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Does corporate shadow banking influence maturity mismatches? Evidence from China

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ABSTRACT

Using data from Chinese listed companies from 2007 to 2022, we identify a new economic impact of shadow banking: increasing maturity mismatches. The results remain robust across various tests. Cross-sectional tests provide evidence that the positive relationship between shadow banking and maturity mismatches is more significant in samples with greater operating risks, lower investment efficiency, and higher information asymmetry. Overall, our findings indicate that shadow banking exacerbates maturity mismatches through various mechanisms, providing valuable insights for ongoing academic debates and regulatory considerations regarding the economic implications of shadow banking.

KEYWORDS

Corporate shadow banking; maturity mismatches; operating risks; investment efficiency; information asymmetry

JEL CLASSIFICATION

G23; G32

I. Introduction

The term “shadow banking” has had a brief yet unusually productive existence. Coined in 2007, it describes intricate chains of credit, liquidity, and leverage that operate outside systemic regulatory oversight. Research focused on China reveals that shadow banking interest rates effectively reflect capital market dynamics, introducing innovative lending practices and pricing mechanisms (Allen et al. 2019). This system helps mitigate distortions in conventional financial markets, providing some breathing space for firms with limited access to financing, thereby promoting innovation output and economic growth (Tian, Tu, and Wang 2024). Meanwhile, substantial research also highlights shadow banking’s adverse effects, including regulatory arbitrage, debt overhang, and economic volatility (Julan, Chang, and Wang 2023; Ren and Shao 2022). Surprisingly, little attention has, however, been paid to how shadow banking and corporate maturity mismatches are related. This study seeks to rectify this omission.

Maturity mismatches occur when firms finance long-term assets with short-term liabilities, impacting operational performance and increases financial risk exposure (Gopalan, Song, and Yerramilli 2014). Furthermore, under the maturity matching

principle, such mismatches can propagate through the economy via debt defaults, amplifying the fragility of the broader economic system (Diamond 1991). Understanding the drivers of maturity mismatches is crucial for assessing risks at both corporate and macroeconomic levels.

Three conceptual viewpoints suggest that shadow banking activities can increase maturity mismatches. First, financial risk theory highlights that high leverage is a primary driver of financial instability for firms. Given its financing characteristics, shadow banking is often associated with elevated leverage levels, further exacerbating firms’ financial vulnerability (Acharya, Engle, and Richardson 2012). This instability is amplified by liquidity risk: according to liquidity theory, if borrowing firms fail to repay loans on time, lenders’ liquidity is severely impacted, weakening their debt repayment capacity and significantly increasing the likelihood of financial distress (Si et al. 2022). Second, agency theory suggests that managers often prioritize short-term financial gains over long-term stability, creating agency conflicts between management and shareholders (Jensen and Meckling 1976). Shadow banking activities typically fall outside a firm’s long-term strategic planning. When management frequently engages in these activities, it disrupts core business investments

and reduces investment efficiency (Han et al. 2023). This decline in investment efficiency affects banks' risk assessments, leading them to favour short-term over long-term lending, thereby intensifying firms' financing maturity mismatches. Third, firms engaged in shadow banking often practice selective information disclosure, worsening the information asymmetry between banks and borrowers (Julan, Chang, and Wang 2023). According to information asymmetry theory, when banks cannot fully assess a firm's financial health and repayment capacity, they mitigate risks by favouring short-term credit, allowing for more frequent monitoring. Overall, these factors collectively exacerbate corporate maturity mismatches.

In contrast, the precautionary motive theory suggests that shadow banking can also reduce maturity mismatches. First, it enhances firms' funding flexibility by efficiently redistributing idle capital to financially constrained firms, thereby promoting adherence to the maturity matching principle (Ren and Shao 2022). Second, the short-term interest gains from shadow banking activities can support firms' long-term funding needs (Allen et al. 2019). This enables firms to optimize their capital structure, which, in turn, attracts more long-term bank debt and further reduces maturity mismatches. Given these competing theoretical arguments, the relationship between shadow banking and maturity mismatches remains an empirical question.

This study contributes to the literature in several ways. First, we draw insights from shadow banking to expand the study of maturity mismatches determinants. While prior research has focused on financial constraints (Wang, Wang, and Chen 2021) and institutional environments (Fan, Titman, and Twite 2012), quantitative analysis of shadow banking's impact remains scarce. Second, we extend the literature on the consequences of shadow banking, which has explored corporate risk-taking and stock price crashes (Han et al. 2023; Si et al. 2022). Our findings demonstrate that the impact of shadow banking on maturity mismatches is more pronounced among firms with higher operating risks, lower investment efficiency, and higher information asymmetry. Third, building upon Chen et al. (2023)'s work on financialization and debt maturity, we demonstrate that

shadow banking, as a non-traditional financial activity, poses greater risks than conventional financialization. To further validate and extend these insights, future research could examine different financial systems to assess the generalizability and heterogeneity of the findings.

