Stablecoin Risk*

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We compare the aggregate implications of a change from bank intermediated payments to stablecoins. We first argue that, in the absence of frictions, a financial ecosystem in which payments are effectuated through banks will yield equivalent outcomes to an ecosystem in which stablecoins are used. In other words, the widespread adoption of stablecoins will have no effect on aggregate outcomes in the absence of frictions. We then observe that banks facilitate payments through accounts, which provides the bank with credit relevant information. We then compare aggregate lending in an account-based payment system such as banks to a tokenized system and show that the latter features more extreme (both good and bad) real outcomes. We conclude with some policy implications.

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Abstract

We compare the aggregate implications of a change from bank intermediated payments to stablecoins. We first argue that, in the absence of frictions, a financial ecosystem in which payments are effectuated through banks will yield equivalent outcomes to an ecosystem in which stablecoins are used. In other words, the widespread adoption of stablecoins will have no effect on aggregate outcomes in the absence of frictions. We then observe that banks facilitate payments through accounts, which provides the bank with credit relevant information. We then compare aggregate lending in an account-based payment system such as banks to a tokenized system and show that the latter features more extreme (both good and bad) real outcomes. We conclude with some policy implications.

1 Introduction

The rapid international adoption of stablecoins and the passage of the 2025 GENIUS act in the US has generated considerable policy interest in the effect of widespread stablecoin use. Concern, especially macro prudential concern, has focused on the potential erosion of banks' deposit base if there is a sustained shift to stablecoins. First, a decrease in banks' deposit franchise may affect monetary policy transmission[1]; second, stablecoins may lead to credit disintermediation[2]; third, stablecoins as private monies may disrupt the singleness of money[3] and finally affect monetary sovereignty[4]. A comprehensive survey of these concerns appears in Cong (2025).

Central to these discussions about stablecoins is the perspective that the current bank-intermediated system is economically efficient in the long run: Stablecoins providing an imperfect substitute for bank deposits disrupt the extant system. In this paper we take the perspective that, in the long-run, if stablecoins prove more efficient as a means of payment, the economy could move to a stablecoin-intermediated system. How would such a system differ or be similar to a bank-intermediated one? What effect would this change have on real projects and investments in the economy?

In a frictionless economy, not only is there no need for financial intermediation, but the nature of any financial intermediation and the kinds of securities either households or intermediaries hold is irrelevant. Thus, whether banks or stablecoins dominate payments is irrelevant. Differences in aggregate outcomes should only occur if transactions through banks differ economically from private outside money. In the tradition of Black (1975), we focus on the importance of banks' account-based payments systems and an attendant informational friction. If banks no longer intermediate payments then information about counterparties and cashflows is lost to potential lenders.

In our model, there are three cash flow states, high, medium, and low. Banks, which specialize in making loans, are able to generate information about the probabilities of low cash flow states. This information is available to banks as a by-product of their provision of account-based payment services: Monitoring past inflows and outflows allows a bank to estimate the likelihood of cash flows falling below a certain threshold. To make our point most starkly, we assume that for any firm, banks perfectly know the probability of the low state. They thus naturally offer debt contracts and mitigate risk.

Stablecoins represent a token-based payment system, and so in a stablecoin economy, information from the account-based system is essentially lost. Further, the 2025 Genius Act in the US

[1] Ahmed et al (2026)
[2] Cheng et al (2022)
[3] Gorton et al 2023, Lee et al (2026)
[4] Aldasoro et al (2026)

prohibits stablecoin providers from providing a yield to its customers. Thus, in a stablecoin-based economy, investment will be made by non-bank financial intermediaries. These intermediaries have an incentive to forecast growth prospects at a firm. In particular, if they have to find out about a state, they will focus on the chance of extremely high payoffs. In the model, they perfectly know the probability of the high cash flow state. In other words, the economy features heavier tails.

We compare realized financing from an account based system in which lenders can perfectly assess the probability of the low cash flow state to a token-based system in which the financier can perfectly assess the probability of the high cash-flow state. Relative to the first best level of investment, both the bank based and token based systems feature inefficient investment. If either the cost of inefficient investmemt (in the case of high fixed costs) or benefit of successful projects (as in high cashflows) are sufficiently large, a token based system produces higher expected value. Further, the token-based system robustly features more extreme outcomes. Specifically, the probability of extreme payoffs (either high cashflows or very low ones) is larger for the token-based system.

Our focus on the informational implications of different payment systems has implications for the various ongoing policy debates. For example, tokenized deposit systems even though similar to stablecoins, fundamentally differ because of the informational implications.[5] Our focus on the shfit from bank-intermediated lending to non-bank financial intermediaries (NBFIs) through the real-location of stablecoins has implications for regulation. Various lending platforms provide vehicles for real stablecoin investment.[6] In as much as banks are regulated to protect the payment system, the NBFIs that invest stablecoins held for transaction purposes are also exposed to bank-like risks including liquidity risk and should be a focus for regulators.

Our model is stylized to capture the fundamental informational difference between account-based and token-based payments systems. However, there is ample evidence that banks' observation of payment flows in customers' transaction accounts provides valuable information about credit-worthiness. For example, Puri, Rocholl, and Steffen (2017) investigate consumer credit defaults at German Savings Banks between 2004 and 2008. Pertinent to the informativeness of account-based systems, they find that relationship customers have default rates that are 40 basis points lower than new customers. This is large as the unconditional average default rate is 60 basis points. In a similar vein, Agarwal, et al. (2018) suggest that information about changes in the behavior of a customer's other accounts at the same bank helps predict the behavior of the credit card account

[5] Programmable deposit networks include `https://www.cari.com/`.

