

Oil Price Volatility, Corporate Liquidity Hoarding, and Financial Stability: Evidence from Chinese A-Share Listed Firms (2019-2023)

Xiao Qiu

*Business School, Soochow University, Suzhou, China
mileyq2026@163.com*

Abstract. In 2022, the global energy market experienced severe turbulence, with the Brent crude oil price reaching as high as 140 US dollars per barrel. As the world's largest crude oil importer, Chinese enterprises faced significant cost shocks and cash flow pressures. This study uses quarterly data of non-financial listed companies in China's A-share market from 2019 to 2023 as samples, and employs panel fixed effect regression and Bootstrap mediation effect model to examine the impact of oil price shocks on enterprises' cash holdings and the transmission path. The study finds that the oil price shock led to an average increase of 1.94 percentage points in the proportion of cash holdings by enterprises, with particularly significant responses in the manufacturing and information service industries. Defensive hoarding behavior spreads through two channels: credit contraction and commercial credit freeze, forming a self-reinforcing cycle and exacerbating the fragility of the financial system. This study provides micro evidence and policy references for understanding how external energy shocks evolve into systemic risks.

Keywords: crude oil prices, corporate cash holdings, financial stability, financing constraints

1. Introduction

Oil price fluctuations are key variables in macroeconomics and corporate decision-making. As the world's largest crude oil importer, China's economy is deeply integrated with the international energy market. Existing literature indicates that oil price uncertainty affects enterprises' investment, financing, and cash holding decisions, and precautionary savings drive enterprises to increase liquidity during periods of high volatility [1, 2]. However, existing studies mostly focus on one-way effects and lack a complete depiction of the micro responses transmitted to the macro stability path under extreme shocks.

The sharp increase in Brent crude oil prices in 2022 provided a natural experimental scenario. This study, using the first quarter of 2022 as the dividing point, selected Chinese A-share non-financial listed companies from 2019 to 2023 as the sample. By employing panel fixed effect regression and the mediation effect model, it explored whether the oil price shock changed the cash holding levels of enterprises, the transmission channels, and the mechanism of systemic risk accumulation. This study theoretically revealed the manifestation of the "synthetic fallacy" in energy

shocks and filled the gap in interdisciplinary research on microcredit and macro-stability [3]. In practice, it provided micro evidence for formulating counter-cyclical liquidity policies and offered a reference for emerging economies to deal with commodity shocks.

2. Literature review

The preventive savings theory posits that as uncertainty increases, enterprises will increase their cash reserves to cope with financing constraints [4]. Empirical studies on Chinese listed companies support this view: oil price uncertainty significantly raises the cash holdings of enterprises, and non-state-owned enterprises, energy-intensive industries, and enterprises with stronger financing constraints respond more noticeably [1, 5]. Further, oil price fluctuations not only affect cash holdings but also reshape the financing and asset allocation behaviors of enterprises [6]. Research shows that the increase in oil price uncertainty has intensified enterprises' reliance on bank credit, suppressed bond financing, and significantly promoted the financialization trend of enterprises [3]. From a macro perspective, the defensive strategies of individual enterprises may trigger the "synthetic fallacy", that is, a large number of enterprises simultaneously hoarding cash, cutting investments, and tightening commercial credit, thereby causing credit contraction and economic slowdown, forming a self-reinforcing cycle where enterprises are cautious first, finance is vulnerable later, and they become even more cautious in the end. However, existing literature rarely incorporates the entire process of enterprise liquidity adjustments triggered by external shocks and their feedback effects on the financial system into a unified framework. This study aims to fill the aforementioned research gap through the natural experiment of the oil price shock in 2022.

3. Comparison of enterprise liquidity management before and after the 2022 oil price shock

3.1. Definition of the shock window

This study adopts a comparative analysis framework before and after the shock. The pre-shock period was from the first quarter of 2019 to the fourth quarter of 2021, during which the international crude oil price remained generally stable; the post-shock period was from the first quarter of 2022 to the fourth quarter of 2023, during which the crude oil price experienced significant fluctuations. The dividing point was set as February 2022, which was the time when the Brent crude oil price sharply rose due to the conflict between Russia and Ukraine.

