretical framework to navigate the tradeoff between maintaining stability and incentivizing issuance. Based on the Diamond and Dybvig (1983) model of bank runs, the paper shows that an unregulated private equilibrium is suboptimal. Stablecoin issuers hold risky assets to maximize profits, increasing run risk. A social planner can improve the equilibrium by requiring the backing of stablecoins with a safe asset (such as central bank reserves in a narrow bank setting), and creating conditions for other sources of revenue for issuers (such as central bank reserves remuneration or policies for payment data utilization). The model offers a baseline for the ongoing policy discussion while identifying considerations for further study.

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WORKING PAPERS

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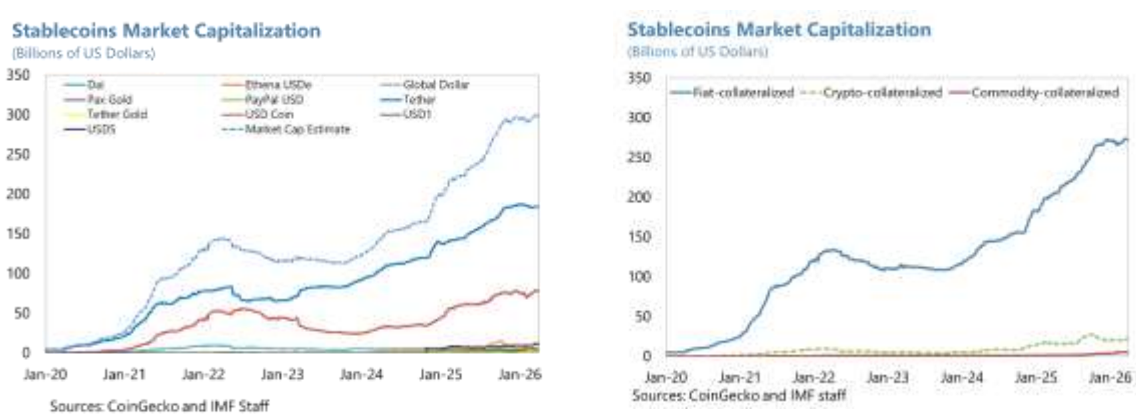
Contents

I. Introduction

Stablecoins have emerged to the forefront of policy discussions. Stablecoins are crypto assets purported to maintain a stable value typically relative to a national currency like the U.S. dollar. The enactment of the U.S. Genius Act in July 2025 marked a turning point for stablecoins, providing a legal foundation for issuance and regulation in the U.S. and positioning stablecoins more prominently in the global discussion. Prior to this, the popularity of stablecoins had fluctuated, reaching a peak following Facebook's 2018 Libra announcement and a trough around the bankruptcy of Terra Luna, a popular stablecoin, in 2022. Parallel regulatory developments contributed to the evolution of the policy landscape. These include the European MiCa Regulation in 2023, the Monetary Authority of Singapore's acknowledgement that regulated stablecoins could serve as a potentially acceptable form of money for financial transactions, and further developments of legal and regulatory frameworks in Japan and the United Kingdom.[1]

The assets backing stablecoins have evolved but vulnerabilities remain. The stablecoin market increased by 50 percent over 2025, reaching 300 billion by year-end.[2] Stablecoins are primarily pegged to fiat currencies, with non-fiat-backed stablecoins accounting for less than 10 percent of market cap (Figure 1). Stablecoins are mostly issued in U.S. dollars (with the two leading coins USDC and USDT (Tether) accounting for more than 80 percent of market cap) and backed with short-term government debt, cash, and deposits in commercial banks. But that is a recent development. Earlier, stablecoins were backed with more volatile assets, and such practice persists today in some cases. In 2024, for instance, Tether, the largest stablecoin by market capitalization, still held 5 percent of its reserves in Bitcoin and undisclosed assets.[3] Terra Luna went one step further, operating with minimal reserves but promising to purchase Terra Luna coins if their price dropped – a proposition that proved untenable under market pressure. But even the more stable USDC, issued by Circle, reached 87 cents to the dollar in March 2023 following the collapse of Silicon Valley Bank in which Circle held significant deposits.

Figure 1: Stablecoins Market Capitalization



[1] See Bank of England (2025) "Proposed regulatory regime for sterling-denominated systemic stablecoins". More broadly, the Financial Services and Markets Act (FSMA), in force since 2023, grants the Bank of England powers to establish a regulatory framework for stablecoins. The Bank's initial thinking on the regime for systemic stablecoins was set out in a discussion paper published in November 2023.

[2] Still, they are far smaller than the total crypto asset market cap which stands at $3.2 trillion in January 2026.

[3] https://tether.to/ru/transparency/?tab=reports .

Stablecoins are mostly being regulated and marketed as payment instruments – a digital form of money. Although current use-cases are mostly contained to purchasing unbacked crypto assets such as Bitcoins, anecdotal evidence suggests that usage is expanding to include payments, especially across borders. The U.S. Genius Act, for instance, refers to “payment coins,” MiCA Regulation refers to “E-money tokens,” and the Bank of England’s proposal refers to stablecoins widely used in payments.

Stablecoins promise to bring significant benefits. These are discussed widely, including in IMF (2025). They include faster, cheaper, and more accessible payments within and across borders. Stablecoin payments can be made around the clock by anyone with access to a global blockchain. Payments can also be programmed to occur in the future or at exactly the same time as an asset or good is received to minimize counterparty risk. Furthermore, stablecoins can be held in wallets offering compatible financial services in a single, convenient location. In China, WeChat and Alipay, for instance have grown over an existing social media network. The payment of other on-chain assets such as tokenized bonds may also be easier with stablecoins. Finally, new applications are still being explored and introduced by third parties. Stablecoins could spur innovation and product diversity in digital payments and financial services. If anything, the perceived benefit of stablecoins seems sustained by their growth and adoption, especially among younger generations.

But stablecoins also come with notable risks. These are also discussed in IMF (2025). Many pertain to operational stability, financial integrity, the protection of user funds, and contagion to other financial institutions, especially banks. Many of these risks are being addressed to different extents by nascent laws and regulations. Risks to macro-financial stability also arise. These include risks of currency substitution, of capital flow volatility and contagion across borders, and of payment system fragmentation if stablecoins are not compatible with one another. Many of these risks must still be addressed by policy.

This paper focuses on the specific risk of runs on stablecoins, which could cause drops in stablecoin values. Runs entail large and coincident redemptions of stablecoins for cash or sales of stablecoins on secondary markets. Runs could occur if users perceive a risk that issuers do not hold sufficient assets to match the value of outstanding stablecoins. Runs can be self-fulfilling if the assets that issuers must sell to meet redemption requests lose value as a result. An initial wave of redemptions can trigger several other such waves. Issuers can face a scenario in which they are unable to meet redemption requests. If correctly priced, that risk should result in a discount on the price of stablecoins. That is, a stablecoin with a dollar face value would trade at a price slightly lower than a dollar.

Run risk typically bars an instrument from being considered money. The characteristics of money are many. BIS (2025) provides a detailed discussion. This paper highlights the litmus test of Holmstrom (2015) suggesting that money is an asset that is accepted “no questions asked” (NQA). When money is exchanged, no party spends time checking the value of money relative to the unit of account, nor fearing losses from holding the money received. In short, the (nominal) price of money must be stable over time and widely known by all parties to a transaction, and the run risk is widely perceived to be zero. The history of money can be read as a long attempt to satisfy the NQA criteria (Box 1).

Three options arise to dampen risks of runs; this paper focuses on one such option within the confines of a formal model, that of making the reserve assets as safe as possible. The first option is to require issuers to hold very safe and liquid assets (such as central bank reserves in a narrow bank setting). The second is to require them to hold additional loss-absorbing equity. And the third is to provide public backstops to ensure issuers can honor redemptions even in crisis times. Backstops could include a form of deposit insurance, access to central bank liquidity standing facilities, and emergency lending. All options are potentially related. If backing assets are not fully safe, in the sense that their price may drop, then additional equity may still be needed. And if equity is not sufficient, backstops may still be necessary. The complex interplay between these options are better considered in a separate paper. The first option, instead, could be satisfied by itself and is the focus of this paper.