II. Data and empirical methodology

Our sample comprises A-share firms listed on the Shanghai and Shenzhen stock exchanges from 2007 to 2022. We obtain financial statements and governance data from the China Stock Market & Accounting Research Database (CSMAR). The final sample excludes special treatment firms (ST and PT), financial institutions, and observations with missing or abnormal data. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate outlier effects. The final dataset consists of 36,525 firm-year observations.

To examine the impact of shadow banking on corporate maturity mismatches, we set the following regression model:

$$MM_{i,t} = \beta_0 + \beta_1 SB_{i,t} + \gamma \mathbb{X}_{i,t} + Year + Industry + \varepsilon_{i,t} \quad (1)$$

where i and t index firm and year, respectively, while $\varepsilon_{i,t}$ denotes the disturbance term. Following Han et al. (2023), corporate shadow banking (SB) is measured as the ratio of credit intermediation activities, including entrusted loans, entrusted wealth management, and private lending to total assets. MM represents the maturity mismatches level, calculated as the difference between the ratio of short-term liabilities to total liabilities and the ratio of short-term assets to total assets (Zhao, Peng, and Feng 2024). It captures the extent of the mismatches between a firm's fund utilization and debt repayment maturities. The vector \mathbb{X} includes all other control variables, as outlined Wang, Wang, and Chen (2021). Additionally, unobserved time-varying factors, such as industry characteristics and macroeconomic conditions, may also influence maturity mismatches. To account for these factors, the model incorporates industry and time fixed effects. Finally, to address potential heteroscedasticity and serial correlation, we use

standard errors clustered at the firm level. Detailed definitions and descriptive statistics of the main variables are provided in [Tables A1 and A2](#).

III. Empirical results

Baseline results

[Table 1](#) gives the resulting estimates for model (1). Column (1) includes only shadow banking as an independent variable, while column (2) considers further control variables. The coefficients of *SB* are significantly positive at the 1% level. In column (2), the coefficient for *SB* is 0.047, suggesting that after controlling for other potential factors affecting mismatches, a 1% point increase in the ratio of shadow banking activities to total assets corresponds to a 0.047% point rise in mismatch level.

Table 1. Baseline regression results.

Variables	(1)	(2)
	MM	MM
SB	0.043*** (0.016)	0.047** (0.023)
Size		0.002 (0.002)
Age		−0.013*** (0.004)
Lev		0.013 (0.015)
Growth		−0.001 (0.004)
ROA		0.039 (0.038)
FA		0.038** (0.018)
Indep		0.001 (0.001)
Top1		0.011 (0.018)
MSR		0.026* (0.016)
Dual		−0.003 (0.005)
BM		0.001 (0.011)
Year FE	YES	YES
Industry FE	YES	YES
Constant	0.128*** (0.003)	0.428*** (0.075)
<i>N</i>	36525	36525
adj. <i>R</i> ²	0.009	0.027

This table reports the baseline results. Robust standard errors, clustered at the firm level, are shown in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Robustness checks¹

¹We conducted robustness checks to verify the reliability of the results, including alternative specifications of dependent and independent variables²³ and excluding the years of the 2008–2009 financial crisis from the analysis. The results reported in [Table 2](#) confirm our main findings.

Cross-sectional evidence

Next, we performed cross-sectional tests to explore the plausible channels through which shadow banking influences maturity mismatches. We examined whether the effect of shadow banking on maturity mismatches is more pronounced in samples characterized by higher operating risks, lower investment efficiency, and greater information asymmetry. To measure these characteristics, we specifically used the volatility of return on assets to measure operating risk, investment efficiency levels to assess the deterioration of real investment, and earnings management levels to gauge information asymmetry. We then sequentially introduced *High_Risk*, *Low_Ivef*, and *High_Opaque*, along with their interaction terms with *SB*, into Model (1). The results of the interaction term coefficients in [Table 3](#) support our conjectures about these channels.

Table 2. Robustness checks results.

Variables	Alternative shadow banking	Alternative maturity mismatches	Alternative sample
	(1)	(2)	(3)
	MM	MM2	MM
Rec_SB	0.052*** (0.020)		
SB		0.039*** (0.014)	0.044*** (0.016)
Constant	0.428*** (0.075)	−0.119*** (0.040)	0.411*** (0.077)
Controls	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
<i>N</i>	36525	36525	34114
adj. <i>R</i> ²	0.027	0.116	0.027

This table reports the results of robustness checks, using alternative measures of corporate shadow banking activities and maturity mismatches, as well as alternative sample. Robust standard errors, clustered at the firm level, are shown in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

¹We also conducted instrumental variable tests, and the two-step system GMM tests are presented in [Appendix B](#) and [Appendix C](#) for brevity.