3.2. Core assumption derivation

The theoretical logic of this study is based on the motivation for preventive savings. The sharp increase in oil prices in 2022 exacerbated the uncertainties faced by Chinese enterprises through two channels [7]: Firstly, energy costs rose directly, reducing the profit margins of enterprises, especially having a significant impact on high-energy-consuming industries; Secondly, the future trend of oil prices was highly uncertain, making it difficult for enterprises to accurately predict input costs. Against this backdrop, rational management teams prioritized maintaining liquidity rather than expanding investment, and the proportion of cash holdings by enterprises will systematically increase.

The impact of the oil price shock varies significantly among different types of enterprises. State-owned enterprises usually enjoy more convenient access to credit and policy support, with relatively loose financing constraints, and have a weaker motive for defensive cash accumulation. Non-state-

owned enterprises face tighter financing constraints and higher external financing costs. When internal cash flow tightens due to the oil price shock, the motivation to increase cash holdings for self-insurance becomes stronger. Similarly, manufacturing industries have a higher energy consumption intensity, and the impact of oil price increases on their costs is more direct. The expected adjustment in liquidity is expected to be greater than that in the service industry. Moreover, enterprises may also adopt supplementary financial strategies such as reducing financial leverage to alleviate interest expense pressure and increasing financial assets to partially hedge against oil price risks.

3.3. Data and variable design

3.3.1. Sample selection and data sources

This study selected non-financial Chinese A-share listed companies as the research sample. The sample selection followed the following criteria. First, financial industry listed companies were excluded because their asset-liability structure and liquidity management logic are fundamentally different from those of non-financial enterprises. Second, companies that were subject to special treatment (ST) or delisting risk warning (*ST) were excluded to eliminate the interference of abnormal financial samples on the research conclusions. Third, observations with severely missing data were excluded.

The research window covered the first quarter of 2019 to the fourth quarter of 2023, and a balanced panel data set was ultimately formed. Financial data were sourced from Chinese Research Data Services Platform (CNRDS), crude oil price data was from the U.S. Energy Information Administration (EIA), and the OVX index was from the Federal Reserve Economic Data (FRED).

3.3.2. Variable definition

In terms of variable selection, this study initially focused on the measurement of oil price shocks. The core explanatory variable is the oil price shock, which is measured by the shock dummy variable (with a value of 1 for 2022Q1 and beyond). The dependent variable was the proportion of cash holdings by enterprises, defined as the sum of cash and cash equivalents divided by total assets. To verify the transmission mechanism, this study included two mediating variables, namely financing constraints, represented by the SA index, and the level of enterprise financialization, represented by the proportion of financial assets to total assets.

Furthermore, to eliminate the influence of other enterprise characteristics on liquidity decisions, this study also controlled for a series of factors that might affect the cash holding volume, including enterprise size, leverage ratio, growth rate, and controlled for industry and year fixed effects. The summary of variable definitions is presented in Table 1 below.

Table 1. Variable definitions and measurements

Variable	Symbol	Measurement
Cash holding ratio	Cash	$\frac{\text{Cash} + \text{Cash equivalents}}{\text{Total assets}}$
Oil price shock	Shock	if quarter $\geq$ 2022Q1, Dummy variable = 1, otherwise 0

Table 1. (continued)

Enterprise size	Size	Natural logarithm of total assets
Leverage	Lev	$\frac{\text{Total debt}}{\text{Total assets}}$
Financialization	Fin	$\frac{\text{Financial assets}}{\text{Total assets}}$
Financing constraints	SA	SA index = $0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Age}$

3.4. Empirical strategies and result analysis

3.4.1. Empirical strategy

The empirical strategy of this study is divided into two levels. The first level involves comparing the means before and after the shock and conducting t-tests to determine whether there is a significant difference in the proportion of cash holdings by enterprises, and combining sample analysis to examine the heterogeneity effect [1]. The second level constructs a panel fixed effect regression model and a Bootstrap mediation effect test to investigate the direct effect and indirect transmission path of oil price shocks on the cash holdings of enterprises.

