

I. Motivation

The interbank market in many countries features a tiered structure. A few large banks are intermediating funds among numerous heterogeneous small banks. The credit allocative efficiency among small banks is essential to a well-functioning interbank market as well as monetary policy transmissions. In the tiered interbank market, the large bank can relax financial frictions and improve credit allocation efficiency through **delegated monitoring**. (Craig and Ma, 2022) In the meanwhile, however, the large bank enjoys **market power**, and would charge monopoly rents in the interbank intermediation. (Eisenschmidt et al., 2021)

The central bank has many tools to implement monetary policies, and the interbank market plays a crucial role in the transmission. Specifically, through the conventional instrument, the **open market operation (OMO)**, the central bank injects or withdraws liquidity to the interbank market. As only primary dealers (large banks) are eligible to be the central bank's OMO counterparty, the interbank market is multi-tiered. So the efficacy of OMO relies on the large bank's functioning in channeling funds from the central bank to small banks. In the meanwhile, **structural monetary policy tools (direct lending)**, are also frequently used, especially during the market turbulent period. The aim of direct lending is to inject liquidity directly to small banks when the interbank market is not functioning well. **In summary, the relative efficacy between OMO and direct lending depends on the large bank's (dys)functioning in the interbank market.**

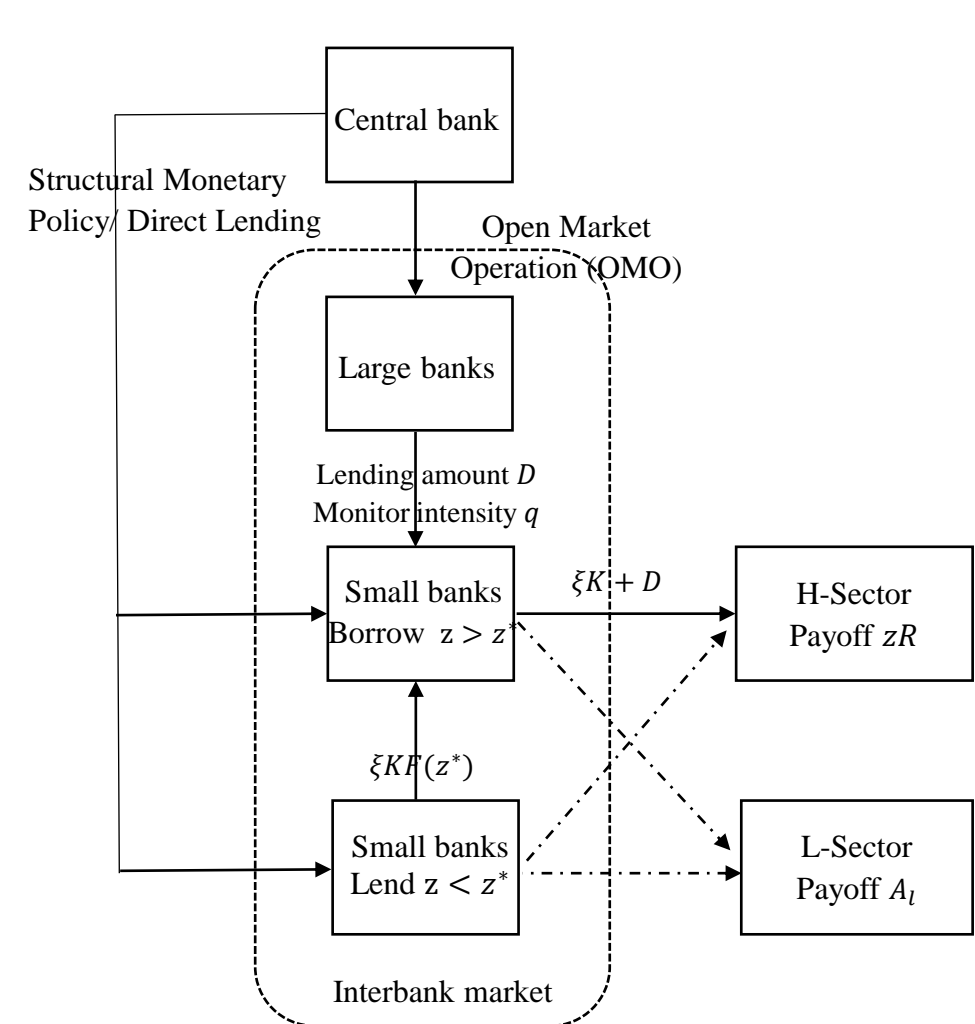


Figure 1. Multi-tiered interbank market

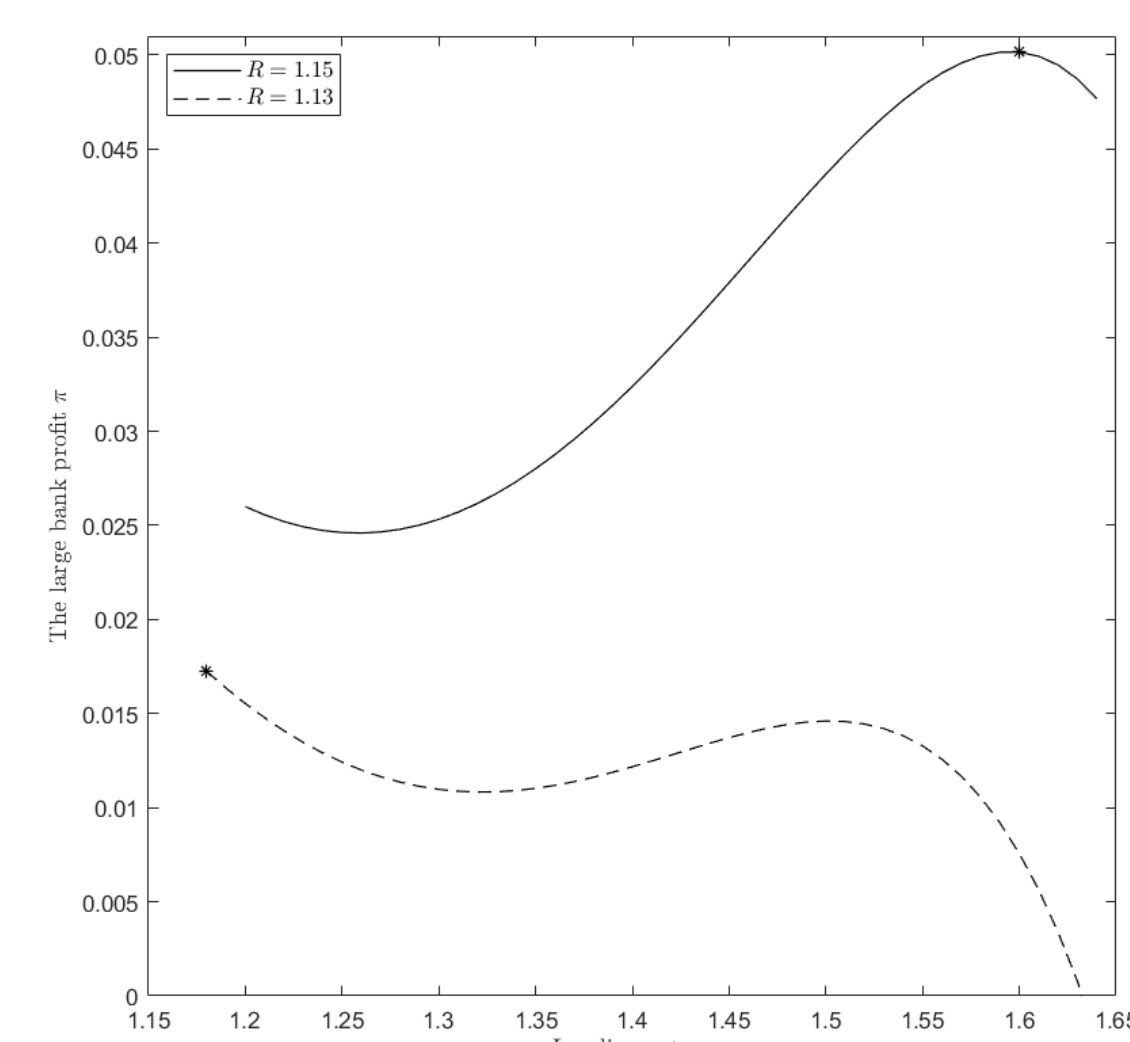


Figure 2. The large bank's optimal choice

III. Monetary policy implementations

When the economy goes well, the large bank will choose the interior optimal solution (solid line in Figure 2), and the interbank market credit allocation is highly efficient. In this scenario, the central bank's OMO through this well functioning interbank market is relatively more effective than direct lending, as shown in Regime 1 of Figure 3.