This paper proposes a model to identify conditions under which stablecoins could be void of run risk; that is, when they could be accepted NQA. The model builds on Diamond and Dybvig (1983) as well as Goldstein and Pauzner (2005) and Kashyap et al. (2023). The model starts with households that do not consider the aggregate effect of their individual actions. In parallel, a monopolistic issuer holds risky assets to maximize profits. Such investments increase risks of insolvency, which issuers are willing to take given limited liability. As a result, run risk increases. Nevertheless, households are willing to hold stablecoins given their utility in payments. Finally, stablecoin issuers do not internalize how run-risk undermines household welfare.

The model is used to explore which policy instruments could dampen runs. Self-regulation is not enough. Namely, if left to their own account, stablecoin issuers will hold a high share of risky assets and recurring runs will plague the system. The social planner could require the backing of stablecoins with a higher share of safe assets (such as central bank reserves), but would still allow some risks of runs. That is because positive returns on the backing portfolio are necessary to incentivize companies to issue an optimal amount of stablecoins in the first place. In this model, issuance is socially desirable given household preferences for holding different forms of money, including stablecoins. The assumption seems warranted given the broad portfolio of payment instruments seen in society. But if the safe assets are remunerated (such as central bank paying interest on reserves), issuers will no longer hold risky assets and run risk will drop to zero. Similarly, issuers can be induced to hold safe assets if they are allowed to reap other sources of income, such as from selling or leveraging data. One key implication is that two policy instruments are necessary (the provision of a safe asset and the remuneration of that asset – or regulation allowing other sources of income) to achieve the dual policy objectives: the stability of stablecoins (a price objective) and their issuance (a quantity objective).

This paper contributes to the policy debate by laying a systematic basis for discussion. The paper highlights the importance of taking multiple objectives into account, such as minimizing run-risks and incentivizing issuance and innovation. The tradeoffs between such objectives would need to be carefully managed with multiple policy levers. If anything, this paper draws attention to the question of fully or partially backing stablecoins with central bank reserves. In practice, there are additional elements and trade-offs a central bank would need to consider with respect to choosing whether to open its accounts to stablecoins issuers. While this paper highlights the benefits in terms of stability and singleness of money, potential costs include the need for central banks to more closely supervise stablecoin issuers, related reputational risks, and potential challenges of bank disintermediation. Policymakers will need to carefully weigh those with the implications of our model.

A related question is why we need reserve-backed stablecoins issued by non-banks if banks can issue tokenized versions of their deposits (deposit tokens) that possess similar technical capabilities? One potential answer draws from experiences of China. This country’s experience with e-money and other digital payment instruments shows that technology companies with large networks (such as e-commerce or social networks) are well positioned to provide payment services and generate related technological and financial innovations. If these technology companies were allowed to experiment with stablecoins, with large daily transactions, they could potentially support retail digital payments, stimulate innovation, and generate synergies with other digital services such as e-commerce and social networking. Such experiments, of course, have to be conducted under a proper regulatory framework. One possible model would be to allow technology companies to set up narrow banks (subject to proper licensing and 100 per cent reserve requirement), which can issue stablecoins fully backed by central bank reserves. Full banking licenses may be excessively costly for the risks involved as they would require more capital and the provision of deposit insurance, as well as unnecessary if the policy objective is to stimulate payment innovation of non-banks. Experiences from e-money markets in China show that the narrow banking model could enable quick scaling and large payment networks, which could potentially revolutionize the payment market, and at the same time ensure safety, stability and singleness of money.

Some central banks have begun the discussion. The Bank of England, for instance, has proposed that a portion of the assets backing stablecoins be held in central bank reserves (Bailey, 2025 and Bank of England 2025). The Bank of England has set an expectation for systemic stablecoin issuers to have direct access to payment systems, and the U.S. Federal Reserve (Waller, 2025) is also exploring giving stablecoin providers (among other payment service providers) intraday access to central bank reserves for the purpose of making payments. The objective is different from the stability objective explored in this paper, but is related nonetheless. Box 3 provides a simple framework to compare these options and a brief review of the discussion.

This paper complements and expands the current literature on stablecoins. It fills a void in the literature by providing a theoretical framework for the backing of stablecoins taking into account both stability and incentives for issuance. Gorton and Zhang (2021) study episodes of money creation and argue that stablecoins could become a reliable means of payment only if they are (i) issued by insured banks and (ii) fully backed by government bonds or central bank reserves. Catalini and De Gortari (2021), and Kahn and Sing (2021) also favor high-quality and liquid assets to back stablecoins. Caramichael and Liao (2022) considers full backing with central bank reserves, as in a narrow bank. Gorton and others (2022) consider a model closest to that in this paper and argue that stablecoins can successfully maintain a peg even in the face of run risk as leveraged investors are willing to pay a premium to borrow stablecoins. Parma and others (2022) provides a comprehensive view of risks posed by stablecoins and argues for full backing by central bank reserves, at least for stablecoins that offer redemption into cash on demand. Aldasoro and others (2023) emphasizes the parallels between stablecoins and offshore dollar accounts called Eurodollars, and argues that backing assets must be especially safe and liquid to ensure stability. Gross and Senner (2026) analyzes instead different options for increasing safety of stablecoins, including through safer asset backing, loss-absorbing equity, and redemption gates, in a setup where a feedback loop between reserve asset prices and stablecoin redemptions can give rise to fire sales.

This paper is organized as follows. Section II develops a theoretical model based on Diamond and Dybvig (1983) to analyze the policy trade-offs on the backing of stablecoins. Section III provides an overview of the current policy landscape on stablecoins. And section IV concludes.

Box 1: Private Money in Search of NQA – A Historical Overview

This box reviews notable instances of private money issuance throughout history. The search of how to create an NQA asset to be used as money evolved over time, as commodity money was replaced by paper money. With paper money, the NQA status would no longer be based on trust in the intrinsic value of the printed paper, but fundamentally on trust in the issuer and its balance sheet.

Historically, private paper money provision has not always been successful. Banknote issuance has always been associated with a sovereign entity, a monarch, or a state, as the power of the state was seen as providing the ultimate trust in the money. Still there have been examples in history of purely private banknote provisions. Probably the most known case is the Free Banking Era in the US during the 19th century. During this period private banks in the US were allowed to issue their own bank notes. However, while banks had to back their note issuance one-for-one with state bonds that were deposited with the state treasurers, bank notes issued were not traded at-par. Uncertainty over the stability of the bank, especially for banks far away from the transaction place, led to discounts on their value. As views differed on the stability of the issuing bank, the discount applied to bank notes varied, creating further uncertainty about the value of bank notes. Private money was not an NQA asset during the Free Banking epoch.

Today, private account-based money (mostly bank deposits), rooted in the public's trust in the central bank, supervisory authorities, and deposit insurance schemes represent the dominant form of money. Today, private paper money (cash) provision is still seen in a few economic areas: Scotland, Northern Ireland, Hong Kong SAR, and Macao SAR. In these jurisdictions, banks must hold central bank reserves or foreign exchange reserves to fully back cash issuance. Instead, account-based private money, in the form of deposits issued by commercial banks, represents the dominant form of money in most economies. In the US, currency in circulation sums to around $2 trillion, while short term deposits (the other constituents of M1) amount to $16 trillion. In most instances, households do not see a difference between holding banknotes and holding bank deposits. Advances in regulation and supervision of commercial banks, as well as the introduction of deposit insurance, have strengthened public trust and given bank deposits, under most scenarios, the NQA property.

But stablecoins are distinct from bank deposits. Stablecoins are digital cash and token-based money, whereas bank deposits are account-based money. While the distinction between the two forms may appear porous for some economists, it is important from a legal perspective. Their differences manifest along several dimensions. First, stablecoins allow some degree of anonymity depending on the design, while bank deposits do not. Second, stablecoins can be easily transferred through a change of possession without a nexus of contractual arrangements, while bank deposits can only be transferred through a nexus of regulated contracts. This is because, as tokenized money, a stablecoin transfer is likely governed by property law, while a bank transfer is likely governed by contract law. Third, bank deposits are regulated to maintain stable value by fractional reserve requirement and deposit insurance, while similar arrangements may not be suitable for stablecoins as tokenized money.

II. A Model of Stablecoin Issuance

In this section, we present a model to study stablecoin issuance and to formalize trade-offs that arise when stablecoin issuers need to decide the type of asset used to back stablecoin issuance. Households use stablecoins reflecting their convenience in transactions and can tolerate some risk associated with the stablecoins.[4] The stablecoin issuer decides how much to issue and which portfolio to hold as reserves, including risky and risk-free assets. The issuer uses its investment proceeds to improve the quality of services,

[4] The model is focused on the role of stablecoins in transactions since stablecoins are unremunerated assets, hence their demand for store of value will be generally limited. Still some demand will arise also for store of value, see equation (4).

hence creating a trade-off between reducing run-risk and improving transaction efficiency. We also use the framework to illustrate policy tradeoffs such as between safety and innovation using a variety of tools including regulation on reserve assets including central bank reserves and their remuneration.