Table 2 below presents the descriptive statistics of the main variables. In the entire sample, the average proportion of enterprise cash holdings is 17.85%, with a standard deviation of 13.39%, indicating significant differences in liquidity reserves among enterprises. The average enterprise size is 22.33 (after taking the logarithm), the average leverage ratio is 41.61%, and the average financialization ratio is 10.35%.

Table 2. Descriptive statistics of the entire sample

Variable	N	Mean	Std.Dev	Min	25th	Median	75th	Max
Cash Ratio	91,490	0.1785	0.1339	0.0000	0.0848	0.1425	0.2332	0.9779
Firm Size (ln)	91,490	22.3315	1.5001	17.2854	21.3042	22.0731	23.0885	31.4309
Leverage	91,490	0.4161	0.2134	0.0062	0.2442	0.4032	0.5669	0.9999
Financialization	91,490	0.1035	0.1325	0.0000	0.0124	0.0529	0.1426	0.9831

The comparison before and after the shock in Table 3 shows that the average cash holding ratio of enterprises before the shock was 16.97%, and it rose to 18.91% after the shock, increasing by 1.94 percentage points ($t = 22.21$, $p < 0.001$). This initially verifies the upward effect of oil price shocks on enterprises' cash holdings. In addition, the leverage ratio decreased from 42.01% to 41.12% (a decrease of 0.89 percentage points), and the financialization ratio increased from 10.02% to 10.76% (an increase of 0.74 percentage points), both being statistically significant at the 1% level, indicating that enterprises actively reduced debts and increased financial assets after the shock.

Table 3. Pre-shock vs. post-shock comparison (t-test)

Variable	Pre-shock Mean	Post-shock Mean	Difference	p-value	Sig.
Cash Ratio	0.1697	0.1891	0.0194	0.0000	***
Firm Size (ln)	22.3113	22.3559	0.0446	0.0000	***
Leverage	0.4201	0.4112	-0.0089	0.0000	***
Financialization	0.1002	0.1076	0.0074	0.0000	***

Note: *** $p < 0.001$

3.4.2. Trend comparison analysis

From Figure 1 to Figure 3, two important features can be observed. Firstly, the Brent crude oil price rose sharply after February 2022, increasing from an average of \$59.63 per barrel before the shock (from January 2019 to January 2022) to \$91.86 per barrel after the shock (from February 2022 to December 2023), with an increase of \$32.23 per barrel (54.1%). The t-test confirmed that this difference was statistically significant ($t = -16.84$, $p < 0.001$). At the same time, the price volatility significantly increased, with the standard deviation of weekly price changes expanding from 0.36% before the shock to 4.62%. The OVX index, which measures the uncertainty of market expectations for oil prices, slightly increased from 43.11 to 45.58, but this change was not statistically significant ($t = 1.83$, $p = 0.068$). This indicates that although the shock caused a drastic change in the oil price level and significantly increased the actual price volatility, the market's implied volatility expectations responded relatively moderately. Secondly, the average cash holding ratio of the sample enterprises remained at approximately 16.97% before the shock and continued to rise to approximately 18.91% after the shock. The two curves showed a synchronous upward trend after the breakpoint, initially confirming the positive push effect of the oil price shock on the cash holdings of enterprises.

