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DOES INVESTMENT-FINANCING MATURITY MISMATCH BOOST FIRM PERFORMANCE UNDER DIGITAL ECONOMY? INVERTED U-SHAPED RELATIONSHIP TEST

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Abstract. In China's economic practice, the mismatch between investment and financing horizons is widespread, exerting complex effects on corporate performance. With the rise of the digital economy, enterprises facing this mismatch exhibit new dynamic characteristics in innovation activities and outputs. Therefore, this study employs a comprehensive approach using quadratic regression and panel threshold models, based on 33,802 firm-year observations. It also constructs a provincial digital economy index using the entropy weight method to further explore the relationship between investment-financing maturity mismatch and corporate performance. The findings reveal that under the current digital economy environment, the relationship between investment-financing maturity mismatch and corporate performance still follows an inverted U-shaped curve. Firm characteristics significantly influence this relationship: investment-financing maturity mismatch tends to affect technology-based firms earlier, though technology-based firms exhibit lower sensitivity to mismatch compared to non-technology-based firms. Furthermore, digital economic development flattens the inverted U-curve, shifting its inflection point to the left, with technology-based firms exhibiting this effect more pronounced than non-technology-based firms. This divergence in the inverted U-relationship among firms can be attributed to differences in internal governance and market competitive environments.

Keywords: digital economy, investment-financing maturity mismatch, corporate performance, inverted U-shaped curve.

JEL Classification: G32, O33, O16.

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1. Introduction

Amid ongoing reforms in China's investment-financing system, maturity matching has increasingly become a crucial factor in ensuring corporate sustainability (Ren et al., 2024; Li et al., 2026). However, in recent years, the phenomenon of investment-financing maturity mismatch has become increasingly prevalent in corporate financial practices. This mismatch refers to the discrepancy between a firm's investment horizons and its financing structure, presenting significant challenges and opportunities for businesses worldwide. Recognized as a key factor triggering financial crises and corporate liquidity risks (Brunnermeier & Oehmke, 2013; International Monetary Fund, 2020; Wang, 2023), its impact on corporate performance continues to attract substantial attention from both academia and industry (Wu & Du, 2025).

Existing literature exhibits significant divergence regarding the causes and economic consequences of maturity mismatch. Some scholars argue that maturity mismatch can serve as a deliberate corporate strategy to reduce financing costs and convey positive market signals (Kahl et al., 2015; Benlemlih, 2017); other studies emphasize its potential to exacerbate liquidity risk and increase financing costs, thereby negatively impacting corporate performance (Wang et al., 2021). Additionally, research indicates that maturity mismatch often stems from institutional constraints, such as an underdeveloped financial system or distorted interest rate term structures (Fu et al., 2024). Although existing research has extensively examined how external market and corporate governance factors influence the relationship between maturity mismatch and corporate performance (Hartmann & Vachon, 2018; Zhang et al., 2024), a critical research gap remains: systematic empirical studies on how maturity mismatch affects corporate performance in the digital economy context, along with its mechanisms and variations, are lacking. Related studies have also examined entrepreneurship ethics (Ahsan, 2020), R&D investment (Alam et al., 2020), cyber risk in SMEs (Armenia et al., 2021), environmental violations (Xing et al., 2024), and digital inclusive finance (Xu et al., 2023).

The rapid transformation of China's economy and the rise of the digital economy have provided a unique institutional and technological background for testing the above hypothesis (Ma et al., 2025; Wu et al., 2025; Zhou et al., 2025). Over the past decade, the investment-funding term-matching behavior of Chinese enterprises has shown a relatively clear structural differentiation. The phenomenon of "short-term debt financing supporting long-term investment" with term mismatch has been particularly prominent in some enterprises, but it is not a universal or sole model for listed companies (Zhitao & Xiang, 2023). China's digital transformation has profoundly reshaped the operational models, information environment, and financing structure of enterprises (Litvinenko, 2020; Sun et al., 2024), providing a new analytical perspective for understanding the differences in term mismatch behavior among different enterprises and their economic consequences. Therefore, this study, based on the data of Chinese A-share listed companies from 2010 to 2022, re-examines the relationship between investment-funding term mismatch and enterprise performance from the perspective of the digital economy, aiming to provide empirical evidence and policy implications for optimizing financing decisions, improving performance, and reforming financial systems in emerging markets for enterprises.