The analysis is based on a model of optimal stablecoin issuance with a run risk on the stablecoin. The model is a modification of the classic bank run model of Diamond-Dybvig model and adapts Goldstein and Pauzner (2005) and Kashyap et al. (2023). In this model's set up, we have a stablecoin issuer who is funded by households[5] who value stablecoins for storage and transactions. For revenue, the issuer can invest in a portfolio of risky, illiquid assets and safe, liquid assets. The illiquidity of the stablecoin's issuer balance sheet gives rise to a run risk. The issuer can generate additional revenue from the use of household stablecoin transactions data to the extent that the regulator allows it. The issuer can use its profits to improve the quality of transaction services, attracting greater demand for stablecoins.

Timing and Assets

The model consists of three periods, $t = \{1,2,3\}$, features a single consumption good, and includes a continuum of households and a stablecoin issuer.

There is a productive, but illiquid, risky asset. Funds invested at $t = 1$ yield $1 + R$ per unit of investment at $t = 3$ with probability ω (which we call the "good" state of the world) and zero otherwise (the "bad" state). The risky asset delivers no yield at $t = 2$ but it can be liquidated for an uncertain amount $\xi \sim U\left[\underline{\xi}, \overline{\xi}\right]$ with $0 < \underline{\xi} < 1 < \overline{\xi}$, which is realized at $t = 2$. ξ defines the risky asset liquidation value. Define $\Delta\xi = \overline{\xi} - \underline{\xi}$. Households can also invest in cash, which has a zero return, but has a cost of use. This cost wants to represent the costs to access (shoe-leather costs) and store cash.[6]

Additionally, the economy will feature a stablecoin, issued by a stablecoin issuer, which can be held and used for consumption purposes by the household. Stablecoins are a liability of the stablecoin issuer denominated in the local currency, with a promise to be redeemed at face value. Still, they could be subject to runs, that is, the risk (from the point of view of households) that stablecoin is redeemed at less than face value. Provided there are no runs, stablecoins have two advantages for households with respect to physical cash: (i) they give a better transaction experience and (ii) they provide a higher ex-post return, since cash is costly to handle and store. These assumptions are a stylized way to capture the benefits of stablecoins with vis-à-vis physical cash for transactions.[7] Note that the key predictions of the model hold true also if we consider other means of payments than physical cash, for instance bank deposits, as long as they have higher costs and provide an inferior user's experience compared to stablecoins.

Households

Households have endowment e_H at t = 1 and decide how much to hold stablecoins, S, and how much to hold in cash, M (at cost of storing cash $-d$). Each household receives an idiosyncratic preference shock at $t = 2$ to consume early or late as in Diamond and Dybvig (1983). Formally, at $t = 2$, a portion of households, δ, receive

[5] We refer to those that hold stablecoins as households, using standard economic terminology. However, we could interpret these to be as well investor or traders in crypto assets.

[6] Cash can be stolen and cannot be stored in large quantities without significant risks and space. Some estimates pointed that the costs of storing cash are around 0.5 percent. See for instance Witmer and Yang (2016).

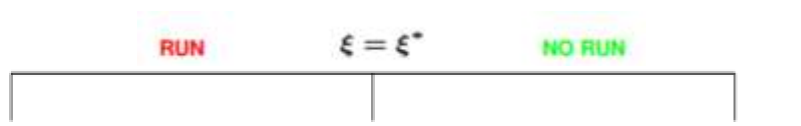
[7] For instance, stablecoin transactions could be cheaper, especially for cross-border transactions, available 24/7, and not subject to sanctions risks.

a preference shock to consume immediately, while the rest, $1-\delta$, want to consume at $t=3$. These shocks are private information, independent and identically distributed, and are not contractible ex ante. Given that the preference shocks are independent and identically distributed, a fraction δ of households will need to consume at $t=2$ and the rest wait to consume at $t=3$, which we will refer to as impatient and patient, respectively. Thus, households are ex ante identical, but ex post heterogeneous.

Stablecoins are demandable, and early withdrawals are serviced sequentially. Depending on the realization of ξ, the stablecoin issuer may not have enough resources to fully pay any level of withdrawals. Aside from extremely high or low realizations of ξ, the stablecoin issuer is at risk for self-fulfilling runs: a patient household will redeem its stablecoins early if it believes that other patient households will do the same. To address the coordination problem and obtain a unique equilibrium, we assume that each household receives a noisy signal about the true realization of ξ at $t=2$.[8] These signals not only provide information about the fundamental ξ, but also about the beliefs of other savers, and so serve to coordinate the patient households' decisions.

Based on the signal the households form posterior beliefs about ξ and we show that there is a unique threshold ξ^*, such that all patient households redeem their stablecoins when they believe the true realization is below that value and they keep their stablecoins otherwise (Figure 3). We will refer to ξ^* as the run threshold and denote the probability of a run by $q=\left(\xi^*-\underline{\xi}\right)/\Delta\xi$.[9]

Figure 2: Run vs No Run Space



If there is no run, i.e., $\xi\in\left[\xi^*,\overline{\xi}\right]$, only impatient households withdraw, and they receive S. Patient households' repayments will depend on the state realization at $t=3$; they receive their promised payment, S, with probability ω and zero otherwise, since the stablecoin defaults. In a run, all depositors attempt to withdraw, and there is probability $\theta(\xi)$, defined later, that any depositor gets S. Households have quasi-linear preferences for consumption, such that they value consumption linearly at $t=2$ and $t=3$. This is the first assumption that greatly simplifies the patient households' decision to join a run, since we only need to compare the expected payoff from stablecoins at $t=2$ versus $t=3$.

We assume that impatient households enjoy transaction benefits from having stablecoins when there is no run. This advantage is described by a concave function V that is increasing in the amount of stablecoin S.[10] The expected utility of an individual household is given by:

[8] The signal is drawn from a uniformly distributed with mean ξ.

[9] The uniqueness of the threshold ξ^* follows from Kashyap et al. (2023) and Goldstein and Pauzner (2005).

[10] Peck and Shell (2010) also have a similar assumption about the utility from the transaction services of deposits.

$$\mathbb{U}_H = U(e_H - S - M) + \overbrace{\int_{\underline{\xi}}^{\xi^*} [\beta\delta + \beta^2(1-\delta)]\,[\theta(\xi)S + M(1-d)]\,\frac{d\xi}{\Delta\xi}}^{\text{run}} + \underbrace{\int_{\xi^*}^{\bar{\xi}} \beta\,\delta[S + M(1-d)]\,\frac{d\xi}{\Delta\xi}}_{\text{no run, impatient}} + \underbrace{\int_{\xi^*}^{\bar{\xi}} \beta^2\,(1-\delta)[\omega S + M(1-d)]\,\frac{d\xi}{\Delta\xi}}_{\text{no run, patient}} + \underbrace{\int_{\xi^*}^{\bar{\xi}} V\,(S)\,\frac{d\xi}{\Delta\xi}}_{\text{transaction services}} \qquad (1)$$

U is the utility function for $t = 0$ consumption with $U' > 0$ and $U'' < 0$; V captures the transaction services of stablecoins with $V(0) = 0$, $V' > 0$ and $V'' < 0$; $\beta \leq 1$ is the time-discount factor.[11] [12]

Households choose their holdings of stablecoins and cash to maximize $\mathbb{U}_H$. An individual household takes the run threshold, ξ^*, and the probability of being repaid in a run, $\theta(\xi)$, as given. These objects depend on the aggregate stablecoin portfolio, and we suppose that the individual household is atomistic, to not account for its impact on them. In contrast, a social planner would internalize the effect of the choices. Nevertheless, individual households have rational expectations and correctly anticipate the equilibrium level of run-risk when making their decisions. Finally, short selling of stablecoins and cash is not allowed, i.e., $S, M \geq 0$.