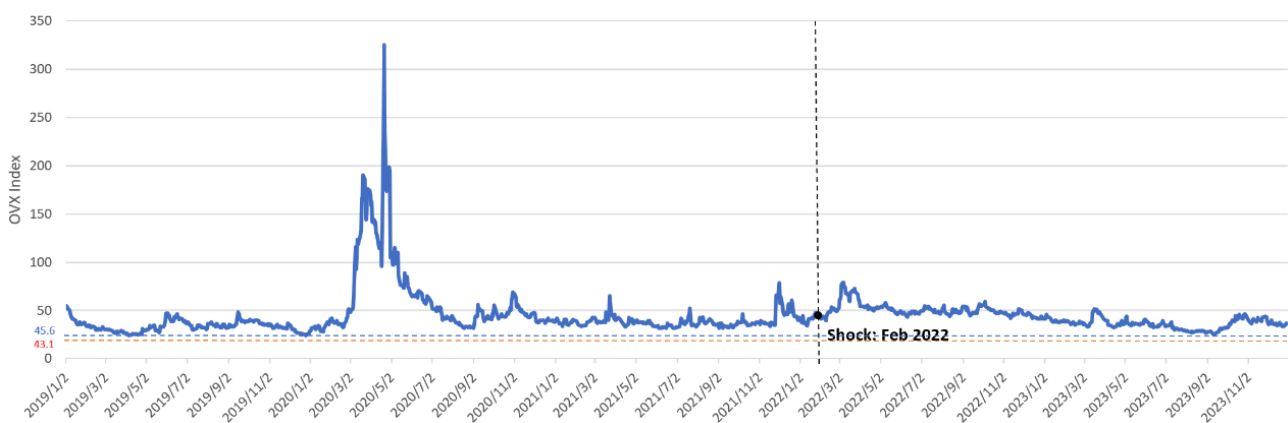


Figure 1. Brent crude oil price (2019-2023)

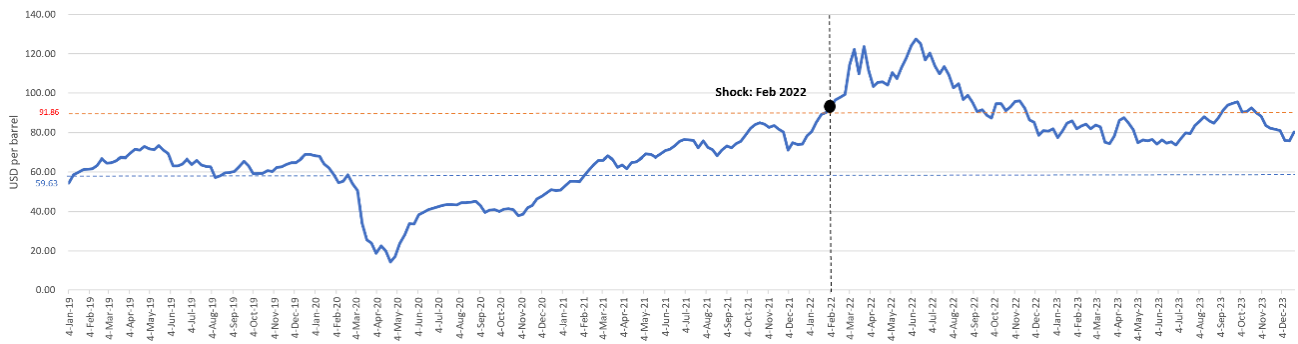


Figure 2. OVX oil volatility index (2019-2023)

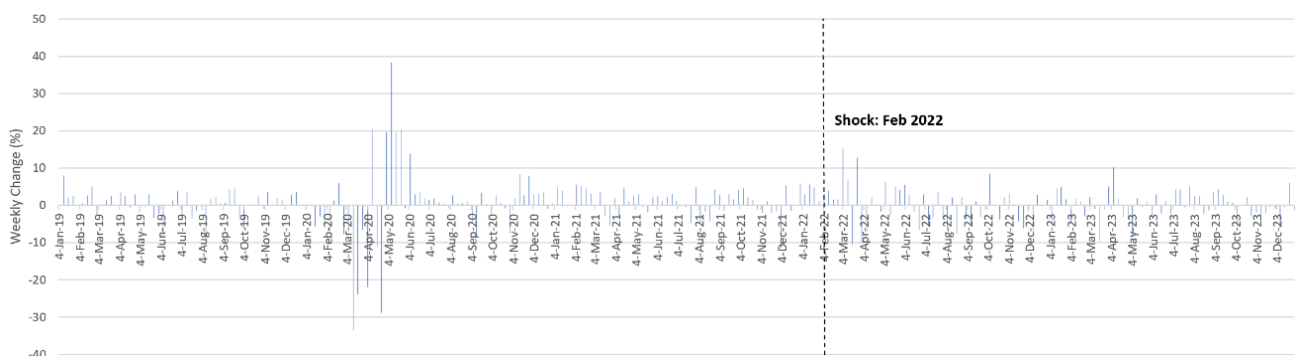


Figure 3. Brent crude oil weekly price change (2019-2023)

