The Effectiveness and Industry Heterogeneity of China's Monetary Policy

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Abstract. Despite the ongoing easing of monetary policy in China over the last few years, economic development has not been as fast as expected, and the effectiveness of monetary policy has been questioned. However, some studies have verified that monetary policy is effective for some industries. Therefore, this article uses the panel regression model and group regression methods to empirically test the effectiveness and industry heterogeneity of China's monetary policy. The full sample regression results show that monetary policy works well in affecting the investment of Chinese listed firms. The results of group regression indicate that monetary policy has no significant impact on corporate investment in five industries: transportation, storage and postal services, accommodation and catering, real estate, health and social work, and culture, sports, and entertainment. This article speculates the reasons for the failure of monetary policy in these five industries and recommends that the People's Bank of China launch more targeted structural monetary policies.

Keywords: monetary policy, effectiveness, industry heterogeneity.

1 Introduction

From 2021 to 2024, the People's Bank of China (PBoC) has lowered interest rates multiple times in an effort to aid in China's economic recovery in the post-epidemic period, with the one-year medium-term lending facility (MLF) rate falling from 2.95% at the beginning of 2021 to 2.3% in August 2024. However, China's actual GDP growth rate in 2023 was 5.2%, failing to reach the World Bank's forecast of 5.6%. China's monetary policy hasn't had the anticipated impact of boosting the economy, and its effectiveness has been questioned.

However, many of China’s industries such as new energy and consumer electronics are developing rapidly. Therefore, China's monetary policy may have industry heterogeneity. Existing empirical studies have also found that monetary policy does not significantly regulate the output of industries such as energy, steel, chemicals, and home appliances[1]. Therefore, this study hopes to empirically test the effectiveness and industry heterogeneity of China's monetary policy.

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2 Literature Review

As illustrated in Figure 1, the transmission path of monetary policy to the actual economy can be roughly divided into three links: First, The central bank's monetary policy action will alter the policy interest rate, which will impact the capital cost of financial institutions; second, the change in the capital cost of financial institutions will hence change the interest rate and scale of their corporate loans; third, the impact of changes in corporate financing costs will affect firms' real economy investment decisions[2].

Fig. 1. Monetary policy transmission path

Existing research has found that the second link, financial institutions to firms, is the primary cause of monetary policy's declining effectiveness. Specifically, the effectiveness of monetary policy is weakened by three reasons: the central bank's macro-prudential policy, imperfections in financial markets, and foreign monetary policy shocks. First, the drop of total factor productivity in China led to a decline in the return on capital, so the "decoupling of funds from the real economy to the virtual economy" intensified. Therefore, the macro-prudential policy produce a "counter-effect" against monetary policy: it hinders banks' credit expansion during monetary easing, weakening the effectiveness of monetary policy. [3]. Second, China's financial system is still not perfect, which leads to higher costs for banks to lend to private enterprises. When monetary policy is loose, the cost of loans to enterprises will only fall to a limited extent[4]. More specifically, in economic downturns, the financial accelerator effect will lead to the deterioration of corporate balance sheets and amplify the impact of information asymmetry[5]. Especially, the prevalence of shadow banking offers companies a subistitute to bank loans, weakens the effect of tight monetary policy[6]. Third, foreign monetary policy shocks will also weaken the regulatory effect of the monetary policy of the country's central bank. When foreign monetary policy is loose, foreign banks will increase their credit and liquidity risks, and to a certain extent replace domestic financial institutions to provide financing for enterprises[7].

Regarding the industry heterogeneity of monetary policy, existing studies have found that there are clear disparities in how monetary policies affect the output of various industries[8]. Generally, capital-intensive industries, industries with small average enterprise size, and industries with high average enterprise debt ratio are more receptive to changes in monetary policy[1]. More specifically, the forward guidance policy has a noteworthy positive impact on high-tech industries and manufacturing but is not significant on real estate and new energy industries[9]. However, another following study found that central bank communication (a type of forward guidance policy) has negatvie imp;act on manufacturing industry, contradictory to the previous research [10].