The optimal choice of stablecoins by the households yields the following stablecoin demand function:

$$U'^{(e_H-S-M)} \geq [\beta\delta + \beta^2(1-\delta)] \int_{\underline{\xi}}^{\xi^*} \theta\,(\xi)\,\frac{d\xi}{\Delta\xi} + \left[\beta\delta + \beta^2(1-\delta)\omega + V'^{(S)}\right](1-q) \qquad (2)$$

which holds with strict equality if households choose to hold stablecoins in equilibrium, i.e., $S > 0$. The previous condition says that households equate the marginal utility of forgone consumption at $t = 1$ to the expected marginal utility gain from holding stablecoins in the future. In a run, all households redeem; an individual household will redeem with probability $\theta(\xi)$ for each realization of $\xi < \xi^*$. Otherwise, with probability $1 - q$, a run does not occur, and only impatient households withdraw. In this case, an individual household is either impatient with probability δ and is able to redeem the stablecoin or is patient with probability $1 - \delta$ and redeems in period 3 with probability ω. Absent a run, households also enjoy the marginal benefit of transaction services, $V'(S)$.

Households may also self-insure by holding cash. The optimal M is given by:

$$U'^{(e_H-S-M)} \geq [\beta\delta + \beta^2(1-\delta)](1-d) \qquad (3)$$

[11] Patient stablecoin holders (who hold it for more periods) accrue more benefit from transaction services, which is subsumed inside V.

[12] At t=2 and t=3 the discount factor is β and β^2, respectively.

This condition compares the marginal loss in consumption to the expected value from cash storage with no transaction services and holds with strict equality if $M > 0$. Without loss of generality, we consider equilibria in which $M = 0$ but $S > 0$, i.e., The first order condition with respect to stablecoins holds with equality, while the first order condition with respect to cash is slack. Households will not use cash whenever (i) their endowments are not excessive, or (ii) stablecoin transaction services are sufficiently valuable.

Substituting the stablecoin demand schedule into the expected utility $\mathbb{U}_H$, we get the indirect utility function,

$$\mathbb{U}_H^* = \underbrace{U(e_H - S) + U'^{(e_H - S)}S}_{\text{Surplus from storage}} + \underbrace{(1-q)\left[V(S) - V'^{(S)}S\right]}_{\text{Surplus from transactions}} \tag{4}$$

for the benchmark case in which $M = 0$. Given the assumptions about $V(\quad)$, it is easy to show that the third term in $\mathbb{U}_H^*$ is strictly positive. Moreover, the first two terms must be higher than the utility level from saving only using cash, otherwise households could choose $M > 0$ and attain that level of utility. Hence, households are always better off using the stablecoin compared to autarky.

This produces an equilibrium and a set of decision rules for households that has intuitive properties. In particular households use stablecoins because it offers a better way to save for the future and facilitates transactions. The former is captured by the benefit in terms of period 1 consumption (the first two terms in $\mathbb{U}_H^*$). The latter is captured by the benefit from the transaction services (the last term in $\mathbb{U}_H^*$).

Stablecoin Issuer

The stablecoin issuer maximizes profits by choosing:

- *the overall scale of stablecoin issuance (S).* The scale of stablecoins issuance is affected by the issuer's investment level in the quality of the transaction services given by the stablecoin. The higher the investment, the higher the usefulness of stablecoins, the higher the demand.
- *its asset liquidity mix*. The issuer can invest in a portfolio of risky, illiquid assets (I) and safe, liquid assets (L).

We interpret the safe, liquid asset to be central bank reserves, as the only asset in an economy that is fully safe and liquid. For simplicity we abstract from equity holdings in the stablecoin issuer balance sheet, so that total investment equals total stablecoin holdings.[13]

In an extension to the model we allow the investment costs to be offset by revenue from the use of stablecoin transactions data, to the extent that it is legally allowed (limitations can come, for instance, from privacy laws), and the possibility for the central bank to change the remuneration of central bank reserves, the liquid asset

[13] Introducing capital requirement in the model would not alter qualitatively its predictions.

Thus, the stablecoin issuer problem can be formalized as deciding how much to invest in a liquid asset, L, and the illiquid/risky asset, I, subject to the following balance sheet constraint:

$$I + L = S \tag{4}$$

If a run occurs at $t = 2$, i.e., $\xi < \xi^*$, the stablecoin is liquidated and the proceeds are distributed on a first-come, first-served basis. The maximum level of withdrawals that can be served in full is:

$$\theta(\xi) = \frac{\xi I + L}{S} \tag{6}$$

which is also equal to the probability of being served if all stablecoin holders withdraw.

If there is not a run, i.e., $\xi \geq \xi^*$, the balance sheet and profits after $t = 2$ depend on the realization of ξ and the level of withdrawals, λ. The stablecoin issuer will recall and liquidate a portion $y(\xi, \lambda)$ of its portfolio of the illiquid, risky asset to serve the early withdrawals. The amount recalled is given by:

$$y(\xi, \lambda) = \max\left[\frac{\lambda S - L}{\xi I}, 0\right] \tag{7}$$

The profits that the stablecoin issuer receives from investment in the good state at $t = 3$ are equal to RS. In the bad state, the stablecoin issuer defaults, so profits are zero. The issuer needs to incur an operating cost, X. The issuer will choose to operate only if expected profits exceed X. The issuer can also invest in improving the transaction services of the stablecoin at cost v per dollar of stablecoin. Let $V(S) = V^0(vS)$.[14]

Finally, the issuer can earn revenue from the use of household payment data determined by the function $B(S)$, which is increasing in the about the stablecoin holdings S.[15] However, the regulator controls the extent to which the issuer can exploit this revenue stream (for example, due to data privacy concerns) via parameter $b \in [0,1]$, where $b = 0$ represents a ban on data use.[16]

Given a level for the liquidation value ξ and the level of withdrawals λ, the issuer will choose to operate if the following incentive compatibility constraint is satisfied:

$$\omega\big[\big(1 - y(\xi, \lambda)\big)IR\big] - Sv + bB(S) - X \geq 0 \tag{8}$$

The incentive compatibility requires that the expected payoff to the issuer is higher than X. The stablecoin issuer's expected profit is given by:

[14] It is simple to extend the framework to allow for differential value of services for impatient and patient stablecoin holders.

[15] If B''>0, there are economies of scale for the stablecoin provider, i.e., the issuer earns revenue from the use of household payment data at a rate that increases in the amount of the stablecoin holdings.

[16] One could alternatively interpret this revenue (*bB(S))* as coming from fees on payments' transactions, as long as transactions would be proportional to the amount of stablecoins issued.

$$\pi = \int_{\xi^*}^{\bar{\xi}} \omega \left[\left(1 - y(\xi,\lambda)\right)IR\right] - Sv + bB(S) - X\frac{d\xi}{\Delta\xi} \quad (9)$$

Households' Run Decision

The timing of the model is here summarized:

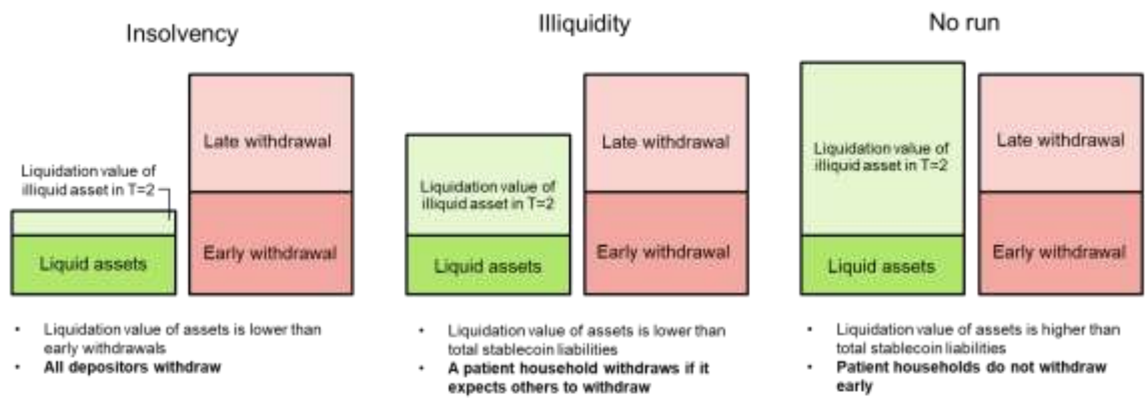
Period 1. Households buy stablecoins, and the stablecoin issuer chooses the asset liquidity mix and the overall scale of stablecoin issuance.