3.4.3. Comparative analysis of sub-samples

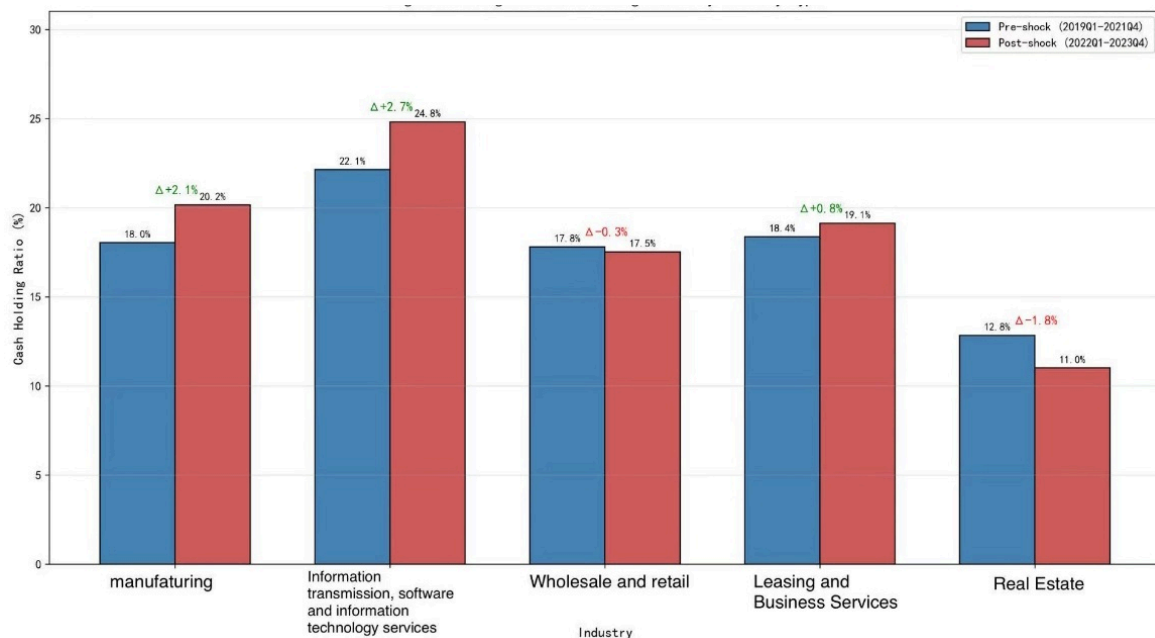


Figure 4. Changes in cash holding ratios by industry type

Figure 4 below presents the changes in the cash holding ratio by industry before and after the shock. The cash holding ratio of manufacturing enterprises increased from 18.05% before the shock

to 20.16% after the shock, rising by 2.11 percentage points. The information transmission, software and information technology services industry rose from 22.14% to 24.82%, increasing by 2.68 percentage points, with the highest increase among all industries. The wholesale and retail industry decreased slightly from 17.81% to 17.53%, while the real estate industry dropped from 12.84% to 11.01%. These results confirm the theoretical expectation that manufacturing is more sensitive to oil price shocks due to its high energy intensity, while the larger increase in the information service industry may reflect its stronger financial flexibility and precautionary saving tendency. Alhadadi also found through research on oil-exporting economies that oil price uncertainty is significantly correlated with higher corporate cash holdings, indicating that this phenomenon is widespread across different economies [6].

Then, Table 4 further reports the cross-sectional differences in the proportion of cash holdings in various industries after the shock: manufacturing was 20.16%, with a sample size of 18,409. Information services was 24.82%, with a sample size of 2,548. Wholesale and retail trade was 17.53%, with a sample size of 1,069. Real estate was 11.01%, with a sample size of 531.