In general, existing research has proposed a large number of monetary policy measurement tools with sound theoretical support, providing a wide range of reliable

options for this study. In terms of the study of monetary policy effectiveness, existing research has proposed corresponding theories for each link in the entire monetary policy transmission path and conducted empirical research, laying a solid theoretical foundation for this study and providing multiple indicators and methods for measuring the effectiveness of monetary policy. However, in terms of the industry heterogeneity of monetary policy effectiveness, existing research has only conducted an overall output analysis of each industry[1]. Or they focus on analyzing the differences between different tools while ignoring the overall effectiveness of monetary policy[8]. Or maybe the analysis does not cover all industries[9].Therefore, the purpose of this study is to evaluate the overall efficacy of China's monetary policy and to thoroughly examine the variations in monetary policy efficiency across different industries.

3 Methods & Data Sources

3.1 Assumptions

To study the effectiveness and industry heterogeneity of monetary policy, this study uses Chinese-listed company data to analyze China's monetary policy's effects on business investment across industries.

Even though the PBoC has been implementing a loose monetary policy in recent years, China's economic growth in 2023 has fallen short of predictions. Therefore, the efficacy of monetary policy on all corporate investment should be tested first:

Hypothesis 1: China's monetary policy has an ineffective impact on overall corporate investment.

Then, the industry heterogeneity of monetary policy is tested:

Hypothesis 2: China's monetary policy is effective for some industries and ineffective for other industries.

3.2 Variable Selection and Processing

To examine monetary policy's industry heterogeneity from a firm's micro perspective, this study selects corporate investment as the measure of the effectiveness of monetary policy, which is also the explained variable of this study. This research is based on the method of Geng Zhongyuan et al. [9], who also studied the industry heterogeneity of monetary policy, to determine the corporate investment proxy variable:

Corporate Investment = (Cash paid for the purchase and construction of fixed assets, intangible assets, and other long-term assets + cash paid for other investment activities - net cash received from the disposal of fixed assets, intangible assets, and other long-term assets - cash received for other investment activities) / Begging total assets

This study's primary explanatory variable is the monetary policy of the PBoC. The 1-year MLF rate is chosen as the proxy variable in this study. In the interest rate marketization reform framework of the PBoC, the medium- and long-term interest rates in the credit market are regulated by the MLF rate, a medium-term policy rate that represents the banking system's marginal funding cost to receive medium-term base money from the central bank.[11]. Therefore, this study believes that the MLF interest

rate can affect corporate financing costs and hence affect corporate investment decisions.

In addition, to investigate the industry heterogeneity of monetary policy, this study divides Shanghai A-share listed companies into 19 major categories, according to the China Securities Regulatory Commission's "Guidelines for the Industry Classification of Listed Companies" (revised in 2012). Because the financial industry is the transmission channel of monetary policy, it has significantly different accounting indicators and market supervision. Therefore, the samples from financial industry companies are excluded[12][13].

Finally, in terms of control variables, this study refers to previous studies and selects micro-level control variables and macro-level control variables. The micro-level control variables include the return on total assets (ROA), the debt-to-asset ratio (LEV), the ratio of operating cash flow to total assets (CF), the financing constraint (FC), and the logarithm of total assets (LNA). Among them, the financing constraint is measured by the Size-Asset (SA) index, which better avoids endogeneity[14]. The control variables at the macro level include the CPI growth rate representing inflation and the GDP growth rate representing economic development.

Macroeconomic data is from the CEIC database. Data of listed companies is from the CSMAR database.

3.3 Regression model

To verify hypothesis 1, the investment of all firms is regressed on monetary policy:

$$CI_{it} = \alpha_0 + \alpha MP_t + \gamma_m \boldsymbol{Z}^m + \delta_n \boldsymbol{G}^n + u_i + v_t + \varepsilon_{it} \quad (1)$$

where CI is corporate investment, MP is the MLF interest rate, Z is the vector of control variables at the firm level, G is the vector of control variables at the macroeconomic level, u_i is the individual fixed effect, v_t is the time fixed effect, and ε_{it} is the random disturbance term.

Table 1. Descriptive statistics

Variables	Number of Observations	mean	sd	min	max
CI	99,199	0.034	0.064	-1.860	4.865
LEV	99,199	0.390	0.194	0.007	1.287
CF	99,199	0.019	0.063	-0.744	0.839
LNA	99,199	22.292	1.320	18.902	28.697
ROA	99,199	0.030	0.050	-0.805	1.332
SA	99,199	-3.894	0.273	-5.835	-2.085
MLF	99,199	2.981	0.235	2.500	3.300
GDP	99,199	5.565	3.640	-6.900	18.700
CPI	99,199	1.669	1.174	-0.333	4.967
Number of Companies	4,324	4,324	4,324	4,324	4,324

Subsequently, to test Hypothesis 2, group regression was performed by industry.

