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Low Interest Rate Environment and Capital Mismatch: Based on the Economic Environment of China

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Abstract: A notable feature of the Chinese economy over the past decade has been the continuous decline in nominal interest rates. As of May 2025, the one-year loan prime rate (LPR) had gradually declined from 5.3% to 3.1% (data from the People's Bank of China (PBoC). Although conventional wisdom suggests that a low interest rate environment can stimulate economic activity, many studies in recent years have shown that a persistently low interest rate environment can exacerbate capital misallocation in the credit market, leading to economic contraction. This paper studies the impact of the current low interest rate environment on the credit market under China's economic system by constructing an Agent-Based Model. The study found that a sustained low interest rate environment will exacerbate the capital mismatch between state-owned enterprises and private enterprises in the credit market, which in turn will lead to a decline in the average return on investment. Structural reforms can eliminate the adverse effects of this phenomenon, but there are still difficulties in practice.

Keywords: Low interest rates, capital misallocation, financial frictions, agent-based model, structural reform

1. Introduction

In short: a low interest rate environment enables enterprises with low productivity to access financial markets and has a crowding-out effect on the investment of high-productivity enterprises. This phenomenon is particularly serious in China's current economic system due to the parallelism of regulated interest rates and market interest rates and the discrimination between banks towards state-owned enterprises (SOEs) and private enterprises (POEs). Academic research has primarily focused on two key issues: the influence of a low interest rate environment on capital allocation and the impact of China's dual-track interest rate system on capital allocation. Asriyan and Dosis' research demonstrated that capital misallocation resulting from a low interest rate environment leads to a contraction of output and a decrease in social welfare. Chen and Liu's research revealed that capital misallocation in China's current economic framework persists and cannot be resolved by achieving interest rate liberalization. This paper uses Agent-Based Modeling (ABM) to integrate and model heterogeneous State-Owned Enterprises (SOEs) and Private-Owned Enterprises within a comprehensive model that incorporates both regulated and market interest rates, along with financial frictions. The study aims to simulate the effects of interest rate fluctuations and bank preferential policies towards SOEs on capital allocation and investment returns within the credit market. The

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paper presents a theoretical model, derives theoretical outcomes from numerical simulations, discusses selected theoretical results, and concludes with a summary of key findings and contributions.

2. Low interest rate environment and capital misallocation

This is primarily achieved by enhancing the inclination and financial capacity of enterprises to undertake investment endeavors. When interest rates are lower, the cost of borrowing decreases, making it more attractive for businesses to secure funds for expansion, innovation, and other investment projects. This general equilibrium capital mismatch weakens the stimulating effect of declining interest rates on the credit market. When interest rates decline, the rise in asset prices will increase the net worth of enterprises, thereby increasing their willingness and ability to obtain loans. This phenomenon should have strengthened the stimulating effect of falling interest rates, but this balance sheet effect is caused by unexpected changes in the price of capital and cannot be sustained in the long term. Instead, the general equilibrium forces that lead to capital misallocation will continue until interest rates stop falling. The research conducted by Asriyan and Dosis provides empirical support for this perspective. Moreover, in the context of China's economic system, the issue of capital misallocation becomes even more pronounced. The unique characteristics and structures within China's economy may exacerbate the negative consequences of interest rate fluctuations and capital misallocation, posing significant challenges to maintaining stable and sustainable economic development [1,2]. In China's current credit market landscape, large state-owned banks hold a dominant position. The government controls the interest rates on deposits and loans as well as the granting of bank credit through benchmark deposit and lending rates, window guidance, and limits on the scale of bank credit. Therefore, although SOEs actually have lower average productivity than POEs today, banks are still more willing to provide funding to SOEs with government guarantees [3,4]. Coupled with the impact of credit control policies and interest rate control policies, banks are unable to adjust interest rates independently to obtain higher loan returns. n the context of a low interest rate environment, banks tend to prioritize safety, leading them to favor SOEs that have the backing of local governments. As a consequence, POEs, particularly small and medium-sized ones that lack both valuable collateral such as land and government endorsements, have faced long-standing challenges in fulfilling their credit requirements through traditional banking channels. On the other hand, unlike the shadow banking dominated by non-bank financial institutions in Western countries, China's shadow banking is mainly dominated by banks and is an extension of the banking chain. Its main task is to provide credit to the real economy [5]. In China, about two-thirds of shadow banking is actually “disguised bank loans” [6]. In 2018, the “Guiding Opinions on Regulating the Asset Management Business of Financial Institutions” was issued, and the central bank strictly controlled shadow banking in order to reduce debt risks. The contraction of credit and funds has further exacerbated the financing difficulties of POEs.

According to data from the China Finance Yearbook of the Ministry of Finance, in the ten years from 2008 to 2017, the total assets of SOEs surged 4.4 times, and total liabilities increased by a corresponding 4.7 times, accounting for 78% of GDP and 144%. However, the proportion of total profits of SOEs fell from 4.2% to 3.9%, and operating income as a percentage of GDP fell from 72% to 65%. If inefficient or even loss-making SOEs cannot be restructured, they will continue to rely on the low interest rate environment to squeeze limited credit resources, becoming “zombie enterprises”. This will lower the overall economic growth rate and push up the macro debt burden [7].