[6] Investment Vehicles such as Maple Finance (`https://maple.finance/` or markets such as Aave's Horizon platform generate yield for stablecoins.

over time.[7] Theoretical analyses of account-based payments systems appear in Kahn et al (1999).

In our model, in the stablecoin economy, we are agnostic about the particular financial claim held by the non-bank financial intermediaries (NBFI). While it is natural to think of it as equity, it is becoming more common for such actors to provide debt rather than claims with equity-features (see, for example, Morse, 2024). The important feature of the model is that the informational advantage of NBFIs comes from their ability to estimate the probability of the high cash flow state. For example, Jang, Kim, and Sufi (2026) find that the growth in the private credit market is partly due to the informational advantage of lenders who have previously had private equity transactions with the borrowing firms.

The structure of the paper is as follows. First, we discuss the irrelevance of stablecoins as a means of payment in Section 2. Broadly, this is similar to the arguments that in the absence of frictions, organizational forms and portfolios do not affect social value, for example the irrelevance of banks as an institutions as exhibited in Freixas and Rochet (2008). We then turn to the specific friction that will affect value: the difference between an account based and token based payment system in Section 3. Policy implications follow in Section 4.

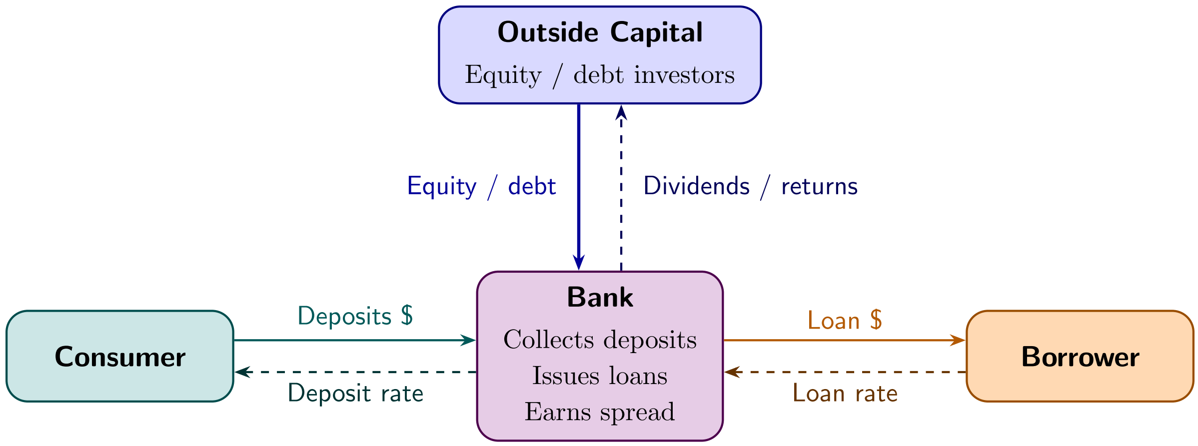
2 Stablecoin Irrelevance

In the absence of frictions, it should be economically irrelevant if stablecoins are used for payments instead of bank deposits. To see this, consider an environment in which consumers retain bank deposits for payment needs, and banks allocate those deposits (possibly leveraged) for real lending. In this economy, the bank acts as an intermediary and pools deposits and uses its expertise to lend to the real economy.

Contrast this with an economy in which all transactions are made with stablecoins. Consumers purchase stablecoins and use them for payments. The monies consumers deposit with the stablecoin issuer are invested in high quality liquid assets.

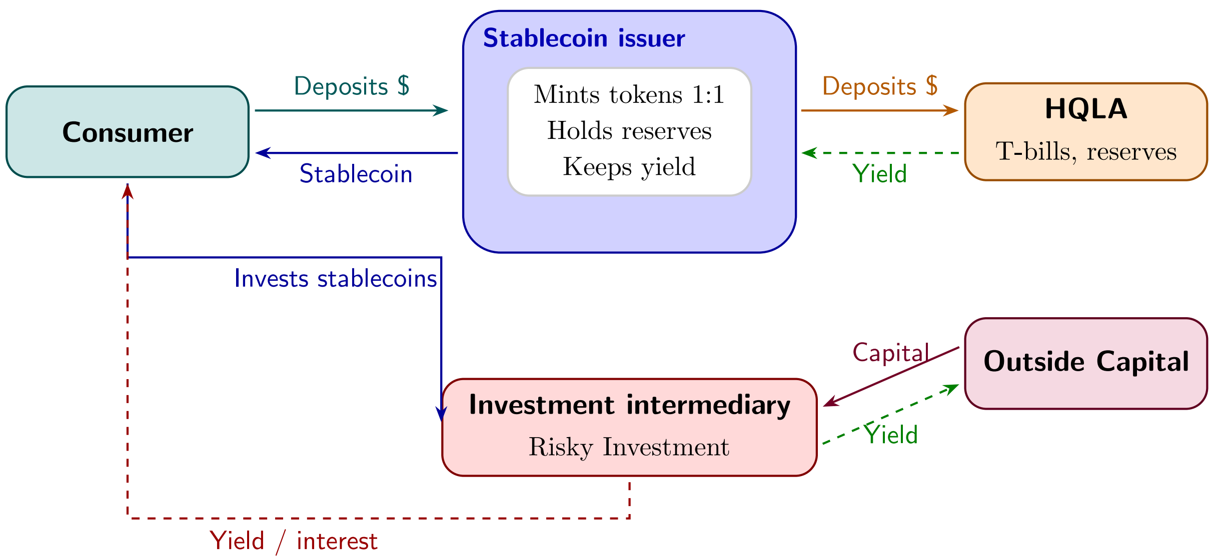
Although the stablecoin issuer is constrained to act as a narrow bank (i.e., to hold assets in high quality liquid assets, consumers can invest stablecoins in intermediaries that then invest in real projects. Such investments could also be leveraged, as an investment intermediary could also raise extra capital. It is useful to recognize that intermediaries who lend stablecoins are already established. Platforms such as Maple Finance, and Goldfinch pool stablecoin deposits from liquidity

[7] See also Mester, Nakamura, and Renault (2007), who establish that the accounts of Canadian commercial borrowers are informative about credit risk, and that changes in these accounts leads to a monitoring response from the lender, and Hau, et al. (2019), who show that Ant Financial's comparative advantage in lending to vendors stemmed from its access to the vendors' transaction data on its online platform.