This study contributes by: 1) examining the digital economy's moderating role on the inverted U-shaped MS-performance relationship, focusing on curve structure and inflection points; 2) employing quadratic and threshold models to test this relationship and identify turning points for different firm types, providing heterogeneity evidence; and 3) offering policy insights for financing strategies and financial reforms in emerging economies.

2. Literature review

Research on investment-financing maturity mismatch originates from Morris (1976), who established maturity matching theory, positing that aligning asset and liability maturities mitigates cash flow risks and safeguards debt repayment capacity.

Scholars hold divergent views on its performance implications. Some contend that moderate mismatch constitutes a strategic choice, enabling high-quality firms to exploit lower short-term financing costs and signal positive prospects, thereby boosting competitiveness and performance (Kahl et al., 2015; Benlemlih, 2017; Fan et al., 2012). Conversely, others emphasize its dangers, noting how mismatch amplifies liquidity risks, raises financing costs, and increases financial distress likelihood, ultimately impairing performance (Wang et al., 2021). This often stems from external constraints like underdeveloped financial systems or distorted interest rates (Converse, 2018; Fu et al., 2024), making its management crucial for crisis mitigation (Bleakley & Cowan, 2010; Tsoukas, 2011).

The digital economy's rise adds new dimensions (Litvinenko, 2020; Sun et al., 2024), significantly influencing maturity alignment (Ding et al., 2025; Li et al., 2023; Si et al., 2023). Digitization alleviates mismatch drivers by enhancing information transparency, reducing bank-enterprise asymmetry, and facilitating long-term financing (Goloshchapova et al., 2019). It also reshapes operations and governance through automation, improving efficiency and curbing short-term debt reliance (Wu, 2023). Furthermore, digital transformation boosts performance via cost reduction, innovation stimulation, and market expansion (Xue et al., 2025; Appio et al., 2021; Hervé et al., 2021), thereby catalyzing financing structure evolution (Véron & Wolff, 2016; Gomber et al., 2018).

3. Theoretical analysis and research assumptions

3.1. Investment-financing maturity mismatch and corporate performance

First, when maturity mismatch falls below a certain threshold, firms often adopt a conservative strategy of "using long-term financing for short-term investments". As the mismatch improves and approaches this threshold, the negative effects of this strategy gradually diminish, ultimately enhancing firm performance. This stems primarily from two reasons: First, according to transaction cost theory, short-term financing costs are typically lower than long-term financing costs (Custódio et al., 2013). Firms reduce financing costs by favoring short-term capital, thereby improving maturity matching. The development of the digital economy, particularly the application of technologies like big data credit scoring and AI-driven risk control, has narrowed information asymmetry between banks and firms. This enables firms to more readily access cost-effective short-term financing, allowing them to optimize their financing maturity structure more efficiently (Ying et al., 2025). Second, driven by agency problems, managers may misuse free cash flow to invest in projects with negative net present value (Wang et al., 2016; Paeleman et al., 2024; Zajac & Goranova, 2024). Reducing such behavior helps curb excessive investment and enhance corporate performance. Digital management tools enhance the efficiency of internal capital allocation and oversight, enabling management to more precisely match long-term funds with strategic projects while directing idle capital toward highly liquid short-term assets. This approach reduces efficiency losses from resource misallocation and mitigates agency costs (Xue et al., 2025).

Conversely, when the maturity mismatch exceeds a certain threshold, firms increasingly rely on aggressive "short-term borrowing for long-term investment" strategies. As the mismatch further deviates from this threshold, liquidity risks intensify, potentially leaving firms unable to secure sufficient short-term funds to repay debts, ultimately leading to deteriorating performance (Botta, 2020; Guo et al., 2021). It is worth noting that while the development of the digital economy alleviates financing constraints, it may also exacerbate term mismatches under specific conditions. For instance, technology-driven enterprises, characterized by high growth potential and asset-light operations, are more likely to secure short-term financing based on projected future earnings during digital transformation. This may exacerbate their tendency toward "short-term borrowing for long-term investment". While digital technologies enhance their risk perception capabilities, they do not fundamentally eliminate the inherent uncertainties and liquidity risks associated with long-term R&D projects. Should external conditions shift or project outcomes fall short of expectations, the refinancing pressures and performance volatility these enterprises face could be amplified (Sun, 2025).