3. Theoretical model

This paper constructs an Agent-Based Model that incorporates three primary entities: SOEs, POEs and banks. The average return on investment of SOEs and POEs is different, and each enterprise is

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heterogeneous. Banks, operating within the framework of the model, allocate a limited number of loans to each enterprise at a regulated interest rate. Moreover, they extend preferential policies specifically to SOEs. The loan approval process is contingent upon the enterprise's investment return. If an enterprise's return on investment surpasses the regulated interest rate, the bank approves the loan application. In cases where an enterprise is unable to secure a loan at the regulated interest rate, it then turns to applying for a loan at the market interest rate. Again, the loan is granted only when the enterprise's return on investment exceeds the market interest rate. Enterprises apply for loans from the bank in a random order until all enterprises have applied. In the model, this paper makes the following five key assumptions:

- Assumption 1: The average return on investment of SOEs is lower than that of POEs. This assumption is consistent with reality and has been demonstrated in Section 2.
- Assumption 2: The return on investment of each enterprise obeys a lognormal distribution with a standard deviation of 0.05.
- Assumption 3: Each enterprise applies for a unit of loan and will not borrow repeatedly.
- Assumption 4: There are both regulated and market interest rates in the credit market.
- Assumption 5: The bank has a probability of directly rejecting POEs ' applications for loans at the regulated interest rate, and the rejected POEs can only apply for loans at the market interest rate.

The Chinese government's credit control and interest rate control policies result in a higher market interest rate than the regulated interest rate, limiting loan supply. Traditional banks issue loans at the regulated rate, while shadow banks issue loans at the market rate. The relationship between traditional and shadow banks under the current Chinese economic system can be simulated by adjusting interest rates in the model.. This assumption is intended to simulate the preferential policies adopted by banks for SOEs. In reality, such preferential policies are usually implemented in the form of government subsidies and window guidance, which are difficult to quantify. Chen's study assumes that POEs are completely unable to obtain loans at the regulated interest rate, that is, all loans to POEs follow the market interest rate [8]. Liu's study simulates the incentive mechanism of banks for SOEs by setting a multiplier τ [9]. In order to give full play to the flexibility of ABM, this paper adopts the method of setting a probability of direct refusal of loans to POEs at the regulated interest rate by banks to simulate the preferential policies of banks for SOEs. That is, the higher the probability, the greater the preferential treatment of SOEs by banks. When the probability is 1, POEs will not be able to obtain loans at the regulated interest rate at all, and when the probability is 0, the preferential policies of the bank for SOEs will disappear. By adjusting this probability in the model, the impact of changes in preferential policies of banks for SOEs on capital allocation and investment returns in the credit market can be simulated.

4. Numerical simulation and theoretical results

4.1. Proposition 1. benchmark model

To ensure the utmost accuracy of the conclusions drawn, it is imperative to populate the model with a substantial number of enterprises and conduct multiple simulation runs. In this paper, the number of SOEs and POEs is set to 10,000, respectively, and 10 simulation experiments are performed for each proposition to obtain the average value for analysis. Due to the difficulty in obtaining specific data, it is difficult to quantify the average return on investment of SOEs and POEs. In this paper, the average return on investment of SOEs is set to 10%, and the average return on investment of POEs is set to 20%, based on data from the literature [10]. The benchmark model uses the market quotation rate for one-year loans in May 2025, which is 3.1%, as the regulated interest rate. The market interest rate is set at 9.3%. In addition, the supply of loans at the regulated interest rate is set at 9,000. The

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probability of a bank directly rejecting a private enterprise's loan at the regulated interest rate is set at 70%. After simulation, the total investment return in the credit market is 2920.8795; the average investment return is 0.1615.

4.2. Proposition 2: the impact of changes in the regulated interest rate on capital allocation and investment returns in the credit market

When the regulated interest rate experiences a 50% reduction, dropping from 3.1% to 1.55%, the total investment return in the credit market is 2925.2403, while the average investment return is 0.1599. In other words, there is a 0.15% increase in the total investment return, but the average investment return has decreased by 0.99%, which is consistent with the expectations of this paper. The decrease in the regulated interest rate has enabled more low-productivity enterprises to obtain loans. However, the existing constraints on the supply of loans at the regulated interest rate and the preferential policies of banks towards SOEs have caused these loans to flow more to SOEs with lower average productivity. POEs that have been squeezed out can only seek loans at market interest rates, which are higher. This has led to a weakening of the growth effect of the decline in the regulated interest rate on total investment return and a decrease in the average return on investment.