Period 2. Each household receives an idiosyncratic preference shock to consume early (in period 2; impatient) or late (in period 3; patient). Thus, some fraction of households will choose to withdraw early their stablecoins for consumption. The issuer recalls and liquidates some illiquid assets to serve early withdrawals if needed. Patient households may withdraw early (leading to a run) depending on beliefs about others' actions and the risky asset's liquidation value, ξ.

Period 3. The issuer receives a rate of return R on its illiquid assets with probability ω, and zero otherwise. The issuer repays households.

Depending on the realization of the liquidation value ξ and households' expectations thereof there can be three scenarios in period 2, shown in figure 3 below.

Figure 3: Run and No Run Scenarios



- In the *no run scenario*, the liquidation value of assets is higher than total stablecoin liabilities. In this case households do not run, and the issuers are able to maintain their promise of redemption at face value for the impatient households who want to redeem early in period 2.
- In the *illiquidity scenario*, the liquidation value of assets is lower than total stablecoin liabilities, but still sufficiently high that the stablecoin issuer is not insolvent, that is, it can face the early withdrawal demand of impatient households by selling some fraction of the illiquid asset. In this case, a patient household withdraws only if it expects other households to withdraw, giving rise to a coordination problem among patient households, which gives rise to potential multiple equilibria[17] If patient households expect a sufficient

[17] In case there is a run, as in the tradition of Diamon-Dybvig model, we assume the sequential service constraint, that is households get paid according to the position in the queue line.

large fraction among them will go to withdraw, they will all withdraw, starting the run. If patient households believe that other patient households will not withdraw then a run will not take place.

- Finally in the *insolvency scenario* the liquidation value of assets is so low that the stablecoin issuer will not be able to meet the demand of impatient households even by selling all its portfolio. All households will then run to the stablecoins to redeem, hoping to be first in line to be able to get the money back.

Equilibrium

In the analysis we compare the result of two different equilibria of the model, the private and the social planner equilibrium, together with the extension when the stablecoins issuers can derive revenue from the use of transaction data.

In the *private equilibrium*, each agent maximizes its own utility or profit and does not take into account the spillovers of one's choice on the other utility. Therefore, the stablecoin issuer maximizes profits, it takes into account how its choices affect both the run risk and the quality of transaction services that households will demand, but it does not consider how its choices will affect households' welfare. Similarly for households, who take the run-risk as given.

In the *social planner's equilibrium*, the social planner wants to maximize jointly household welfare and issuer's profits. The planner explicitly accounts for how the actions of households affect run-risk and, thus, their overall welfare.

We now formally describe each equilibrium in turn.

Private Equilibrium

The issuer will choose both sides of the balance sheet (S, I, L) to maximize her own profits as shown by the equation describing π. The issuer will internalize the effect of her actions on the run threshold ξ^* and on stablecoin demand from households.

Definition 1: Private Equilibrium. *The private equilibrium is defined as the set of stablecoin issuer assets, I, L, stablecoin holdings, S, the run threshold, ξ^*, and investment in transaction services, v that maximize banker's profits* π, *subject to the household stablecoin demand function, the balance sheet constraint of the issuer, and the function of the run threshold ξ^*.*

The issuer's liquidity ratio $\frac{L}{I+L}$ and investment into transaction services v characterize the issuer's choices, and pins down the remaining variables. v determines the amount of stablecoins demanded by households, S. I/L then pins down I and L. Each first-order condition in the private equilibrium takes the form

$$\frac{d\pi}{dC} + \sum_{\Upsilon} \psi_{\Upsilon} \frac{d\Upsilon}{dC} = 0 \tag{10}$$

where $C \in \{I, L, C, \xi^*, v\}$, ψ_{Υ} are the shadow values on constraints Υ, and $\frac{d\Upsilon}{dC}$ are the partial derivatives capturing the effect of choice C on these constraints. Take for example the illiquid asset choice, i.e., $C = I$, then the previous first-order condition says that the optimal level of investment into the illiquid, risky asset is determined by having the stablecoin issuer trade off the marginal return accruing to her, $\frac{d\pi}{dI}$, against the shadow cost of funds from the balance sheet constraint, and the way it affects the run threshold determination, and the household stablecoin demand. The optimality condition for the other variables can be similarly interpreted.

We will summarize the private equilibrium in terms of the asset allocation choice, and the level of stablecoin holdings. The two margins can be easily interpreted. The asset allocation margin is:

$$\text{AMM}_{\text{PE}} = \left(\frac{d\pi}{dL} - \frac{d\pi}{dI}\right) + \frac{d\pi}{d\xi^*}\left(\frac{d\xi^*}{dL} - \frac{d\xi^*}{dI}\right) \quad (11)$$

AMM_{PE} captures the decision to shift a unit of risky, illiquid assets into liquid assets (increasing the liquidity ratio, $\frac{L}{I+L}$), consisting of the direct effect on the issuer's profits (the first term) and the indirect effect via the run probability (the second term).

The stablecoin issuance margin is

$$\text{SIM}_{\text{PE}} = \left(\frac{d\pi}{dI} + \frac{d\pi}{dS}\right) + \frac{d\pi}{d\xi^*}\left(\frac{d\xi^*}{dI} + \frac{d\xi^*}{dS}\right) \quad (12)$$

and captures the decision to raise a unit of stablecoins (by improving transaction services) in order to increase investment into the risky, illiquid asset. This decision will raise run-risk but increase returns in the good state.

Social Planner's Equilibrium

The private stablecoin issuer choices are socially inefficient.[18] The stablecoin issuer is prone to take risks that raise the probability of a run without internalizing how run-risk directly matters for household welfare. This is because the issuer is a monopolist and maximizes her own profits subject to limited liability, while households are atomistic, so that they do not internalize how their choices affect run-risk. In the private equilibrium, the issuer is restricting the supply of stablecoins to suppress the cost of providing transaction services.

The social planner maximizes the following social welfare function:

$$\mathbb{U}_{SP} = w_H \mathbb{U}_H + \pi \quad (13)$$

where w_H is the weight assigned to the households relative to the stablecoin issuer. Given that the households are optimizing equality in the planner's problem, we can substitute the indirect utility function $\mathbb{U}_H^*$:

$$\mathbb{U}_{SP}^* = w_H \mathbb{U}_H^* + \pi \quad (14)$$

[18] In a perfect competition setup, the private and social equilibrium could coincide.

$\mathbb{U}_H^*$ only depends on S and ξ^* with

$$\frac{\partial \mathbb{U}_H^*}{\partial S} = -U''^{(e_H - S)} - (1-q)V''^{(S)}S > 0 \tag{15}$$

$$\frac{\partial \mathbb{U}_H^*}{\partial \xi^*} = -\left[V(S) - V'^{(S)}S\right]\frac{1}{\Delta\xi} < 0 \tag{16}$$

Therefore, a planner who cares primarily about households would like to increase stablecoin holdings S (by increasing investment into transaction value, v) and reduce the probability of run, or ξ^* (by increasing the liquidity ratio, $\frac{L}{L+I}$).

Definition 2: Social Planner's Equilibrium. *The social planner's equilibrium is defined as the set of stablecoin issuer assets, I, L, stablecoin holdings, S, the run threshold, ξ^*, and investment in transaction services, v that maximize $\mathbb{U}_{SP}^*$, subject to the household stablecoin demand function, the balance sheet constraint of the issuer, and the function of the run threshold ξ^*.*

Each first-order condition in the planner's equilibrium takes the form:

$$\frac{\partial \pi}{\partial C} + w_H \frac{\partial \mathbb{U}_{SP}^*}{\partial C} + \sum_{\Upsilon} \psi_\Upsilon \frac{\partial \Upsilon}{\partial C} = 0 \tag{17}$$

The planner's optimality conditions differ from the private ones, because the planner accounts for how her choices affect households, and thus assigns different shadow values on the same constraints Υ. Following the same steps as for the private equilibrium, we can derive the same two margins for the planner, the asset allocation margin and the stablecoin issuance margin.

The asset allocation margin for the planner can be written as $\text{AAM}_{\text{SP}} = \text{AAM}_{\text{PE}} + \text{AAM}_{\text{WD}}$, where AAM_{PE} is the asset allocation margin of the private equilibrium and AAM_{WD} is a wedge, which captures the additional distortions that the planner takes into account and will try to correct, given by:

$$\text{AAM}_{\text{WD}} = w_H \frac{\partial \mathbb{U}_{SP}^*}{\partial \xi^*}\left(\frac{\partial \xi^*}{\partial L} - \frac{\partial \xi^*}{\partial I}\right) \tag{18}$$

These distortions capture the impact on run-risk due to the choice of the asset allocation between liquid and illiquid assets on households. Shifting a unit of loans to liquid assets reduces the run probability, i.e., $\frac{\partial \xi^*}{\partial L} - \frac{\partial \xi^*}{\partial I}$ is negative, so the planner would want a more liquid asset mix than in the private equilibrium.