Finally, to verify Hypothesis 3, a Chow test was conducted based on the group regression model to test the significance of the difference in MLF interest rate coefficients in different industries.

Table 1 displays the findings of the descriptive statistical analysis.

4 Results

4.1 Basic Model

The full sample regression results are shown in Table 2. At the 1% level, the MLF interest rate coefficient is significantly negative. That is, for all listed companies, when monetary policy easing reduces interest rates, the investment level of enterprises will increase. Overall, China's monetary policy has a positive influence on corporate investment, and hypothesis 1 is incorrect.

Table 2. Full sample regression

	(1)
VARIABLES	CI
MLF	-0.1016***
	(0.0080)
LEV	0.0008
	(0.0034)
CF	0.0943***
	(0.0068)
LNA	0.0094***
	(0.0021)
ROA	0.0902***
	(0.0092)
SA	0.0156*
	(0.0083)
GDP	-0.0012***
	(0.0001)
CPI	-0.0000
	(0.0001)
Constant	0.1972***
	(0.0232)
Observations	101,334
Number of Companies	4,372
R-squared	0.0591
Company FE	YES
Time FE	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Group Regression

Industry	MLF	Observations	R-squared	Number of Companies	Company FE	Time FE
Agriculture	-0.1642*** (0.0355)	882	0.1472	32	YES	YES
Mining	-0.0997*** (0.0254)	1,692	0.1785	60	YES	YES
Manufacturing	-0.1103*** (0.0040)	67,172	0.0654	3,022	YES	YES
Electricity, heating, gas, and water production and supply	-0.0960*** (0.0154)	2,703	0.1825	102	YES	YES
Construction	-0.0565*** (0.0149)	2,225	0.0283	84	YES	YES
Wholesale and retail	-0.0499*** (0.0086)	4,173	0.0305	159	YES	YES
Transportation, storage, and postal services	-0.0069 (0.0178)	2,714	0.0331	97	YES	NO
Accommodation and catering	-0.0506 (0.0707)	215	0.2706	8	YES	YES
Information transmission, software, and IT services	-0.0767*** (0.0094)	8,246	0.0285	371	YES	YES
Real Estate	0.0059 (0.0081)	2,404	0.0151	77	YES	NO
Leasing and business services	-0.0557*** (0.0180)	1,337	0.0422	49	YES	YES
Scientific research and technical services	-0.1095*** (0.0222)	1,670	0.0975	101	YES	YES
Water conservancy, environment, and public facilities management	-0.0763*** (0.0161)	1,736	0.1515	84	YES	YES
Health and social work	-0.0088 (0.0504)	246	0.4081	12	YES	YES
Culture, sports and entertainment	-0.0022 (0.0118)	1,322	0.1082	50	YES	NO
Comprehensive industry	-0.0676*** (0.0165)	256	0.3591	8	YES	YES

In the group regression, two industries, residential services, repairs, and other service industry and education industry were excluded because there aren't enough sample firms. As shown in Table 3, Group regression results indicate that the MLF coefficient is not significant across five industries, including transportation, storage and postal services, accommodation and catering, real estate, health and social work, and culture,

sports, and entertainment. It is significantly negative in the sample of 11 industries. When China's monetary policy is loose and interest rates are lowered, corporate investment in these five industries does not increase significantly, while corporate investment in the remaining 11 industries will increase significantly. China's monetary policy has produced significant differences in corporate investment in different industries, Hypothesis 2 has been verified.

This study also used the Chow test to test the coefficient difference of industries with significant MLF coefficients. However, the results showed that the interaction terms between the dummy variables of each industry and the MLF interest rate were not significant. Therefore, it is impossible to compare the influence of monetary policy on these industries through group regression. The impact of industry enterprise investment.

4.2 Robustness Tests

First, the DR007 interest rate, which is also included in the PBoC's interest rate marketization framework, is used in this analysis in place of the monetary policy proxy variable. The benchmark model and the regression findings are essentially consistent. The coefficient of DR007 is not significant in the same five industries.

Second, taking into account the unique effects of the COVID-19 pandemic on the economy, this paper eliminates the samples during the epidemic period, that is, the three years from 2020 to 2022, and performs group regression. After excluding the epidemic period, the significance of the coefficient of MLF rate in some industries has declined due to the reduction in the number of observations, but the overall empirical results are still robust.