However, when the economy decays, the large bank will choose the corner solution (dashed line in Figure 2), leading to a dysfunctioning interbank market. Due to the market power, the large bank charges monopoly rents, an additional funding cost incurred by small banks. In this scenario, the central bank's direct lending can provide cheaper fundings to small banks, which is more effective than OMO, as shown in Regime 2 of Figure 3.

Interestingly, the large bank's optimal choice is very fragile around the economic condition threshold R^* . Following a tiny decay in the economic condition around this threshold, the large bank will shift from the interior optimal solution to the corner solution, leading to a large drop in the interbank market allocative efficiency. **Thus, the large bank's sudden dysfunction will shift the interbank market from the well-functioning regime to the dysfunctioning regime, and central bank's direct lending is relatively more effective to OMO in implementing monetary policies in this dysfunctioning regime.**

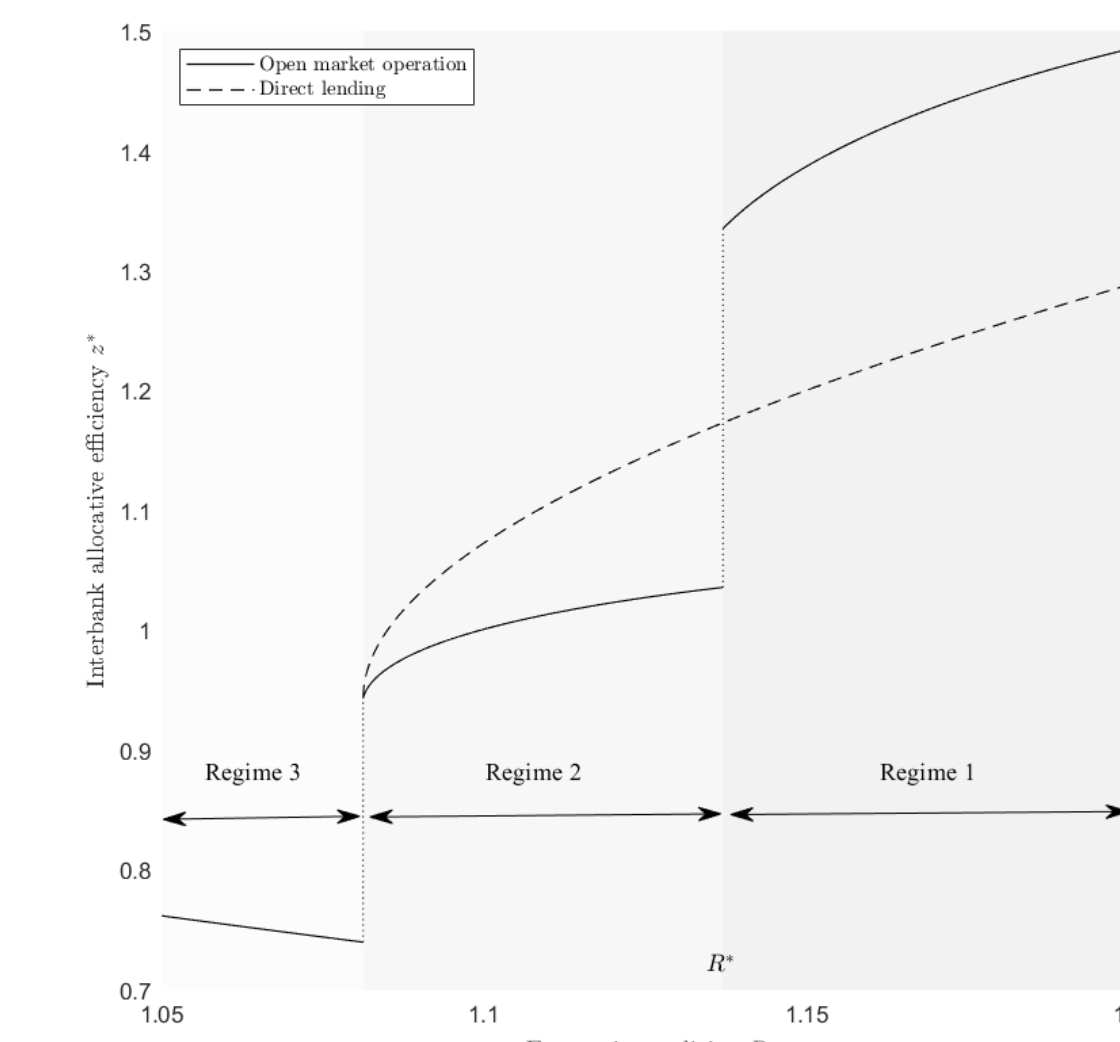


Figure 3. Allocative efficiency: OMO vs. direct lending

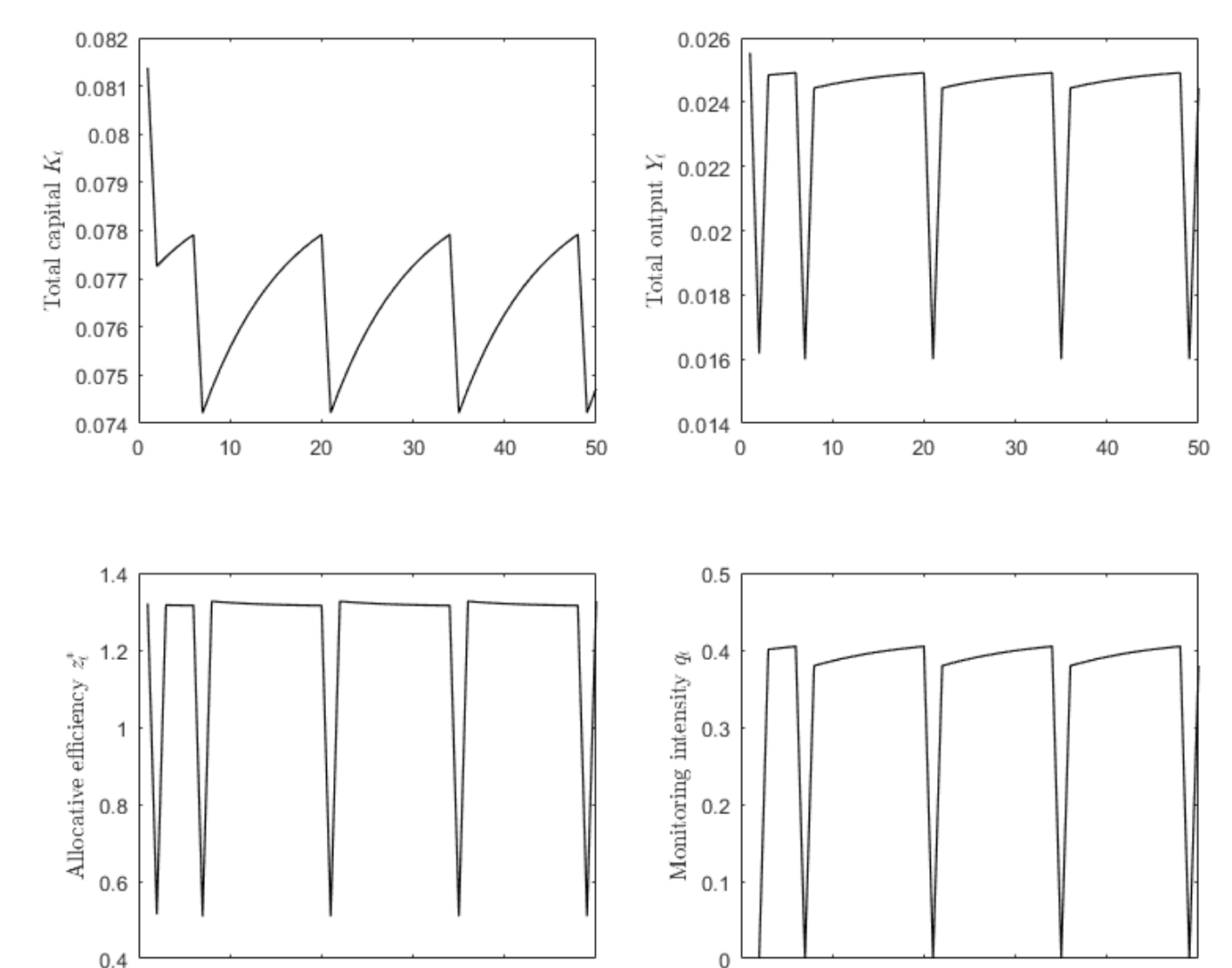


Figure 4. Endogenous boom-bust cycles

II. Model and mechanism

Motivated by these observations, I build a multi-tiered interbank market model highlighting the large bank's role in the interbank credit allocation, and apply this framework to study the central bank's monetary policy implementations. My model is based on the interbank market model studied in Boissay et al. (2016) and Dong and Xu (2020), where numerous small banks with great heterogeneity in efficiency can borrow and lend with a competitive interest rate.