The figure depicts a stylized economy in which funding is intermediated by a bank. The bank collects deposits and potentially raises outside capital. It identifies projects and makes loans to borrowers. This schema could also be consistent with bank creation of inside money as banks can diversify liquidity risk across consumers.

Figure 1: **Real Investment intermediated through a bank**



The figure depicts a stylized economy featuring stablecoins and NBFIs. Consumers deposit dollars into the stablecoin issuer which holds HQLA. Instead of holding tokens passively and not earning yield, consumers can deposit unused tokens into the investment intermediary which invests in risky projects. The investment intermediary can also raise outside capital.

Figure 2: **Real Investment in a stablecoin economy**

providers and then invests them. Maple Finance is currently the largest with over 3.5 billion assets under management. While it offers various products, investments are selected and managed by professional credit underwriters.

The two competing models of intermediated lending are illustrated in Figures 1 and 2. A standard Modigliani-Miller argument implies that, in the absence of particular frictions, these two structures yield the same aggregate investments. Specifically, the particular organization of how monies flow from consumers to firms (both the nature of the intermediation, and the design of claims held by households or intermediaries) is irrelevant unless one or more frictions exist. This observation also implies that in any long-run equilibrium, i.e., one that moves from a bank-intermediated economy to a stablecoin-intermediated one will be equivalent.

We note, however that the equivalence of aggregate investment across different structures does not imply that the distribution of risk across different institutions is the same. If stablecoin issuers hold high-quality liquid assets, they will effectively act as narrow banks. Note also that the demand for stablecoins by customers who wish to use stablecoins as a means of payment will translate into a demand for liquid money-market assets on the part of stablecoin issuers. However, in a frictionless economy, Modigliani and Miller Proposition I implies that firm values will be unaffected. Further, Modigliani and Miller Proposition II implies that the equity of a firm that issues additional short-term debt claims will become riskier.

The irrelevance of organizational form for efficient investment means that understanding the nature of the relevant friction(s) is important to evaluate the effect of stablecoins. Banks are often associated with an enhanced ability to monitor loans, specifically in canonical models, banks which exert effort have specific expertise in ensuring loan performance. We emphasise that this expertise would not be lost if, as noted in our discussion of the structure of a stablecoin intermediated economy, investors, holding stablecoin balances seek returns on those balances they can do so by supplying capital to specialized intermediaries. If it is socially efficient for such intermediaries to exert effort and monitor loans, then they will do so. In short, in the long run, monitoring technology will be acquired by the lender for which it would be most efficacious.

The friction that we focus on is the difference between an account-based payment system such as a bank and a token-based system such as a stablecoin. We take the position that account-based systems allow the provider (the bank in our model) to observe past transactions. Especially for a firm with potential for growth, past transactions can be a good guide to what happens in low cash flow states, but may be less useful as a predictor of future growth. When information on past transactions is lost, a financial intermediary that may arise is something like a venture capitalist, which is able to forecast future growth, but finds the low cash flow states less relevant for its own investment decision.

3 Model

We present a parsimonious framework to allow us to consider optimal investment as a function of the type of information available to a lender.

Technology: Each firm has a project that requires an initial investment of $I > 0$ at time $t = 0$. The investment generates cash flows at time $t = 1$ that are state-dependent denoted x_j. There are three states, $j = \{h, m, \ell\}$. We assume $x_h \geq I$, thus we restrict attention to projects that cover the investment with high state cash flows. Further, for notational simplicity, we assume $x_m = 1, x_h = kx_m$, and $x_\ell = 0$. These state-wise cash flows are held fixed across firms. However, firms are heterogeneous in their probabilities over states. For a given firm, the probability of state j is p_j, and $\sum_{j=h,m,\ell} p_j = 1$. We assume that the distribution of firms over the state probabilities is uniform[8] on the simplex, $\{p_h, p_m, p_\ell \geq 0, p_h + p_m + p_\ell \leq 1\}$. The risk-free rate is normalized to zero.

Each firm is owned by an entrepreneur, who obtains a private benefit $\beta > 0$ from undertaking the project, regardless of the outcome of the project. Thus, if a firm obtains financing, it undertakes the project.

We characterize optimal investment strategy and hence ex ante value of investing under different information regimes: First, if a lender is completely uninformed, second if a lender is completely informed (corresponding to first best) and then if the lender is informed about either p_ℓ or p_h respectively. We note that for these ex ante calculations, the lender receives information and then makes investment decisions and thus exercises the real option of not investing (given its information) in negative NPV projects.

No Information: If there is no information, each project has an NPV of

$$\begin{aligned} & p_h kx + p_m x + p_\ell 0 - I \\ = \quad & kp_h + p_m - I. \end{aligned}$$

Given that the density over the space of projects is 2 at each point[9] then, if the investment is undertaken, in the absence of any information the expected value is

$$2 \int_0^1 \int_0^{1-p_h} (kp_h + p_m - I) dp_m dp_h = \frac{k+1}{3} - I. \tag{1}$$

Thus, the no-information value of investment, V_0, in the economy is

[8] More formally, we assume a Dirichlet distribution with parameters normalized to 1, or a flat prior.