Table 4. Proportion of cash holdings after industry-specific impact

Industry classification	N	Mean	Std.Dev
Manufacturing industry	18,409	0.2016	0.1434
Unknown	13,296	0.1715	0.1237
Other	5,157	0.1714	0.1370
Information transmission, software and information technology services industry	2,548	0.2482	0.1806
Wholesale and retail industry	1,069	0.1753	0.1289
Real Estate Industry	531	0.1101	0.0760
Leasing and Business Services	308	0.1913	0.1873

3.4.4. Mediation effect test

Table 5 reports the regression results of the panel fixed effect. After controlling for firm size, leverage ratio, financialization level, as well as industry and year fixed effects, the coefficient of the shock dummy variable is 0.0182 ($t = 22.21$, $p < 0.001$), indicating that the oil price shock in 2022 increased the average cash holding ratio of enterprises by approximately 1.82 percentage points, further verifying the core hypothesis H1. Regarding control variables, the coefficient of firm size is significantly positive (0.0036), the leverage ratio coefficient is significantly negative (-0.2544), and the financialization ratio coefficient is significantly negative (-0.1666), all of which are in line with theoretical expectations [5]. The model's goodness-of-fit R^2 is 0.155 (see Table 6).

Table 5. Baseline regression results (coefficients)

Variable	Coefficient	Std. Error	t-statistic	p-value	Significance
Shock Dummy (is_post_shock)	0.0182	0.0008	22.21	0.000	***
Firm Size (size)	0.0036	0.0003	11.29	0.000	***

Table 5. (continued)

Leverage (leverage)	-0.2544	0.0023	-111.58	0.000	***
Financialization (fin_ratio)	-0.1666	0.0032	-52.61	0.000	***
Constant	0.2131	0.0066	32.10	0.000	***

Note: Dependent variable is Cash Holding Ratio (cash_ratio). Significance levels: *** p<0.001, ** p<0.01, * p<0.05.

Table 6. Baseline regression results (model fit)

Statistic	Value
Observations	91,490
R-squared	0.1551
Adjusted R-squared	0.1550
F-statistic	4,197
Prob (F-statistic)	0.000

Note: Dependent variable is Cash Holding Ratio (cash_ratio).

Table 7 below presents the results of the Bootstrap mediation effect test (with 1,000 sampling iterations). The indirect effect of the financing constraint path in the first row is 0.0007, with a 95% confidence interval of [0.0003, 0.0011], which does not include 0, indicating that financing constraint has played a significant mediating role [4]. The oil price shock intensified the financing constraints of enterprises, which in turn forced enterprises to increase precautionary cash reserves. The indirect effect of the financialization path in the second row is -0.0032, with a 95% confidence interval of [-0.0043, -0.0022], which is also significant, with a negative direction, indicating that financial assets to some extent replaced cash holdings and constituted a supplementary channel for risk hedging. The direct effect is 0.0668, and the total effect is 0.0643, both of which are statistically significant. Based on the above results, all three core hypotheses of this study have received empirical support.

Table 7. Mediation effect bootstrap results

Path	Coefficient	95% CI (Lower)	95% CI (Upper)	Significant
Shock → SA Index → Cash Holding	0.0007	0.0003	0.0011	Yes
Shock → Financialization → Cash Holding	-0.0032	-0.0043	-0.0022	Yes
Direct Effect	0.0668	0.0608	0.0727	Yes
Total Effect	0.0643	0.0582	0.0704	Yes

Note: Bootstrap iterations = 1,000; valid replications = 1,000. Standardized coefficients are reported. A 95% confidence interval that does not contain zero indicates a significant mediation effect.

4. Transmission channels of corporate liquidity hoarding to financial stability

Previous studies have confirmed that the oil price shock in 2022 significantly increased the cash holdings of enterprises. However, when a large number of enterprises simultaneously adopted defensive liquidity hoarding strategies, individual rational behaviors might be transmitted to the financial system through multiple channels, eventually accumulating into systemic risks [8]. This section analyzes the transmission mechanism from the credit market and commercial credit channels.