As shown in Figure 1, I introduce the large bank in the framework, which plays two important roles. First, the large bank participates in the interbank lending, and makes profits from interest margins. Second, the large bank can relax small bank's borrowing constraint through **delegated monitoring**. The monitoring is costly, so the large bank's monitoring intensity can only be incentivized through her own profits. Moreover, the large bank enjoys **market power**, in that her choices have an impact on the interbank lending rate in equilibrium. So the large bank will internalize the market power into her optimal choice, to maximize profits by choosing her interbank lending amount and monitoring intensity.

The model features **the large bank's sudden dysfunction**, that is a small deterioration in economic conditions can trigger a sharp drop in the large bank's monitoring intensity, as well as the interbank allocative efficiency among small banks. The mechanism that drives the large bank's sudden dysfunction is the complementarity between the large bank's monitoring and the interbank market equilibrium, which I call the **monitoring-quantity-price spiral**.

The large bank's objective function is depicted in Figure 2. Specifically, when the large bank's monitoring intensity is high, interbank financial frictions become weak. This would boost small bank's interbank borrowing demand, and push up the interbank lending rate. So the interbank lending becomes more profitable, incentivizing the large bank to choose a even higher monitoring intensity. This leads to an interior optimal solution, where the interbank market is functioning well. However, such a spiral could go into the opposite direction, leading to the corner solution, where the large bank exert zero monitoring intensity and the interbank market is dysfunctioning. **To conclude, the large bank's optimal choice depends on the relative profits at the interior optimal solution and the corner solution.**