[9] Note that $\int_0^1 \int_0^{1-p_h} dp_m dp_h = 0.5$, so the constant density is 2.

$$V_0 = \begin{cases} \frac{k+1}{3} - I & \text{if } k \geq 3I - 1 \\ 0 & \text{otherwise.} \end{cases} \tag{2}$$

If no information is known about the likelihood of the cashflow states, investment only occurs if the value in the high state (captured by k) is sufficiently high, otherwise no investment occurs.

First Best: To determine the first best investment, assume that the lender knows the probability of each state. Thus, it invests as long the expected cashflows are greater than the initial investment or:

$$p_h x_h + p_m x_m \geq I, \tag{3}$$

where any firm generates profits of $kp_h + p_m - I$. To determine the aggregate value generated by the first-best investing rule, V_f, we integrate over the simplex.

$$V_f = 2\int_0^1 \int_0^{1-p_h} \max\{kp_h + p_m - I, 0\} dp_m dp_h. \tag{4}$$

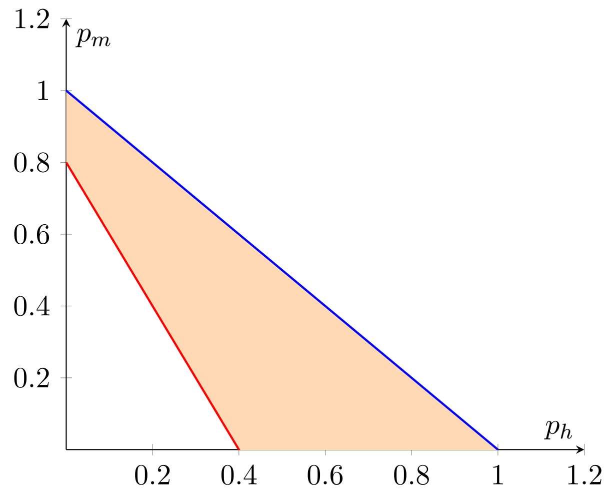
First note that if $I > x_m$ (i.e., $I > 1$), the lender only makes profit if the high state is realized. In this case it obtains positive expected profits if $kp_h > I - p_m$, and so invests as long as $p_h > \frac{I-p_m}{k}$. Conversely if $I < 1$, investing in the middle state also yields positive profits.

Lemma 1 *The value of first best investment is*

$$V_f = \begin{cases} \dfrac{k+1}{3} - I + \dfrac{I^3}{3k}, & 0 \leq I \leq 1, \\ \dfrac{(k-I)^3}{3k(k-1)}, & 1 < I \leq k. \end{cases} \tag{5}$$

The difference $V_f - V_0$ is the maximium value of information in this economy: between the first best value of investing and the uninformed ex ante value. This value is monotonically increasing in the cost of investment. Intuitively, under first best investment as the lender knows the probability of each state they eschew lending when the probably of the bad state is sufficiently large. A completely uninformed lender sometimes takes on negative NPV projects. We now turn to the investment decision when the probability of the low state is known.

Figure 3 represents the first-best investment policy. We set $x_h = 2, x_m = 1, x_\ell = 0$, and $I = 0.8$. With no information, the expected NPV is $\frac{1}{3}(2+1+0)-0.8 = 0.2 > 0$, so all firms obtain financing. Under a first-best investment policy, the set of firms that obtain financing (i.e., the range of p_h and p_m for which firms are financed) is given by the shaded region in the figure.



This figure represents the first-best investment level. The parameters are $x_h = 2, x_m = 1, x_\ell = 0, I = 0.8$. The solid blue line represents the equation $p_m + p_h = 1$. The solid red line represents the equation $p_h x_h + p_m x_m = I$. The orange-colored area between the two lines represent combinations of (p_h, p_m) at which the investment has positive NPV.

Figure 3: **First-best Investment**

In the numerical example presented in Figure 3 setting ($x_h = 2, x_m = 1, x_\ell = 0$, and $I = 0.8$), we can calculate $V_f = 0.2853$.

Investment Decisions if p_ℓ is known: If a lender knows p_ℓ, it can identify firms for which cashflows will be either x_h or x_m, but cannot distinguish between these two states. Given the assumed uniform distribution over the probabilities p_h, p_m, and p_ℓ, the conditional probability of each of states h and m given p_ℓ is just $\frac{1}{2}$. Thus, there exists a debt level at which the lender at least breaks even in expectation if and only if

$$(1 - p_\ell)\frac{x_h + x_m}{2} \quad \geq \quad I, \tag{6}$$

or $1 - p_\ell \geq \frac{2I}{k+1}$. Observing that $1 - p_\ell = p_h + p_m$, we can write the last inequality as

$$p_h + p_m \quad \geq \quad \frac{2I}{k+1}. \tag{7}$$

We consider the debt contract that a lender only observing p_ℓ would offer. Given p_ℓ, the breakeven or zero profit debt level D_0 is determined as follows: Suppose the bank is repaid D_0 in both states h and m. Then, we have

$$(1-p_\ell)D_0 = I \implies D_0 = \frac{I}{1-p_\ell}. \tag{8}$$

The maintained assumption that the bank obtains D_0 in state m is only satisfied if $\frac{I}{1-p_\ell} \leq x_m = 1$. If, instead, $1 < \frac{I}{1-p_\ell}$, the bank obtains D_0 in state h and 1 in state m. In this case, its expected profit from lending to a firm with a given p_ℓ is $(1-p_\ell)\frac{D_0+1}{2} - I$. Setting this expected profit equal to zero yields

$$D_0 = \frac{2I}{1-p_\ell} - 1. \tag{9}$$

Putting these two pieces together, the breakeven debt level is

$$D_0 = \begin{cases} \frac{I}{1-p_\ell} & \text{if } 1 \geq \frac{I}{1-p_\ell} \\ \frac{2I}{1-p_\ell} - 1 & \text{otherwise.} \end{cases} \tag{10}$$

