

There are two very different types of debt:

1. Debt issued to buy a liquid asset, or issued with a liquid asset as collateral
2. Debt issued with an illiquid asset as collateral, or backed mostly by reputation

The first type is very simple, does not require complex institutions such as banks, and can be made to have very little risk. If the creditor can liquidate the asset whenever it decreases in price too much, then its own money will only be at risk in case of a relatively rare sudden price shock. This is the type of lending that we often see in exchanges and in DeFi today. (Other liquidation rules, if used, would introduce some risk premium equivalent to the premium for an option contract.)

The second type of debt is very different. The promise of the debtor to repay in the future is an asset, but because of adverse selection it is a very illiquid one and can hardly be sold. As a result, the institution providing such credit needs to both have specialized knowledge and substantial reserves to put such knowledge to use.

At first glance, one might think that there is not much opportunity for the second type of lending in a decentralized fashion, but that would be untrue. While a decentralized bank cannot accept a house or a car as a collateral for a loan, for it would need a government to back up claims on such goods, it can offer loans using NFTs or other valuable but illiquid assets as collateral. It can be expected that the number of such assets, perhaps representing possession of real-world assets in the blockchain, will increase in the future.

Moreover, there is much lending that is backed solely by reputation or by a credit score. Because government regulations in this regard often increase credit risk (e.g. by requiring that negative credit score information be erased after 5 years), and because governments will be incapable of enforcing these regulations on decentralized banks, it can be argued that such banks may end up with a competitive advantage. Decentralized banks, if they exist, will likely require personal information for such loans, and will sell rights on eventual defaulted debts to third-party debt collectors, just as traditional banks do. Therefore, decentralized banks may well be able to obtain a significant profit by using their reserves for such lending.

However, the history of banking shows that those with the specialized knowledge to provide such loans are often limited by the amount of capital they have. At the same time, many investors who have the available capital lack the knowledge to lend them productively. Therefore a decentralized bank, if it is to be successful, has to both lend money and borrow it from others.

This cannot happen unless there is a mechanism in place to protect the depositors

, those that lend money to the bank. Of course, the bank insider should not be able to abscond with depositors' money, but this is hard to do. Some mechanism needs to be in place not only to prevent the insider from outright stealing money from the bank's treasury, but also to prevent it from tunnelling money to himself or to his associates.

I'll sketch a potential solution to this problem, which is indebted to the classical analysis of [Calomiris \(1991\)](#). To be clear, my proposed mechanism can certainly be improved dramatically. I will also assume that the bank is free to disclose all relevant information about the contracts it participates in (so I'll ignore privacy considerations of bank borrowers).

A banker creates a smart contract and provides some initial capital of its own. This will be the bank's equity capital. It also invites depositors to put money at the contract in order to receive interest. The banker can then use the bank's treasury to give out loans, but these can only be done slowly (e.g. only 5% of the available funds may be used every week). This is so that, if the banker is committing fraudulent transfers, the depositors have some time to act.

The depositors can withdraw money on demand. The banker is supposed to keep a significant reserve. If a bank run does happen, however, and the bank remains without sufficient cash for some determined period (a few days), a bankruptcy process begins, in which all the illiquid assets of the bank are auctioned off over the next weeks. Any money obtained in this way is divided proportionally to the remaining depositors up to the amount due to them, with any surplus being given back to the banker.

If fraud is being committed, the first depositors to withdraw their money will not suffer any losses, and thus will be rewarded for causing a liquidation in this scenario. The liquidation, while potentially causing losses to the other depositors, will still save a substantial part of their capital, as compared to fraud continuing undetected. During a liquidation, equity capital from the banker is likely to be wiped out, generating a strong incentive for him to maintain transparency and a sustainable cash flow. If the bank operates reliably and profitably, the banker will be able to cash out profits slowly over time according to some predetermined rule (e.g. at most 1% of available funds per week).

To prevent bank runs from happening unnecessarily, the banker should have the right to put more of his own money into the bank. However, a better-designed mechanism should also allow:

- Non-controlling shareholders controlling bank equity. This will allow the bank to issue new stock to raise funds to avoid liquidation if needed. The bank would allow profits to be distributed to shareholders by having the bank buy its own shares at the market. Of course, there

would be a need for some governance protocol to replace the banker if needed.

- Junior debt that may be emitted to outsiders at higher interest rate, and that is not payable on demand. Such debt can

be emitted both during liquidity crises, to avoid unnecessary bankruptcies, and preventively, as a cushion to reassure depositors.

Any comments on the feasibility of these ideas would be very much appreciated!