4.1. Credit market channel

The credit market is the primary channel through which liquidity hoarding behaviors are transmitted to the financial system. In response to the operational uncertainties brought about by the soaring oil prices, enterprises tend to actively reduce the scale of bank loans and lower their financial leverage (Table 3 shows a decrease of 0.89 percentage points in the leverage ratio). This decision is prudent and reasonable at the individual level, but when a large number of enterprises simultaneously reduce their loan demands, the commercial banking system, which mainly earns profits from the interest rate spread, will face a sharp decline in interest income and erosion of profit margins. When banks are under profit pressure, they usually raise credit approval standards, such as increasing collateral requirements, tightening credit rating thresholds, and shortening loan terms [3]. This credit tightening effect is not evenly distributed. Small and medium-sized enterprises and private enterprises, due to their shorter credit records and limited collateral assets, are the main bearers. These enterprises are precisely the group with the tightest financing constraints and the strongest reliance on internal cash flow. The credit tightening further deteriorates their financing environment, forcing them to rely more on internal cash reserves, thus forming the positive feedback loop shown in Figure 5 below.

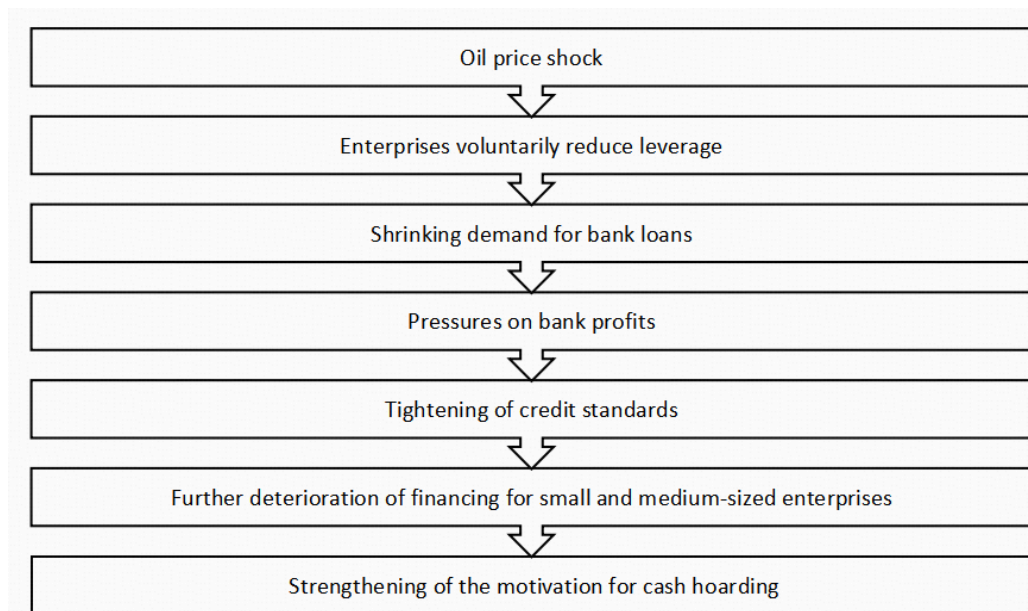


Figure 5. Credit market flowchart

4.2. Commercial credit channel

Commercial credit is an important supplementary channel for enterprises to obtain short-term financing beyond bank credit, and it plays a lubricating role between enterprises in the upstream and downstream of the supply chain. The impact of oil prices also generates systemic transmission effects through the commercial credit network. In the context of a significant increase in oil prices, upstream suppliers face pressure on costs and cash flow, and tend to shorten the credit terms for downstream customers, reduce the scale of credit sales, and increase the proportion of advance payments to reduce their credit risk exposure [3]. Although this behavior is beneficial for individual supplier risk management, it leads to the loss of important short-term financing sources for downstream enterprises (especially small and medium-sized enterprises), forcing them to further consume their internal cash reserves to maintain operations. More seriously, the contraction of commercial credit may directly trigger liquidity crises for downstream enterprises. Enterprises that were originally highly dependent on credit financing from suppliers may encounter payment difficulties when credit suddenly tightens. When a large number of downstream enterprises experience financial strain, the number of commercial paper defaults and overdue accounts payable significantly increases, and the default risk spreads along the supply chain, ultimately leading to an increase in the non-performing loan rate in the banking system, further weakening the willingness of banks to lend (Figure 6).