We now turn to the maximum value of p_ℓ that is consistent with non-negative profits. Conditional on knowing p_ℓ, the expected value of investing is

$$Z(p_\ell) = \frac{1}{(1-p_\ell)} \int_0^{1-p_\ell} (kp_h + (1-p_h-p_\ell) - I)dp_h. \tag{11}$$

$$= \frac{k+1}{2}(1-p_\ell) - I. \tag{12}$$

Hence, $Z(p_\ell) \geq 0$ if and only if

$$1-p_\ell \geq \frac{2I}{k+1} \iff p_\ell \leq 1 - \frac{2I}{k+1}. \tag{13}$$

We define the zero-profit line given p_ℓ as $1-\frac{2I}{k+1}$. Because $p_h + p_m = 1 - p_\ell$, we can equivalently write this as

$p_h + p_m = \frac{2I}{k+1}$. Define

$$\bar{p_\ell} = \max\left\{1 - \frac{2I}{k+1}, 0\right\}$$

Thus, the ex ante value of investing if p_ℓ is known is:

$$V_\ell \;=\; 2\left[\int_0^{1-\bar{p}_\ell}\int_{(1-\bar{p}_\ell)-p_h}^{1-p_h}(kp_h+p_m-I)\,dp_m\,dp_h \;+\; \int_{1-\bar{p}_\ell}^{1}\int_0^{1-p_h}(kp_h+p_m-I)\,dp_m\,dp_h\right] \quad (14)$$

Lemma 2 *The ex ante value of investing if p_ℓ is known is*

$$V_\ell = \begin{cases} \dfrac{(k+1-2I)^2(I+k+1)}{3(k+1)^2}, & 0 \leq I \leq \dfrac{k+1}{2}, \\ 0, & \dfrac{k+1}{2} < I \leq k. \end{cases} \quad (15)$$

Notice that for $I \leq \frac{k+1}{2}$, we can write V_ℓ as $V_\ell = V_0 + \frac{4I^3}{3(k+1)^2}$, namely, the no information version plus a correction for the benefit of information.

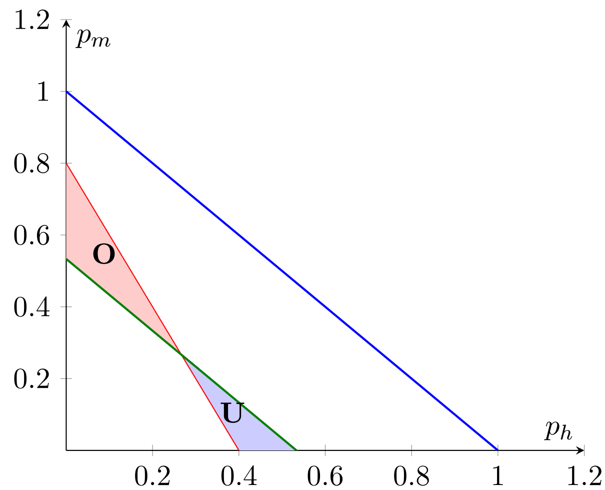
To illustrate the set of projects that are undertaken by a bank, and the accompanying welfare loss, we return to our running example. As before, we set $x_h = 2, x_m = 1, x_\ell = 0$, and $I = 0.8$. Here, $V_\ell = 0.2759$. The set of feasible projects lie below the blue line that intersects both axes at 1 defined as $p_m + p_h = 1$. The solid green line represents the equation $(p_h + p_m)\frac{x_h+x_m}{2} = I$, the breakeven threshold when p_ℓ is known. All projects above this line obtain financing. The red-colored area (labeled "O") represents over-investment under bank lending (i.e., firms that obtain financing but have negative NPV), and the blue-coloured area (labeled "U") represents under-investment under bank lending (i.e., firms that have positive NPV but do not obtain financing). As shown in Figure 4, bank lending is feasible whenever $p_h + p_m \geq \frac{1}{2}$.

Observe that depending on parameter values, it is possible that bank lending leads to over-investment in some projects and under-investment in others. That is, some of the firms that the bank lends to have negative NPV, whereas there are other positive NPV projects that fail to obtain a loan from the bank.

Lender knows p_h but does not know p_m or p_ℓ. Analagous to the previous analysis, given the prior beliefs over the probabilities, and knowing p_h the lender assumes that states m and ℓ are equally likely. Therefore, from the viewpoint of the lender, the expected cash flow of the firm at time 1 is given by $p_h x_h + (1-p_h)\frac{x_m+x_\ell}{2} - I = p_h k + (1-p_h)\frac{1}{2} - I$ (recall that $x_\ell = 0$). Therefore, it is feasible for the the firm to obtain financing if and only if

$$p_h \;\geq\; \frac{2I-1}{2k-1}. \quad (16)$$

We note in passing that $k > I$, so that the high state generates large enough cashflows to repay the



This figure represents the set of firms that obtain financing under bank screening. The parameters are $x_h = 2, x_m = 1, x_\ell = 0, I = 0.8$. The red-colored area (labeled "O") represents over-investment under bank lending (i.e., firms that obtain financing but have negative NPV), and the blue-coloured area (labeled "U") represents under-investment under bank lending (i.e., firms that have positive NPV but do not obtain financing).