The stablecoin issuance margin for the planner is $\text{SIM}_{\text{SP}} = \text{SIM}_{\text{PE}} + \text{SIM}_{\text{WD}}$ where SIM_{PE} is given by the stablecoin issuance margin in the private equilibrium and SIM_{WD} is a wedge, which captures the additional distortions that the planner takes into account and will try to correct, given by:

$$\text{SIM}_{\text{WD}} = w_H \left[\underbrace{\frac{\partial \mathbb{U}_{SP}^*}{\partial \xi^*} \left(\frac{\partial \xi^*}{\partial I} + \frac{\partial \xi^*}{\partial S} \right)}_{\text{Run consequences}} - \underbrace{\left[U''^{(e_H - S)} S + (1-q) V''^{(S)} S \right]}_{\text{Household surplus}} \right] \tag{19}$$

An additional unit of stablecoins to fund illiquid, risky asset investment increases the probability of a run, i.e., $\frac{\partial \xi^*}{\partial I} + \frac{\partial \xi^*}{\partial S} > 0$, the planner would like to do less of that. Yet, the run considerations may be offset by the second term, because taking more stablecoins increases the surplus to the household.

There are two distorted margins that differ between the private and social allocations. The wedges feature a component linking the structure of the balance sheet to run-risk, or a component that captures the surplus created for households. The planner trades off reducing run-risk against improving the surplus accruing to the household when the run does not occur. In doing so, she chooses a different asset allocation, and level of illiquid asset investment funded by stablecoin holdings, which have a direct impact on the surplus and an indirect impact on run-risk. Holding more safe liquid assets and helps households because it makes their stablecoins safer.

Extension: Interest on the Safe, Liquid Asset

We consider the case where the central bank chooses to pay interest on the safe, liquid asset (or central bank reserves). In doing we abstract from considerations about the impact of such policy on the balance sheet and profitability of the central bank. Funds invested at $t = 1$ yield $1 + R'$ per unit of investment at $t = 3$. The stablecoin issuer's expected profit is given by:

$$\pi = \int_{\xi^*}^{\bar{\xi}} \omega \left[\left(1 - y(\xi, \lambda)\right) IR \right] + LR' - Sv + bB(S) - X \frac{d\xi}{\Delta \xi} \tag{20}$$

The profit maximizing liquidity ratio, $\frac{L}{I+L}$, increases in R'. This is clear from the asset allocation margin AAM_{PE}, which captures the decision to shift a unit of risky, illiquid assets into liquid assets. Since $\frac{d\pi}{dL}$ (the direct effect of holding liquid assets on the issuer's profits) increases in R', the issuer shifts from risky, illiquid assets into safe, liquid assets.

The extension allows to bring another key insight of the model:

If the central bank pays interest on the safe, liquid asset, 100 percent backing by liquid, safe assets can be optimal. The model shows that the optimal share of liquid assets increases with the interest rate on the central bank reserves. This is because the relative returns to holding the illiquid asset decreases. If the interest rate is sufficiently high, 100 percent backing by liquid, safe assets would be optimal. This is a policy tool that the central bank can use to encourage greater backing by safe assets.

Extension: Economies of Scale

We consider the case where there are economies of scale in stablecoin issuance. This is captured by function E, which captures the returns from increasing economies of scale in the amount of stablecoin holdings, S, where $E' > 0$ and $E'' > 0$:

$$\pi = \int_{\xi^*}^{\bar{\xi}} \omega\left[\left(1 - y(\xi, \lambda)\right)IR\right] - Sv + bB(S) + \mathrm{E(S)} - X\frac{d\xi}{\Delta\xi} \tag{21}$$

The introduction of economies of scale increases the amount of stablecoin issued. This is clear from the stablecoin issuance margin $\mathrm{SIM}_{\mathrm{PE}}$, which captures the decision to raise a unit of stablecoins. However, the ratio of illiquid to liquid assets remains constant.

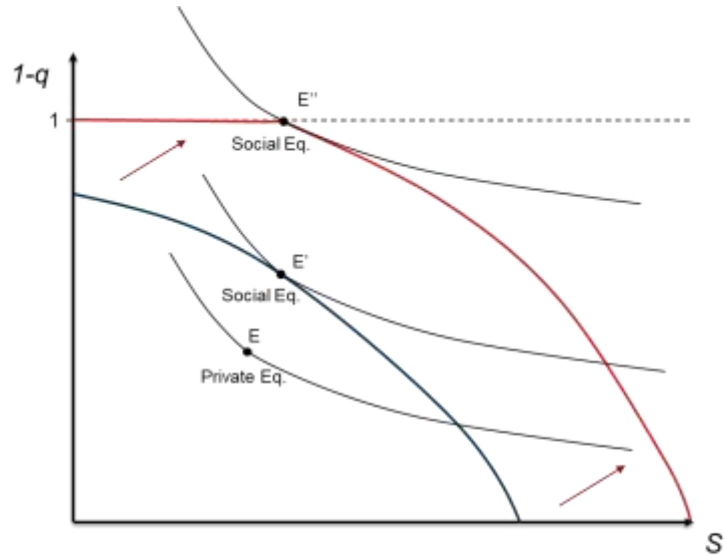
A Graphic Representation of Equilibria

The results of the model can be summarized visually as below (Figure 4). The two axes represent the amount of stablecoins issued (*S*, the x axis) and the stability of the stablecoin issuer (*1-q*, where *q* is the probability of the run on the stablecoin issuer), and each point in the space summarizes a specific combination of run probability and stablecoin issuance that is possible in the model economy. The thin black curve represents social welfare indifference curves, increasing with higher stability and stablecoins issuance (for given relative weight between households and stablecoin issuer in the social welfare function). The bold blue curve represents instead the frontier of combination of run probability and stablecoins issuance achievable if both the stablecoin issuer and households internalized how their choices affect run risk, the requirement to achieve the social optimum.

Private and social equilibrium are two different points on the chart space. The private equilibrium is marked by *E*. In this equilibrium the stablecoin issuer internalizes the effects of its choices on run probability and household demands, but the households do not internalize the effect of their choice. Hence this equilibrium is inefficient, and it lies below the frontier. The social equilibrium is instead marked by *E'*, and by definition it stands on the frontier. With the tools on the investment mix, and scale issuance, the planner can move away from the private equilibrium *E* and achieve the social optimum equilibrium *E'*.

Remuneration of reserves pushes the frontier of the economy. The bold red line represents instead the frontier once we allow for remuneration of reserves. This is so since it provides extra resources to the stablecoin issuer, so that optimal stablecoin issuance can be achieved without investment in the risky asset. This implies also that 100 percent backing by central bank reserves can be optimal, as exemplified by point *E''*.

Figure 4: Equilibria Representation



Source: Authors' elaboration.

In the following section we summarize the key insights coming from the model.

Model's Insights for Stablecoins Issuers' Behavior and Regulation

The model yields five key insights:

1. **The private equilibrium is socially inefficient, thus creating scope for regulation; the private equilibrium features lower stablecoin holdings and higher run probability than the social equilibrium.** In the private equilibrium the stablecoin issuer invests too much in illiquid, risky assets, raising the probability of a run without internalizing how run-risk decreases household welfare. Also, the issuer restricts the supply of stablecoins to lower its costs via less investment into transaction services (akin to higher prices in a standard monopolistic set up).

2. **Absent revenues from other sources than just investment, the socially efficient equilibrium does not prescribe 100 percent backing by safe, liquid assets, consequently run risk is not zero.** The social planner trades off by reducing run-risk against improving household welfare by boosting stablecoin holdings. It is then optimal to accept some run-risk in order for the stablecoin issuers to supply a higher quantity. In this case, however, stablecoins are not really "stable", and would not satisfy the NQA property of money. As such, the label "stablecoin" still seems like a misnomer.

3. **More than one regulatory tool is needed to implement socially optimal allocations.** One tool is needed to manage the liquidity asset mix (run risk), and one to manage the scale of stablecoin issuance. Introducing liquidity requirements will reduce run-risk but also lower the supply of stablecoins.