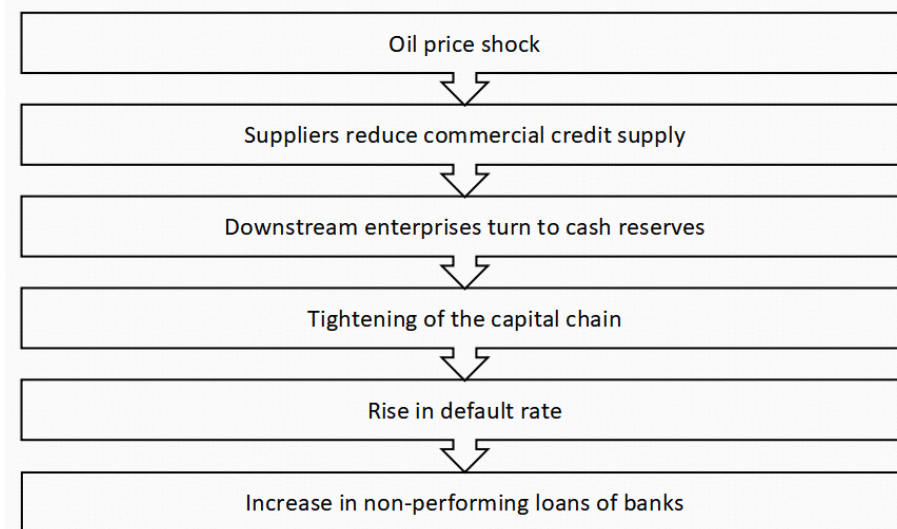


Figure 6. Commercial credit flowchart

4.3. Self-reinforcing cycle

The credit market and the commercial credit channel reinforce each other, forming a self-reinforcing cycle [8]. The soaring oil prices have pushed up operating costs and uncertainties, causing enterprises to increase their cash holdings and reduce investment. A large number of enterprises acting simultaneously have led to a contraction in credit demand and a decrease in commercial credit supply, resulting in a slowdown in the real economy. The deceleration has further weakened corporate profits and debt repayment capabilities, leading to an increase in non-performing loans for banks and tighter credit conditions, and an increase in the risk of supply chain defaults. The pressure on the financial system and the slowdown in the real economy have strengthened enterprises' pessimistic expectations for the future, prompting them to consolidate their cash reserves and push

the cycle to a deeper level. This mechanism reveals the "syndrome fallacy", where each enterprise's cash hoarding is rational at the individual level, but collective actions converge through credit and commercial credit channels into collective irrationality, ultimately exacerbating the overall economic vulnerability.

5. Conclusion

This article begins with the global energy price shock in 2022 and explores the impact of oil price fluctuations on the liquidity management and financial stability of Chinese listed enterprises. The study finds that the oil price shock significantly increased the cash holdings of enterprises, and this effect was more pronounced in the manufacturing and information service industries. The defensive hoarding behavior of enterprises was transmitted to the financial system through two channels: credit contraction and commercial credit freeze. Individual rational choices at the micro level formed a "syntactic fallacy" at the macro level, exacerbating systemic financial vulnerability.

The limitation of the study lies in that the sample is limited to listed enterprises, and the applicability of the conclusion to non-listed enterprises needs to be verified. Additionally, the quantification accuracy of the mediating effect is restricted by the data. At the same time, due to the short observation period, the long-term impact remains unclear. Future research can further explore the sustainability of cash holding adjustments, their applicability in other emerging economies, and the actual effect of policy intervention in blocking the feedback loop of panic vulnerability.

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