Figure 4: **Set of Projects Undertaken with Bank Lending**

investment. In general, the financing contract will specify an amount $y_j \in [0, x_j]$ that is rendered for payment, while the entrepreneur keeps $x_j - y_j$ in each state. An equity contract will specify $y_j = \alpha x_j$, with $\alpha \in [0, 1]$. In practice, many equity-like contracts include liquidation preferences in high states that lead to $\frac{y_h}{x_h} > \frac{y_m}{x_m}$. So the minimum p_h at which you would invest is given by $(2k-1)p_h = 2I - 1$, or

$$\underline{p}_h = \max\left[\frac{2I-1}{2k-1}, 0\right]. \tag{17}$$

We now turn to the ex ante value of investing if p_h is known. We obtain

$$V_h = 2\int_{\underline{p_h}}^{1}\int_{0}^{1-p_h}(p_h k + p_m - I)dp_m dp_h \tag{18}$$

$$\tag{19}$$

Lemma 3 *If p_h is known, the ex ante value of investment is*

$$V_h = \begin{cases} \dfrac{k+1-3I}{3}, & 0 \leq I < \dfrac{1}{2}, \\ \dfrac{4(k-I)^3}{3(2k-1)^2}, & \dfrac{1}{2} \leq I \leq k. \end{cases} \tag{20}$$

Notice that for $I \geq \dfrac{1}{2}$, $V_h = V_0 + \frac{(2I-1)^2(3k-1-I)}{6(2k-1)^2}$, where the last term represents the value of information, again relative to no information.

As with bank financing, we do not take a stance on who retains the surplus when the firm is financed. We continue to assume that bargaining between the firm and the financiers is frictionless, so that all positive NPV projects obtain financing. To illustrate these effects, we again turn to our running example, with $x_h = 2, x_m = 1, x_\ell = 0$, and $I = 0.8$. Figure 5 denotes the set of firms that obtain financing if the lender knows p_h. As with bank lending, there is a set of negative NPV projects that are financed and a set of positive NPV projects that fail to obtain financing. The solid green line represents the equation $p_h = \frac{2I-1}{2k-1}$, the breakeven threshold when p_h is known. All projects to the right of this line obtain financing. The red-colored area (labeled "O") represents over-investment if p_h is known (i.e., firms that obtain financing but have negative NPV), and the blue-coloured area (labeled "U") represents under-investment under VC investment (i.e., firms that have positive NPV but do not obtain financing).

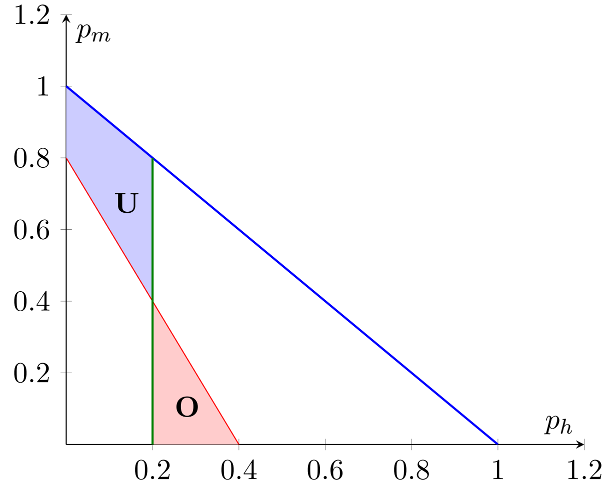
Finally, with these numerical values, we can compute the value generated for the informed lender as $V_h = 0.2560$.

4 Analysis and Discussion

The difference between account-based and token based payment systems means that bank intermediated lending systems are not fungible with stablecoin intermediated lending systems. The differences in information production and use by lenders across the two systems lead to different sets of funded projects and thus aggregate risk in the economy.

We observe that low state informed lender is more attractive than high state information investing for economies with smaller investment amounts or with smaller upside in the high state. This suggests that bank lending economies will be associated with smaller investment projects and those with smaller upside potential.

Proposition 1 *The value of information about the high cashflow state depends on the extent of the cashflows (captured by k) and cost of investment I.*



This figure represents the set of firms that obtain financing if p_h is known. The parameters are $x_h = 2, x_m = 1, x_\ell = 0, I = 0.8$. The solid blue line represents the equation $p_m + p_h = 1$. The solid red line represents the equation $p_h x_h + p_m x_m = I$, the first-best investment threshold. The solid green line represents the equation $p_h = \frac{2I-1}{2k-1}$, the breakeven threshold when p_h is known. All projects to the right of this line obtain financing. The red-colored area (labeled "O") represents over-investment under VC investment (i.e., firms that obtain financing but have negative NPV), and the blue-coloured area (labeled "U") represents under-investment under VC investment (i.e., firms that have positive NPV but do not obtain financing).

Figure 5: **Set of Projects Undertaken with VC Financing**

i. For any investment level $I > \frac{1}{2}$, there is a k^*, such that for $k > k^*$, the value of investing with high state information is higher than investing with low state information so $V_h > V_\ell$.

ii. For any k, there is an investment level I^*, such that for $I > I^*$,, the value of investing with high state information is higher than investing with low state information so $V_h > V_\ell$.