4. **Allowing the stablecoin issuer to generate revenue from non-investment means will lead to an efficient level of stablecoin provision; in this case, 100 percent backing by liquid, safe assets can be optimal.** If investment into illiquid, risky assets is the only potential revenue stream for the stablecoin issuer, high liquidity requirements will hurt the issuer's ability to profit from the issuance of stablecoins. Thus, the issuer will lower the supply of stablecoins below the socially optimal level. In this case, it is optimal to tolerate some run risk for access to stablecoins. However, if the regulator allows the issuer to generate sufficient revenue from stablecoin issuance via other means such as by using stablecoin transactions data or receiving remuneration on stablecoin reserves[19], it will be profitable for the issuer to provide stablecoins at the socially optimal level even without investment in risky assets. 100% backing by liquid, safe assets is then optimal. This set of policies will enable stablecoins to achieve NQA status, at the same time, incentivizing the issuer to invest and supply the optimal amount of stablecoins.

5. **Specifically, if the central bank pays interest on reserves, 100 percent backing by central bank reserves can be optimal.** The model shows that the optimal share of liquid assets increases with the interest rate on the central bank reserves. This is because the relative returns to holding the illiquid asset decreases. If the interest rate is sufficiently high, 100 percent backing by central bank reserves would be optimal. This is a policy tool that the central bank can use to encourage greater backing by safe assets. We note that among all "liquid and safe assets", only central bank reserves are truly NQA.

III. Current Policy Landscape Around Stablecoins

This section provides a brief overview of emerging policies on the issuance and regulation of stablecoins and compares them to the findings of this paper's model. The policy framework for stablecoins remains in its infancy in many jurisdictions, reflecting the rapid innovation and technological advancement associated with stablecoins. Policies attempt to address many of the risks discussed earlier by emitting requirements on operational stability, prudential treatment[20], data regulation, cyber resilience, and AML/CFT compliance. This section focuses more on policies relative to reserve backing, to highlight parallels to this paper's model.

The Financial Stability Board (FSB), the International Organization of Securities Commissions (IOSCO), and the Committee on Payments and Market Infrastructures (CPMI) have all provided recommendations and clarified standards relative to stablecoins and their reserves.[21] These bodies emphasize the importance for stablecoins to provide a legal claim to all users against the issuer and/or the underlying reserve

[19] A similar example is China's regulation on third-party payments. Since 2019, The People's Bank of China (PBoC) has requested all third-party payment providers (TPP)to deposit their customer funds at interest-free accounts at the central bank. In August 2019, PBoC has reversed the interest free policy and started to provide a 0.35 percent annual interest rate on deposited reserves by TPPs.

assets and to guarantee timely redemption. For stablecoins referenced to a single fiat currency, redemption should be at par into fiat.

The policy framework on reserve backing of stablecoins is being developed in many countries. In the same spirit as this paper's model, stablecoin issuers are required to hold 100 percent of their reserves in safe and highly liquid assets. In practice, the definition of such assets differs across jurisdictions. Most countries consider currency, insured bank deposits, central bank reserves, and short-term government bonds as sufficiently safe and liquid assets, e.g., in the European Union (see IMF 2025). Algorithm-based stablecoins are explicitly banned in the EU and Australia. The scale of stablecoin issuance is not capped in most countries, provided the reserve requirement is met, though some jurisdictions have introduced limits on foreign currency backed stablecoins to protect monetary sovereignty. Some jurisdictions (e.g. EU, UK) also explicitly prohibit any interest being paid to stablecoin holders.

Stablecoins economic characteristics are closely related to constant NAV money market funds (MMFs, IMF 2025). MMFs have been vulnerable to runs (Anadu et al 2023)[22]. MMFs were established in the 1970s to provide investors with a market rate of return at a period when bank deposit rates were capped by law. In the U.S., MMFs were designed to mirror deposit features, with share values fixed at $1 or $100. However, as illustrated by the global financial crisis in 2008, MMFs have been subject to runs when liquidity conditions deteriorate and investor sentiment shifts. In response, the SEC revised its rules to require floating Net Asset Values for institutional prime and tax-exempt funds (Bouveret, Martin, McCabe 2022), while government MMFs to allowed to maintain constant Net Asset Values.[23]

In some countries, e-money is more tightly regulated by requiring that backing assets be held in central bank reserves. E-money, which is account-based deposit with mobile payment service provides, has been widely adopted in many Asian countries as a means of payment, and many governments have required e-money providers to safeguard customer funds at commercial banks or specialized financial institutions (Sun and Rizaldy 2023). However, once e-money reaches certain scale, it will exceed the level protected by deposit insurance, and e-money providers' relationship with commercial banks may complicate monetary policy transmission, as observed in China (Box 2). In response to these challenges, the People's Bank of China has then introduced 100 percent central bank reserve requirement for e-money providers, which became narrow banks. These reserves were initially interest free, but eventually remunerated (at 0.35 percent, below the policy rate) to align the incentives of e-money providers, especially after the authorities also tightened data policy, which affected the e-money providers' data-related income.

To the extent that central bank reserves are used to back stablecoins, central banks are likely to have an important role to play in regulating stablecoins. For instance, central banks may want assurances that stablecoin issuers adhere to regulation before giving them access to reserves. Moreover, central banks would likely want autonomy in deciding the degree to which stablecoins would be remunerated.[24] In practice, there could be different models for stablecoins to access central bank reserves, as discussed in Box 3, while only some align with the financial stability focus of this paper's model.

[22] Anadu et al (2023) provides a comprehensive study of runs on money market funds and stablecoins and shows that the large redemption starts when the value drops below 0.995 for MMF and 0.99 for stablecoins.

[23] It should be noted that requiring stablecoins to be fully backed by central bank reserves insulates stablecoins from the, objectively small, credit risks in banks' deposits.

[24] For instance, the Financial Services and Markets Act 2023 (FSMA 2023) expanded the regulatory remit of the Bank to include systemic stablecoins and payment systems using stablecoins. Ultimately, the UK Treasury has the power to bring systemic stablecoins into the Bank's regulatory remit, in line with its responsibilities for systemic payments systems under the Banking Act 2009. Bank of England (2021).

Box 2: Business Model of E-money in China

Over the past decade, e-money has been rapidly adopted in China, with two payment service providers (PSPs), Alipay and WeChat Pay, accounting for more than 90 percent of the mobile payments market (Xie, 2025). The business model of e-money has evolved over time. During the first stage (prior to 2017), PSPs collected significant interest income when placing customer funds with commercial banks. During the second stage (2017-2020), PSPs were required by regulators to move all deposits to interest-free central bank accounts, which meant PSPs became narrow banks. PSPs then increasingly explored the use of data from payment services to cross-subsidize other financial services, such as lending, insurance, and wealth management. During the third stage (since 2020), with the tightening of data regulation, the People's Bank of China (PBoC) has started to remunerate PSP's reserves, likely to compensate for their revenue losses. In this box we provide an overview of some key aspects of the PSPs costs and revenues in China linked to some aspects of this paper's model, with the caveat that this is not meant to represent an exhaustive discussion of the PSP business model. As narrow banks, all PSPs in China are licensed by the PBoC, and their liabilities are fully backed by central bank reserves after 2020.

Fee income

E-money PSPs build their network by collecting fees from merchants rather than from more price-sensitive consumers. In China, Alipay and WeChat Pay charge online payment merchants a 0.6 percent fee, which is lower than the rate charged by credit card companies, often in the range of 2 percent (Sun and Rizaldy 2023).

Interest income

PSPs initially placed customer funds with commercial banks, which provided a significant source of revenue. However, as customer funds grew larger, PSPs started to gain bargaining power and asked commercial banks to bid on interest rates. These operations resemble those of a shadow central bank and affected monetary policy transmission. There were also growing concerns on fund safety and financial stability. In response, the PBoC tightened regulatory rules since 2017, mandating e-money PSPs to gradually transfer their funds from commercial banks to central bank accounts. By early 2019, all E-money PSPs are required to deposit all customer funds at interest-free accounts with PBoC, the new custodian of all customer funds[25]. From then on, PSPs became narrow banks. While these reserves were initially not remunerated, the PBoC changed the "no interest" policy in August 2019 and provided an annual interest rate of 0.35 percent.