Based on this reasoning, we propose the following hypothesis:

H1: *In the current digital economy environment, corporate investment-financing maturity mismatch and corporate performance still exhibit an inverted U-shaped relationship.*

At the same time, given that firms of different types face varying degrees of financing constraints, the impact of investment-financing maturity mismatch on corporate performance may vary across firms. Compared to non-technology-based firms, technology-based firms, which have limited profitability in their early stages, allocate substantial resources to R&D, emphasizing the creation of new products and technologies (Wasdani et al., 2022). Due to the extended duration of R&D cycles, if these initiatives fail or newly developed products do not gain market traction, technology-based firms are highly susceptible to financial distress or even bankruptcy, making them inherently more vulnerable to financial risks (Jung et al., 2018).

Relative to non-technology-based firms, technology-based firms face greater difficulties in obtaining adequate external financing, which exacerbates their challenges in improving their creditworthiness for funding access (Zhang, 2015). This constraint increases the propensity for investment-financing maturity mismatch in technology-based firms, suggesting that its adverse effects on corporate performance may emerge earlier compared to non-technology-based firms (Polzin et al., 2021). In contrast, non-technology-based firms, which face fewer financing constraints, are less likely to prematurely adopt an aggressive "short-term borrowing to finance long-term investment" strategy (Ma & Appolloni, 2025; Peng et al.,2025). Consequently, the adverse effects of investment-financing maturity mismatch on their performance tend to materialize later (Yang & Han, 2023).

Furthermore, due to their prolonged R&D cycles, technology-based firms may exhibit lower sensitivity to investment-financing maturity mismatch in terms of performance outcomes. Based on this reasoning, we propose the following hypothesis:

H2: *The nature of firms influences the relationship between investment-financing maturity mismatch and corporate performance.*

Compared to non-technology-based firms, technology-based firms exhibit a leftward-shifted and flatter inverted U-shaped curve, indicating that the negative impact of investment-financing maturity mismatch on corporate performance occurs earlier in technology-based firms. However, their performance is less sensitive to maturity mismatch than that of non-technology-based firms.

3.2. The moderating effect of digital economic development

Against the backdrop of economic transformation, the mismatch between corporate investment and financing horizons stems not only from institutional constraints but is also closely tied to corporate characteristics. Therefore, formulating effective countermeasures is crucial (Hall et al., 2017; Sun & Luo, 2026).

The development of the digital economy can significantly influence the alignment between a firm's investment and financing maturity (Li et al., 2023), reshaping traditional financial decision-making frameworks. Based on dynamic capability theory (Teece et al., 1997) – which emphasizes the ability to integrate, build, and reorganize resources to respond to rapidly changing environments – we argue that the digital economy enhances firms' capacity to perceive and seize opportunities while improving their efficiency in reorganizing resources.

First, the digital economy enhances enterprises' environmental awareness and opportunity identification capabilities (Cohen & Levinthal, 1990; Ma et al., 2025). Leveraging digital technologies such as big data analytics, artificial intelligence forecasting, and cloud computing, enterprises can capture market dynamics, industry trends, and policy changes in real time, enabling more accurate predictions of future cash flows and financing needs (Wu, 2023). This heightened foresight enables enterprises to proactively identify liquidity risks stemming from maturity mismatches and adjust their financing term structures accordingly (Goloshchapova et al., 2019). Second, the digital economy enhances enterprises' capabilities for decision integration and resource restructuring. Through digital management systems like ERP and SCM, enterprises achieve comprehensive integration and real-time sharing of financial, operational, and investment data (Li et al., 2023). This facilitates more efficient internal resource coordination by management, optimizing capital allocation by matching long-term funds to strategic long-term projects while deploying idle short-term funds into secure short-term investments, thereby reducing efficiency losses from resource misallocation (Xue et al., 2025). Finally, the digital economy strengthens enterprises' external coordination and relationship management capabilities. Digital technologies reduce information asymmetry between enterprises and external stakeholders such as investors and banks (Véron & Wolff, 2016; Gomber et al., 2018). By enhancing information transparency and credibility through technologies like blockchain and smart contracts, enterprises can more readily gain investor trust and secure long-term capital support. This broadens long-term financing channels and reduces excessive reliance on short-term debt (Appio et al., 2021; Hervé et al., 2021; Mielcarek & Dymitrowski, 2022). Concurrently, digital supply chain ecosystems enhance collaborative efficiency between enterprises and their upstream and downstream partners. By optimizing accounts receivable management and sharing financial resources, they improve overall capital turnover and mitigate the negative impacts of maturity mismatches.