Aggregate lending volumes and the resultant risk exposure will also differ across the different regimes. To determine these economy wide variables for each relevant case we consider the set of projects that are undertaken. To see this, consider investment under the low information regime. Given the bank's optimal investment policy, the aggregate investment is given by the mass of projects that are viewed as viable multiplied by the investment amount.

$$I_\ell \;=\; 2I\left[\int_0^{1-\bar{p}_\ell}\int_{(1-\bar{p}_\ell)-p_h}^{1-p_h} dp_m\,dp_h \;+\; \int_{1-\bar{p}_\ell}^{1}\int_0^{1-p_h} dp_m\,dp_h\right]. \tag{21}$$

We obtain

$$I_\ell = \begin{cases} \frac{I(k+1-2I)(k+1+2I)}{(k+1)^2} & \text{for } 0 \leq I \leq \frac{k+1}{2} \\ 0 & \text{otherwise} \end{cases} \tag{22}$$

Similarly, consider the risk profile of projects that are undertaken under the low information regime. We are interested in the average realization of the high and low cashflow states as these capture the extreme outcomes. To see this, consider the average value of the high outcome state, we are interested in $E[p_h \mid \text{low signal}]$. We obtain

$$E[p_h \mid \text{low signal}] \quad = \quad \frac{2I\left[\int_0^{1-\bar{p}_\ell}\int_{(1-\bar{p}_\ell)-p_h}^{1-p_h} p_h\, dp_m\, dp_h \;+\; \int_{1-\bar{p}_\ell}^{1}\int_0^{1-p_h} p_h\, dp_m\, dp_h\right]}{2I\left[\int_0^{1-\bar{p}_\ell}\int_{(1-\bar{p}_\ell)-p_h}^{1-p_h} dp_m\, dp_h \;+\; \int_{1-\bar{p}_\ell}^{1}\int_0^{1-p_h} dp_m\, dp_h\right]} \tag{23}$$

Similarly, we obtain the conditional average for the low state (p_ℓ) in the low state information regime and across the different information regimes. Defining $T = \frac{2I}{k+1}$ and $L = \frac{2I-1}{2k-1}$ we obtain:

Lemma 4 *The conditional expected values of high and low cashflow state realizations are as follows:*

Conditioning State	*Average p_h*	*Average p_ℓ*
First Best ($I \leq 1$)	$\frac{k^2-I^3}{3k(k-I^2)}$	$\frac{k^2-3I^2k+I^3(k+1)}{3k(k-I^2)}$
Low Signal ($p_h + p_m \geq T$)	$\frac{1+T+T^2}{3(1+T)}$	$\frac{(1-T)(1+2T)}{3(1+T)}$
High Signal ($p_h \geq L$)	$\frac{1+2L}{3}$	$\frac{1-L}{3}$

The likelihood of different risks in the economy can be ranked. First, if the cashflows in the high state are sufficiently large, there is an informational benefit to being informed about the high cash flow state and the economy realizes more outcomes in that region. Similarly in terms of the low state, the bank intermediated lending economy has lower realizations of the low state. Intuitively, the bank restricts investments that fail and so the NBFI economy exhibits larger fails. Overall, the implication of Proposition 2 is that outcomes are more extreme (both good and bad outcomes) for economies that rely on NBFIs.

Proposition 2 *Lenders using different information generate economies with different aggregate risk. In the absence of specialized information,* $E[p_h] = E[p_\ell] = \dfrac{1}{3}$.

i. For k sufficiently high, $E[p_h \mid \text{high signal}] > E[p_h \mid \text{low signal}]$

ii. $E[p_\ell \mid \text{high signal}] > E[p_\ell \mid \text{low signal}]$

For our running example (i.e., with $x_h = 2, x_m = 1, x_\ell = 0$ and $I = 0.8$), these values are summarized in Table 1.

	Mass of Projects Invested in	Aggregate Value	Average p_h	Average p_m	Average p_ℓ
First-best Investment	0.680	0.285	0.427	0.365	0.208
Bank Financing	0.716	0.276	0.395	0.395	0.210
NBFI Financing	0.640	0.256	0.467	0.267	0.267

Table 1: **Overall Outcomes With Different Financing Methods**

As seen from the table, two important differences between bank financing and NBFI financing are: (i) relative to aggregate first-best investment, we obtain over-investment under bank financing and under-investment under NBFI investment (ii) the bank is able to eliminate some projects with a high likelihood of outright failure, whereas the NBFI focuses on projects with a high likelihood of "home run" success.

To understand how an economy with lenders with access to account-based information lead to different outcomes than those that made by risk intermediaries, consider the differences in the average probabilities reported in Table 1. In Figure 6, the average probabilities of each state are depicted.

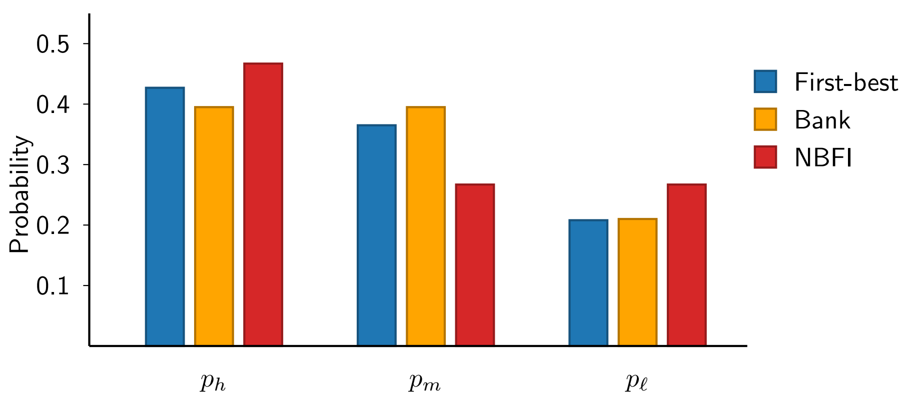


Figure 6: **Probability distributions across financing regimes**

The distribution of project risk is higher for the NBFI than for the bank, in that both the average p_h and the average p_ℓ are higher under NBFI financing. Aggregate value from invested projects is higher under bank financing, despite the over-investment, whereas the aggregate quality of projects (as measured, for example, by the expected cash flow of the average project that is undertaken) is higher under NBFI investment. The shift from the lender operating an account-based payment system to being funded by a token based payment system affects the risk of real projects in the economy. The NBFI economy features more extreme outcomes, in the sense of more projects that have high cash flows and more with low cash flows.