IV. Endogenous boom-bust cycles

To analyze implications on aggregate quantities, I introduce the multi-tiered interbank market into a standard macro model. The economic condition is endogenized as MPK from the production sector. Similarly, there exists a threshold of total capital outstanding. A tiny amount of capital accumulation around this threshold would trigger the large bank's sudden dysfunction, leading to a large drop in the interbank allocative efficiency as well as total output, which can be interpreted as **financial crisis**.

In a dynamic setting, the large bank's sudden dysfunction can serve as a new mechanism in generating endogenous boom-bust cycles. As shown in Figure 4, the economy never converges, and financial crisis occurs in about every 12 years. This is because the large bank shifts between the interior optimal solution and the corner solution around the threshold of total capital outstanding, leading to the variations in the allocative efficiency, the aggregate quantities, as well as the economic conditions (or MPK).

V. Contributions

This paper builds a theoretical framework to analyze the central bank's optimal monetary implementations, highlighting the large bank's intermediation in a multi-tiered interbank market.

The theory features the large bank's sudden dysfunction, which can serve a new mechanism to generate endogenous boom-bust cycles, as well as financial crisis.

This paper also establishes supporting evidence in the context of China, including the stylized facts on China's multi-tiered interbank market, on the PBOC's monetary policy operations, as well as their transmissions in the interbank market.

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