Data-related revenue

The payment service enables large E-money PSPs, such as Alipay, expand into other business (lending, insurance, wealth management, etc.) via network effect. Payment-related data could be useful for assessing credit risk and informing lending decisions. More broadly, payments data can be used to analyze consumer and merchant behavior, help PSPs improve products and services, and support more targeted marketing. With technological advancement, such as machine learning to process vast quantity of data in milliseconds, data-related revenues and cross-subsidies grew rapidly for e-money PSPs. However, this income stream also faced headwinds as China tightened its data policy. In October 2021, China released a draft personal data protection law to regulate how companies process user data. To address potential data monopoly, the

[25] The total balance of nonbank online payment institutions (including Alipay and WeChat Pay) in the PBC reached RMB1.99 trillion ($305 billion, equivalent to 6.1 percent of total reserves at the PBC) in September 2021.

consumer and business credit-related information of platform companies was separated from lending business, and the authorities drafted regulation on licensing and other requirements for any company (including PSPs) to collect, hold and utilize consumer and business credit-related information (including non-traditional data). .

China's experience with E-money offers some suggestions for stablecoin regulation. It highlights for instance the balance that policymakers need to strike to support technology and business innovation by the private sector, while at the same time maintaining monetary and financial stability, and promoting healthy market competition. It is crucial to note however that e-money is still account-based money and differs significantly from token-based money such as stablecoins. In particular, the potential anonymity, ease of transfer, and differences in governing law may argue for an even stronger regulation of stablecoins.

Box 3: Stablecoins and Access to Central Bank Reserves

There are various possible models to give stablecoins access to central bank reserves, which could also have implications for run risks. Each has different tradeoffs and objectives, only some of which align with this paper's focus on financial stability. Models are captured in the table below.

Possible models of stablecoins (models to the left are closest to CBDC)

Levels of access to CB reserves	Full service	Partial service	Light service	Self service
Overnight For backing	All assets held as CB reserves	Fraction of assets held as CB reserves	X	X
Intraday For payments	√	√	√	X
Emergency For liquidity	n/a	√	X	X

It is useful to consider levels of access to central bank reserves by stablecoin issuers, according to three dimensions (noted in the first column): 1— Access to overnight central bank reserves to back the issuance of stablecoins; 2— Access to intraday central bank reserves to make payments on the central bank's payment infrastructure; 3— Access to emergency central bank reserves to obtain liquidity support in a crunch.

Four possible models of stablecoin design can be constructed according to how each addresses the three dimensions of access to central bank reserves.

- **Full-service model:** Stablecoins are fully backed with central bank reserves. The issuer also has access to the central bank's payment system, enabling interoperability between different stablecoin issuers. This model is closest to narrow banking and what has been called "synthetic CBDC" (Adrian and Mancini-Griffoli, 2018).

- **Partial service model:** Stablecoin issuers hold a fraction of their assets as central bank reserves, with access to the central bank's payment system and emergency liquidity. This model seems most similar to the Bank of England's recent proposal (2025) for stablecoin regulation.
- **Light service model:** Stablecoin issuers only access the central bank's payment system, ensuring interoperability between stablecoins but not allowing stablecoins to hold safe and liquid central bank reserves overnight to back their issuance. This is similar to the concept of a skinny payment account under exploration by the US Federal Reserve (Waller, 2025).
- **Self-service model:** Stablecoin issuers have no access to any form of central bank reserves, just as in most cases of stablecoins to date.

Each of the service models has different implications for the operational and reputational risk of the central bank. We do not explore these considerations here. Our model highlights that the full-service model could be sufficient to limit run risks in stablecoins. Still the partial service model could also support stability of stablecoins. In this model the central bank could give stablecoins access to standing facilities, as well as emergency liquidity lending. By providing support in case of runs, the central bank might disincentives holders to run in the first place. A comparison between the different options is out of the scope of this paper and is left for future work.

The full-service model is closest to CBDC. In fact, an additional step would be to allow stablecoin issuers to distribute CBDC. Users may not notice the change except that they would no longer be exposed to the balance sheet risk of the private issuer, even if that were small. The stablecoin issuer would continue to offer value where it has a notable comparative advantage, that is in interfacing with end-users, innovating at the wallet level, and cross-selling other financial services.

IV. Conclusion

In today’s digital financial world, various forms of crypto assets have proliferated. While the unbacked crypto assets, such as Bitcoin, have proven to be unstable and create significant financial risks, stablecoins, which aim to maintain stable value, could bring benefits to society if well regulated. As a means of payment, stablecoins could improve the efficiency of transactions, lower transaction costs, and enhance financial inclusion. Global stablecoins could also facilitate cross-border payments and remittances. Furthermore, stablecoins issued by technology companies could spur innovation and product diversity by leveraging the synergies between digital payments and other digital services. However, as a form of privately issued digital money, stablecoins are subject to runs and pose potential risks to monetary and financial stability if not well regulated. Recent volatility among crypto assets and stablecoins highlights these risks and the urgency to develop policies to reap benefits while minimizing risks.

Payment stablecoins attempt to be privately issued digital money; if so, they should be regulated accordingly. Money is distinctive for at least three reasons. First, its “no-questions-asked” (NQA) property allows users to transact without costly verification of value, thereby facilitating billions of transactions each day (Holmström, 2015). Second, the “singleness of money” ensures that monetary exchange is not subject to fluctuating exchange rates across different forms of money, whether privately issued (e.g., bank deposits) or publicly issued (e.g., cash) (Eichengreen, 2025). Finally, money is inherently vulnerable to runs. The U.S. “free banking" era of the nineteenth century illustrates the dangers of a monetary system lacking adequate regulation to contain run risk on bank-issued money (Eichengreen, 2025).

This paper provides a theoretical framework to analyze the reserve backing for stablecoins as digital money. The model builds on the classic Diamond and Dybvig (1983) bank run model and assesses different reserve backing policies for stablecoin issuers. The model concludes that the private equilibrium of stablecoin issuance is not efficient, thus creating scope for regulation. In such an equilibrium, the issuer restricts the supply of stablecoins and invests excessively in illiquid, risky assets, raising the probability of a run without internalizing how run risk decreases household welfare. Policymakers trade off reducing run-risk against improving household welfare by boosting stablecoin holdings. High liquidity requirements will make stablecoins safer but will reduce the issuer's profit from stablecoins issuance and depress stablecoins supply below the socially optimal level. In this case, it is optimal to accept some run-risk in order to incentivize stablecoin issuers to supply a higher quantity.

However, a better outcome is achieved if stablecoins are backed with safe assets that also provide a source of income (or coincide with an external source of income). If stablecoin issuers can hold a safe asset such as central bank reserves and generate revenue from the remuneration of reserves or from data utilization (if permitted by law), issuers will find it profitable to provide stablecoins at the socially desirable level even without investing in risky assets. When this alternative income is sufficiently high, full backing by central bank reserves in a narrow bank setting could be optimal.

This paper's model stresses the role that a uniform, safe, and liquid reserve asset can play to minimize run-risk of stablecoins, achieve NQA status, and support the "singleness of money." While other assets can have very low credit and liquidity risks in normal times, none will be as safe and liquid as central bank reserves, and the purported safe assets may quickly lose liquidity under market stress or crisis. Furthermore, central banks could utilize a set of tools including reserve remuneration and data utilization policy to regulate the size and impact of stablecoin issuance.

Several issues are left for future research. For one, the model abstracts from other policy objectives such as market contestability. For instance, allowing issuers to profit from payments data favors larger providers due to scale and network economies related to data analysis, potentially leading to market concentration. Second, requiring a stablecoin issuer to hold central bank reserves has implications that go beyond this paper's model. These include a larger central bank balance sheet, deposit disintermediation from the banking sector, potential complications for the operation of monetary policy, capacity constraints to supervise stablecoin issuers, and reputational risks. In addition, paying interest to stablecoin issuers on their central bank reserves could also be seen as privatizing seigniorage given that stablecoins would not be permitted to pass on interest to coin holders. Third, other options exist to potentially uphold the stability of stablecoins. As mentioned, these include requiring issuers to hold loss-absorbing equity capital and providing stablecoins with some form of backstop akin to deposit insurance. The relative efficiency and resilience of these options remain an open and multifaceted question. For instance supervising a narrow bank could be arguably easier. Another approach would be to issue CBDC, a liability of the central bank, and allow payment service providers that would otherwise issue stablecoins to distribute the CBDC to end-users. These issues are left for future work.

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