²Following Julian, Chang, and Wang (2023), we use the ratio of other receivables over sales as a proxy (*Rec SB*) for corporate shadow banking activities.

³Zhong, Cheng, and Zhang (2016) propose an alternative indicator for mismatches, denoted as *MM 2*, which is calculated as (Capital expenditure - Δlong-term debts - net proceeds from equity finance - net cash flow from operations - disposal of fixed assets)/total assets.

Table 3. Cross-sectional analyses results.

Variables	Corporate operating risk	Investments efficient	Information asymmetry
	(1)	(2)	(3)
	MM	MM	MM
SB*High_Risk	0.366** (0.161)		
High_Risk	0.001 (0.004)		
SB*Low_Ivef		−0.258** (0.113)	
Low_Ivef		0.004 (0.003)	
SB*High_Opaque			0.318*** (0.027)
High_Opaque			−0.005 (0.003)
SB	0.043* (0.023)	0.060** (0.025)	0.047** (0.023)
Constant	0.428*** (0.075)	0.425*** (0.075)	0.428*** (0.075)
Controls	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
N	36525	36525	36525
adj. R ²	0.027	0.027	0.027

This table reports the results of mechanisms through which shadow banking exacerbates maturity mismatches through three channels: increased corporate risk-taking (*High_Risk*), lower investment efficiency (*Low_Ivef*), and greater information opacity (*High_Opaque*), using cross-sectional analysis.

IV. Conclusions

This study examines the previously unexplored relationship between shadow banking and maturity mismatches. The findings show that shadow banking exacerbates maturity mismatches, and this result holds under endogeneity tests and a series of robustness checks. Furthermore, cross-sectional tests indicate that the positive relationship between shadow banking and maturity mismatches is significantly stronger in firms with higher operating risks, lower investment efficiency, and greater information asymmetry. Study limitations and future research directions are detailed in [Appendix D](#).

Author contributions

CRedit: **Zhibo Xu**: Conceptualization, Supervision, Writing – original draft, Writing – review & editing; **Zhongxin Gan**: Writing – review & editing; **Zihao Ning**: Data curation, Formal analysis, Methodology, Software, Supervision, Writing – original draft, Writing – review & editing.

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APPENDICES

A. Additional tables

Table A1. Variable definitions and measurement.

Variables	Definition
MM	(Short-term liabilities/Total liabilities) - (Short-term assets/Total assets).
MM2	(Capital expenditure - Δ Long-term debts - Net proceeds from equity finance - Net cash flow from operations - Disposal of fixed assets)/Total assets.
SB	The sum of entrusted loans, entrusted wealth management, and private lending over total assets.
Rec_SB	The ratio of other receivables over sales.
Size	The natural logarithm of total assets.
Age	The natural logarithm of firm age.
Lev	The book value of debt over the book value of total assets.
Growth	The differential between consecutive fiscal periods' sales figures, normalized by the preceding term's revenue.
ROA	The ratio of net profit to total.
FA	The fixed asset over total asset.
Indep	The ratio of the number of independent directors over the number of board members.
TOP1	The ownership percentage of the largest shareholder.
MSR	The ratio of number of shares held by senior executives to total number of shares.
Dual	A binary variable, assigned 1 when the roles of chief executive and board chairperson are held by the same individual, and 0 otherwise.
BM	The ratio of the end-of-period market value to the book value of shareholders' equity.
High_Risk	Firm risk-taking, calculated as:

$$Risk_{i,j,t} = \sqrt{\frac{1}{N-1} \sum_{i=1}^N [(ROA_{i,j,t} - MeanROA_{j,t}) - \frac{1}{N} \sum_{i=1}^N (ROA_{i,j,t} - MeanROA_{j,t})]^2}$$

Where $N = 3$ and ROA is the net earnings to total assets, j represents firm i in year t corresponding industry classification. $MeanROA$ denotes the industry mean ROA . This index is positive correlated with the size of corporate risk-taking. High_Risk is assigned a value of 1 if a company's risk-taking indicator exceeds the industry's annual average; otherwise, it is assigned a value of 0.

Low_lvef The absolute value of the residual, estimated using the Richardson expected investment model, serves as a measure of investment efficiency. If a company's residual value exceeds the industry's annual average, Low_lvef is assigned a value of 1; otherwise, it is assigned a value of 0.

High_Opaque Accrual earnings management is estimated using the modified Jones model as a proxy for information asymmetry. If a company's information asymmetry indicator exceeds the industry's annual average, High_Opaque is assigned a value of 1; otherwise, it is assigned a value of 0.

Table A2. Descriptive statistics.