Our focus is on account-based payment systems and it is useful to consider this in the context of tokenized deposits. As a concrete example consider the tokenized bank deposits operated on the Cari network. While described as "tokenized," the fact that such deposits are bank deposits they retain the account-based aspect of payment systems and are thus fundamentally different from stablecoins. What such systems offer in comparison to existing systems are convenience as the deposits are potentially programmable and the shared ledger characteristics potentially reduce clearing and settlement costs. That is, if there is a private value to bank deposits, the extra functionality associated with tokenization and smart contracts will increase this.

Our framework does not touch on maturity or liquidity transformation. In our schemata of a stablecoin intermediated economy (Figure 2) consumers holding stablecoins deposit them in an investment intermediary to generate yield. Even though stablecoins are backed by HQLA and are thus redeemable, if consumers desirous of yield deposit them with an investment intermediary, then capital requirements or other restrictions may be appropriate. Consumer welfare and the resiliency of the payment system is an important regulatory goal, which suggests that there is a role for prudential regulation of stablecoin investment intermediaries. We note in passing that rehypothecation in smart contract based environments is simple. Specifically, If a stablecoin is deposited in an investment intermediary that then reinvests the coin in an illiquid asset, a consumer desirous of a liquid asset could obtain a token that is claim to the future redeemable stablecoins. While providing immediate liquidity such staked tokens could circulate as a token-based means of payment.[10]

Given our focus on the importance of account-based information which is currently generated by banks, a move to stablecoins suggests that there is a social role for providing verifiable transaction histories. On public blockchains, transactions can be tracked from wallet to wallet. However, in general, the owners of wallets are not publicly known. Thus, while any individual can prove they own a wallet, counterparties may or may not publicly identify themselves. If stablecoins are predominantly issued on public blockchains, there is a role for an information aggregator that tracks both wallets and flows.

[10]Staked Ethereum such as that circulated by the Lido network provides a model for how tokens can be used to make illiquid investments tradeable.

5 Conclusion

We focus on the real implications of a change to a stablecoin or token-based payment economy. Given the information inherent in account-based payment systems, a shift to a tokenized payment system will lead to more extreme real outcomes – higher probabilities of high outcomes and higher probabilities of low outcomes.

A change to a stablecoin intermediated system may require a different regulatory approach. First, technology underpinning tokenization makes rehypothecation or the origination of claims for future cashflows a simple smart contract implementation. Such claims could be used as a means of payment, and should be carefully monitored by regulators. Second, the information provided by an account-based payment system is not easily replicated in a token-based world but could be implemented with regulation.

More broadly, if the economy shifts from a bank-intermediated to a stablecoin-intermediated one, the current regulatory levers will have to be applied to the full range of stand alone institutions that collectively will provide the services that currently banks provide.

6 Proofs

Proof of Lemma 1

Graphically, V_f is the area of the simplex less the negative NPV projects.

i. If $I < 1$, the planner invests in both the medium and high states. Thus, $V_f = 2\int_0^1 \int_0^{1-p_h} (kp_h + p_m - I)dp_m dp_h - 2\int_0^{I/k} \int_0^{I-kp_h} (kp_h + p_m - I)dp_m dp_h$

ii If $1 > I$ the planner only invests in the high state. Thus $V_f = \int_{\frac{I-1}{k-1}}^{I/k} \int_{I-kp_h}^{1-p_h} (kp_h + p_m - I)dp_m dp_h + \int_{I/k}^{1} \int_0^{1-p_h} (kp_h + p_m - I)dp_m dp_h$

The result follows.

■

Proof of Lemma 2

We evaluate

$$V_\ell \;=\; 2\left[\int_0^{1-\bar{p}_\ell} \int_{(1-\bar{p}_\ell)-p_h}^{1-p_h} (kp_h + p_m - I)\, dp_m\, dp_h \;+\; \int_{1-\bar{p}_\ell}^{1} \int_0^{1-p_h} (kp_h + p_m - I)\, dp_m\, dp_h\right]$$

Note $\bar{p}_\ell = 0$ for $I > \frac{k+1}{2}$, and so it collapses to 0.

The result follows

■.

Proof of Lemma 3

Note that $\underline{p}_h = 0$ for $I < \dfrac{1}{2}$, which yields the range for the integral.

The result follows.

■

Proof of Proposition 1

i. If $I > \frac{1}{2}$, for a fixed I find a k, so that $I < \frac{k+1}{2}$. For this k, V_h is cubic as $V_h = \frac{4(k-I)^3}{3(2k-1)}$ and $V_h > V_\ell$.

ii. If $I = \frac{k+1}{2}$, $V_\ell = 0$, but $V_h > 0$ and so the result holds.

■

Proof of Lemma 4

Follows directly from the arguments in the text.

■

Proof of Proposition 2

i. Referring to Lemma 4 for $I > \frac{1}{2}$, $E[p_h \mid \text{high signal}]$ is greater than $\frac{1}{3}$, whereas in the low signal case, p_h and p_m are treated symmetrically.

ii. Referring to Lemma 4, the correction to the average p_ℓ for the high signal is $\frac{2I-1}{2k-1}$ as p_m and p_ℓ are treated symmetrically.

■

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