5 Discussion

The results of the full sample regression show that China's loose monetary policy can greatly encourage corporate investment growth. Specifically, every time the MLF interest rate drops by 1%, the proportion of corporate cash used for investment in the beginning total assets will increase by 0.1%.

The group regression results by industry indicate that China's monetary policy has no significant impact on corporate investment in five industries, including transportation, storage and postal services, accommodation and catering, real estate, health and social work, and culture, sports, and entertainment. Meanwhile, Corporate investment in other 11 industries is significantly impacted by China's monetary policy, including agriculture, mining, manufacturing, electricity, heating, gas and water production and supply, construction, wholesale and retail, information transmission, software and IT services, leasing and business services, scientific research and technical services, water conservancy, environment and public facilities management industry, and the comprehensive industry.

Specifically for each industry, the real estate industry may be greatly affected by the policies implemented by the government in recent years to restrict real estate over-

heating and avoid systemic financial hazards. For example, since 2016, major cities across the country have successively introduced real estate purchase restriction policies, which have suppressed real estate consumption. Under the model of excluding samples from 2020 and later periods and adopting dual fixed effects (time fixed effects are significant this time), At the 10% significance level, the real estate sector's MLF interest rate coefficient is positive. Therefore, during this period, the growth of real estate investment has run counter to the macroeconomic control of monetary policy. The "Three Red Lines" policy launched in August 2020 has imposed numerous limits on real estate firms' ability to finance themselves, which has significantly limited their ability to invest.

The culture, sports, and entertainment industry has also experienced similar situations. Due to frequent tax evasion and "yin-yang contracts" incidents involving entertainment celebrities, the supervision of the entertainment industry has been tightened in recent years, which may inhibit investment in the entertainment industry. After excluding samples in 2020 and beyond, the MLF coefficient of the culture, sports, and entertainment industry is significantly positive under the dual fixed effects model, that is, its investment changes are in the opposite direction of monetary policy regulation.

The investment environment in China's accommodation and catering industry has been poor in recent years, with high risks. According to data compiled by Xiaoniu Research, the average lifespan of Chinese catering companies has been declining since 2013, from 2.9 years to 508 days, which reflects the fierce competition and high investment risks in the catering industry. In addition, the small number of listed companies in this industry may not represent the investment changes in the entire industry, and the scope of analysis needs to be further expanded.

Transportation, storage, and postal services may be related to national infrastructure investment policies and are therefore less affected by monetary policy. Since 2016, the proportion of China's infrastructure investment in fixed asset investment has gradually declined. According to the "Statistical Bulletin on the Development of the Transportation Industry" issued by the Chinese government each year, the growth rate of China's railway and highway mileage has also gradually slowed down. With the continuous improvement of related infrastructure, China no longer has the same need for investment in postal, storage, and transportation services as it did in its early economic expansion.

The health and social work industry is closely related to national health care issues and therefore is strongly influenced by Chinese government policies and supervision. For example, the centralized bulk drug procurement policy and the Diagnosis Related Group (DRG) reform will have a significant impact on the market demand and revenue of the industry, and thus affect the investment decisions of companies. Therefore, its investment may be greatly affected by the epidemic and government policies, and less affected by monetary policy.

6 Conclusion

This paper uses a panel data model to empirically test the impact of China's monetary policy on the investment of all listed companies and companies grouped by industries. Under the circumstances of the full sample, it is discovered that the monetary policy coefficient is significant. But when regressing on industry groups, monetary policy has no significant effects on 5 industries, including transportation, storage and postal services, accommodation and catering, real estate, health and social work, and culture, sports, and entertainment. This discovery verifies the core hypothesis of this study, that is, there are differences in the significance of monetary policy on different industries. Therefore, it is suggested that the PBoC can raise targeted structural monetary policies to influence these 5 industries. In the subsequent Chow test, the coefficient differences among industries with significant monetary policy coefficients were not significant.

This study only discovered and verified the industry heterogeneity of China's monetary policy. On this basis, the causes and mechanisms of the industry heterogeneity of China's monetary policy need to be further explored. At the same time, manufacturing companies account for most listed companies in China. Therefore, the industry heterogeneity of monetary policy can also be further refined to the secondary industries in the manufacturing industry for analysis.

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