Variable	N	SD	Mean	Min	p50	Max
MM	36,525	0.251	0.131	-0.585	0.156	0.617
SB	36,525	0.084	0.063	0.000	0.034	0.495
Size	36,525	1.275	22.066	19.777	21.864	25.576
Age	36,525	0.816	2.146	0.000	2.303	3.367
Lev	36,525	0.204	0.419	0.051	0.412	0.875
Growth	36,525	0.388	0.174	-0.552	0.115	2.380
ROA	36,525	0.061	0.041	-0.224	0.040	0.208
FA	36,525	0.160	0.214	0.002	0.181	0.695
Indep	36,525	1.155	3.772	2.000	3.000	8.000
Top1	36,525	0.150	0.347	0.086	0.326	0.750
MSR	36,525	0.200	0.137	0.000	0.005	0.693
Dual	36,525	0.451	0.285	0.000	0.000	1.000
BM	36,525	0.245	0.615	0.121	0.615	1.167

Table A3. Instrumental variable approach and system GMM results.

Variables	First-stage	Second-stage	GMM
	(1)	(2)	(3)
	SB	MM	MM
Shadow_IV	−0.004*** (0.001)		
L.MM			0.612*** (0.016)
SB		8.496*** (2.712)	0.387*** (0.110)
Controls	YES	YES	YES
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Kleibergen-Paap rk Wald F		11.537	
Under-identification test (p-value)	0.000***		
AR (1)			0.000***
AR (2)			0.158
Number of groups			4,151
Number of instruments			135
Sargan statistic (p-value)			0.000***
Hansen statistic (p-value)			0.269
N	36525	36525	28471
adj. R ²	0.151	−0.348	

Notes: Columns (1) and (2) present the Two-Stage Least Squares (2SLS) results, while column (3) reports the two-step System Generalized Method of Moments (GMM) estimates. Robust standard errors with Windmeijer (2005) finite-sample correction are reported in parentheses. We use the second and subsequent lags of the main explanatory variable (SB) as GMM-style instruments, with the instrument set collapsed to reduce the number of instruments (Roodman 2009). The total number of instruments (135) is substantially smaller than the number of cross-sectional units (4,151), indicating no instrument proliferation concerns. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix B. Instrumental variable estimates

To address potential endogeneity bias from reverse causality between shadow banking scale and maturity mismatches, we utilized an instrumental variable approach. Specifically, we use housing purchase restrictions implemented by local governments as our instrument (Tian, Tu, and Wang 2024). China has experienced a significant real estate boom (Glaeser et al. 2017). To mitigate systemic risks, local governments implemented housing purchase restrictions to control speculative demand, which reduced financing requirements in the real estate sector. Consequently, this available capital flowed into manufacturing firms through shadow banking channels (Allen et al. 2019). The transmission mechanism of this policy provides an effective measure of exogenous variations in shadow banking supply.

Housing purchase restrictions are related to shadow banking supply but have limited direct impact on firms'

maturity mismatches. Additionally, cross-regional and temporal, variation in policy implementation strengthens the analysis' identification precision and robustness. Columns (1) and (2) of Table A3 present the instrumental variable regression results. The positive relationship between shadow banking and maturity mismatches remains robust after addressing endogeneity concerns, supporting our hypothesis that shadow banking increases maturity mismatches.

Appendix C. System General Method of Moments tests

We employ the two-step System GMM estimator with Windmeijer (2005) finite-sample correction to further address potential endogeneity and serial correlation. Following standard dynamic panel data modeling practice, we treat the lagged dependent variable (*L.MM*) as predetermined because it is unrelated to the contemporaneous error term, while *SB* is treated as endogenous. We use all other variables, including year and industry fixed effects, as strictly exogenous instruments.

In column (3) of Table A3, the AR(2) test p-value of 0.158 confirms the absence of second-order serial correlation. The Hansen test p-value, which exceeds 0.1, provides reasonable support for the validity of our instrumental variables. The coefficient of *SB* is 0.387 and is significant at the 1% level, indicating that the GMM results are consistent with our baseline findings.

Appendix D. Research Limitations and Future Directions

This study has several limitations. First, the inherent opacity of corporate shadow banking, particularly in relending activities, poses significant challenges for data acquisition. Future research could explore advanced data collection and identification methods. Second, this study focuses on China and treats corporate shadow banking as homogeneous. Future research could examine the relationship between shadow banking and maturity mismatches across different economic, regulatory, and institutional contexts. Additionally, researchers could investigate how various types of corporate shadow banking activities differently influence these relationships. Finally, while shadow banking exacerbates maturity mismatches and highlights the need for stronger regulatory frameworks to mitigate risks, it may also affect other financial decisions, such as capital structure choices, warranting further exploration.