Based on these insights, we propose the following hypotheses:

H3: *The development of the digital economy has flattened the inverted U-shaped relationship between investment-financing term mismatch and corporate performance (curve smoothing effect), while shifting the inflection point of the curve to the left (inflection point shift effect).*

H4: *The moderating effects generated by digital economic development – namely the curve-smoothing effect and the inflection point shift effect – exert a stronger influence on technology-based firms than on non-technology-based firms.*

4. Research design

4.1. Data sources and sample selection

We selected financial data of A-share firms listed on China's Shanghai and Shenzhen stock exchanges from 2010 to 2022, along with provincial-level digital economy development indicators, as our research sample. We applied standard data filters, excluding financial firms, ST firms, and observations with missing data. After applying these filters, we obtained a total of 33,802 firm-year observations. To mitigate the impact of extreme values on our research conclusions, all continuous variables were winsorized at the 1% level at both tails. Our data come from the CSMAR database.

4.2. Definition of variables

Dependent variable: Corporate performance. Corporate performance is measured using the Gross Profit Margin (GPM), with higher values indicating superior performance.

Independent variable: Investment-Financing Maturity Mismatch (MS). Building on the capital gap concept of Frank and Goyal (2003), investment-financing maturity mismatch is defined as the extent to which the increase in long-term investment funding supply surpasses the current period's long-term financing. Referring to the methodology of Gertler et al. (2012), we use cash outflows for the acquisition and construction of fixed assets and other investment activities as a proxy for long-term investment and net increase in long-term borrowing – calculated as the sum of current-period long-term borrowing and non-current liabilities due within one year, minus prior-period long-term borrowing – as a proxy for long-term loans. The difference between these two components, adjusted for equity financing and internal financing, represents "investment-financing maturity mismatch". To control for scale effects, this value is normalized by total assets, serving as the proxy variable for investment-financing maturity mismatch.

$$\mathrm{MS} = \frac{\mathrm{INV} - (\Delta \mathrm{LONGDEBT} + \Delta \mathrm{EQUITY} + \mathrm{OCF} + \mathrm{SCF})}{\mathrm{ASSET}}. \tag{1}$$

In Eq. (1), INV denotes cash outflows for the acquisition and construction of fixed assets and other investment activities; ΔLONGDEBT represents the net increase in long-term borrowing; ΔEQUITY captures the equity raised during the period; OCF measures net cash flow from operating activities; and SCF accounts for cash inflows from the sale of fixed assets. $MS > 0$ indicates short-term loans for long-term investment (long-term investment exceeding long-term financing); $MS < 0$ indicates long-term loans for short-term investment (long-term financing redundant). An increase in MS thus shifts from the former to the latter. Both are maturity mismatches and may affect firm performance.

Moderating variable: Digital Economic Development Level (DEDIC). Following the digital economy measurement approach proposed by Xin et al. (2023), we develop three dimensions aligned with the conceptual framework and practical context of the digital economy: digital economy infrastructure, digital industrialization, and industrial digitalization. Digital economy infrastructure is further divided into traditional infrastructure and new digital infrastructure, which includes six specific indicators. Digital industrialization consists of three indicators, while industrial digitalization is further categorized into agricultural digitalization, industrial digitalization, and service industry digitalization, covering four indicators.

We apply the entropy weighting method, an objective weighting technique, to determine the weights of these 13 indicators, resulting in a composite index to quantify digital economic development. The composite index was constructed using the entropy weighting method based on 13 indicators across three dimensions: digital infrastructure, digital industrialization, and industrial digitalization. The detailed indicator system and weights are omitted for brevity but are available upon request.

Control variables: Firm size (SIZE), measured as the natural logarithm of total assets; financial leverage (LEV), defined as total liabilities divided by total assets; ownership type (SOE), which equals 1 if the ultimate controller is state-owned and 0 otherwise; ownership concentration (TOP), measured as the proportion of shares held by the top ten shareholders; and firm age (AGE), calculated as the difference between the observation year and the IPO year. We also include province (PRO) and year (YEAR) fixed effects to account for regional and time-specific influences. Detailed definitions of the core variables are provided in Table 1.