4.3. Proposition 3: the impact of the credit boom on capital allocation and investment returns in the credit market

When the supply of loans at the regulated interest rate is increased by 50% rising from its initial level to 12,000, the total return on investment in the credit market is 2980.3227, while the average return on investment is calculated to be 0.1569. In other words, the total return on investment has increased by 2.04%, but the average return on investment has decreased by 2.85%. These findings are in congruence with real-world observations. When the supply of credit increases under a regulated interest rate, more enterprises are able to obtain loans at low interest rates. However, due to the preferential policies of banks towards SOEs, a greater proportion of these loans also goes to SOEs, which typically exhibit lower average productivity levels. This results in a situation where although the total return on investment has increased, the average return on investment has decreased significantly. A typical example is that in response to the global financial crisis, the Chinese government launched a massive stimulus plan of 4 trillion yuan at the end of 2008, which led to an extremely significant expansion of credit. Although the stimulus plan boosted total investment, it also led to a significant decline in the return on investment [11].

4.4. Proposition 4: the impact of changes in banks' preferential policies towards SOEs on capital allocation and return on investment in the credit market

When the probability of banks directly refusing private loans at the regulated interest rate drops to 0, the total investment return in the credit market is 2859.9968; the average investment return is 0.1666. In essence, this indicates a 2.08% decline in the total investment return, yet a 3.16% increase in the average investment return By eliminating preferential policies for SOEs from banks, SOEs and POEs face the same reception conditions, and loans at the regulated interest rate are more likely to go to POEs with higher average productivity. Although it lowered the total return on investment, it made the allocation of funds in the credit market more reasonable, and the average return on investment increased.

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5. Discussion

5.1. Structural reform and existing dilemmas

As evidenced by the preceding analysis, lowering the regulated interest rate and increasing the supply of loans at the regulated interest rate can indeed elevate the total return on investment in the credit market in the short term, but it will lead to more serious capital misallocation, resulting in a lower average return on investment. This causes the credit market to first boom and then decline, which is consistent with the research of Asriyan and Dosis [1,2]. Meanwhile, Chen and Liu's research shows that interest rate liberalization is also unable to solve this phenomenon [3,4]. Structural reforms that expose SOEs to the same degree of financial frictions as POEs are an effective way to solve the problem of resource misallocation. However, such structural reforms are very difficult under China's current economic structure.

Firstly, although SOEs generally exhibit lower productivity levels, due to the absence of a comprehensive and reliable social security system in China, the government relies on SOEs to contribute to the provision of social insurance and other public goods. Therefore, SOEs not only have to maximize profits, but also have the task of maintaining employment and providing public goods. This is one of the main reasons why the government grants them favorable credit conditions [12]. Secondly, SOEs are also important from the perspective of taxation and debt. In China, the boundaries between enterprises and the government are often unclear. After the tax sharing reform in the 1990s, 90% of local tax revenue came from enterprises, which stimulated local governments to compete to invest in the manufacturing and real estate industries, which have huge investment volumes. Local government financing platforms are heavily involved in development and construction through the form of “public-private partnerships” (PPP). As of May 2020, there were a total of 9,575 PPP projects nationwide, with an aggregate value approaching 15 trillion yuan. Furthermore, statistical data reveals that between 2007 and 2014, half of the local government's industrial tax revenue was derived from industries plagued by overcapacity. The current debt situation of local governments is also not optimistic. It is estimated that China's total local debt between 2015 and 2017 will be about 50 trillion yuan, accounting for about 60% of GDP, of which 30% to 40% is “hidden debt” owed by financng platform companies. In 2017, except for the six provinces and municipalities of Beijing, Shanghai, Guangdong, Fujian, Sichuan and Anhui, the average revenue of financing platform companies in other provinces cannot cover debt interest expenses after deducting government subsidies. This means that from the perspective of taxation and debt, structural reforms may lead to the collapse of the local government economy. How to balance short-term and long-term development and allow reforms to proceed smoothly remains an issue worthy of in-depth study.

5.2. Model deficiencies

The paper presents three problems with its model. The first problem assumes that loans supply is limited at regulated interest rates and unlimited at market interest rates, focusing on the impact of preferential policies for Special Economic Zones (SOEs) by banks [13]. However, it overlooks the existence of similar financial frictions at market interest rates, suggesting that financing difficulties for enterprises may be more severe than presented in the model. The second problem assumes equal numbers of SOEs and POEs, but ignores the difference in the proportion of funds and debt among enterprises. Statistics show that SOEs have a higher average debt ratio than POEs, indicating a more serious capital mismatch. The third problem is that the model only simulates the corporate borrowing process and does not consider corporate savings. A more complex model that considers savings dynamics could improve the analysis results.

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6. Conclusion

China's current economic system has led to a capital mismatch in the credit market, and the disadvantages caused by this phenomenon will be exacerbated by a persistently low interest rate environment. Due to banks' preferential policies for SOEs, SOEs, which have relatively low average productivity, have obtained more low-interest-rate regulated loans and crowded out POEs with higher average productivity. A large number of POEs, especially small and medium-sized POEs, face the dual pressure of insufficient credit supply and higher market interest rates. This paper constructs an Agent-Based Model and confirms the above points through dynamic simulation. Based on this, this paper discusses the need for structural reform in China's credit market and analyzes the difficulties behind it. Eliminating the difference in the difficulty of obtaining loans between POE and POEs through structural reform can increase the average return on investment in the credit market, thereby injecting vitality into the market and achieving long-term sustainable economic development.

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