Table 1. Variable definitions

Type	Explanation	Variable	Definition or calculation method
Dependent variable	Corporate performance	GPM	(Total revenue – total cost) / Total revenue
Independent variable	Investment-financing maturity mismatch	MS	Cash outflows for the acquisition and construction of fixed assets and other investment activities – (Net increase in long-term borrowings + Increase in equity during the period + Net cash flow from operating activities + Cash inflows from the sale of fixed assets), normalized by total assets to control for scale effects.
Moderating variable	Digital economic development level	DEDIC	Composite index derived from the entropy weighting method applied to 13 indicators.
Control variables	Firm size	SIZE	Natural logarithm of total assets
	Financial leverage	LEV	Total liabilities / Total assets
	Nature of property rights	SOE	Equals 1 if the ultimate controller is state-owned; otherwise, 0.
	ownership concentration	TOP	Shareholding ratio of the top 10 shareholders
	Firm age	AGE	Observation year – IPO year

Table 2 presents the descriptive statistics of the main variables. From the statistical results, the mean of MS is –0.0802, the minimum value is –1.243, and the maximum value is 0.314. The overall distribution shows a certain degree of left skewness. This indicates that within the sample period from 2010 to 2022, Chinese A-share listed companies, on average, tend to adopt a conservative term-matching strategy of "long-term borrowing and short-term investment". However, at the same time, the standard deviation of MS is relatively large, reaching 0.209, indicating that a considerable proportion of enterprises are in the "short-term borrowing and long-term investment" aggressive region, facing significant liquidity risks and refinancing pressures that cannot be ignored. In summary, the investment and financing term-matching behavior of the sample enterprises is not unilaterally biased towards the conservative or aggressive end, but rather presents a structural feature of both conservatism and aggressiveness coexisting, with significant differences across enterprises and periods. This distribution fact is consistent with the logical reasoning that the term mismatch is regarded as a continuous variable in the research design, and then examines the potential nonlinear relationship between it and enterprise performance. It also provides a practical basis for later distinguishing different enterprise types for heterogeneity analysis.

Table 2. Descriptive statistics for core variables

Variable	N	Mean	Std. Dev.	Min	Max
GPM	33,802	0.288	0.177	–0.0123	0.840
MS	33,802	–0.0802	0.209	–1.243	0.314
MS^2	33,802	0.0512	0.185	0.00000237	1.546
DEDIC	33,802	0.236	0.164	0.00767	0.593
SIZE	33,802	22.26	1.295	19.91	26.28
LEV	33,802	0.428	0.204	0.0569	0.898
SOE	33,802	0.367	0.482	0	1
TOP	33,802	57.83	15.20	22.80	90.34
AGE	33,802	10.57	7.505	1	28

4.3. Model design

To analyze the impact of Investment-Financing Maturity Mismatch on firm performance, we develop the following quadratic regression model based on theoretical analysis:

$$GPM_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 MS^2_{it} + \sum \alpha_3 Controls_{it} + PRO + YEAR + \varepsilon_{it}. \tag{2}$$

In Model (2), GPM measures the firm performance of listed companies and serves as the dependent variable, measured by the gross profit margin. MS is the independent variable, representing the degree of Investment-Financing Maturity Mismatch. MS^2 is the squared term of Investment-Financing Maturity Mismatch, included to test for the presence of an inverted U-shaped relationship between Investment-Financing Maturity Mismatch and firm performance. Controls represents the control variables, while PRO and YEAR denote province and year dummy variables, respectively. ε is the random disturbance term, with subscript i representing firms and t representing years.

If H1 holds, α_2 is expected to be significantly negative, indicating an inverted U-shaped relationship between Investment-Financing Maturity Mismatch and firm performance. If H2 holds, α_2 is expected to be significantly negative in both technology-intensive and non-technology-intensive firms, with the inflection point of the inverted U-shaped curve occurring at a higher level in non-technology-based firms than in technology-based firms.

Additionally, to further examine the moderating effect of digital economy development on the nonlinear relationship between Investment-Financing Maturity Mismatch and firm performance, we extend Model (2) to incorporate the following moderating effect model:

$$GPM_{it} = \beta_0 + \beta_1 MS_{it} + \beta_2 MS_{it}^2 + \beta_3 MS_{it} \times DEDIC_{it} + \beta_4 MS_{it}^2 \times DEDIC_{it} + \beta_5 DEDIC_{it} + \sum \beta_6 Controls_{it} + PRO + YEAR + \varepsilon_{it}. \quad (3)$$

In Model (3), $DEDIC_{it}$ represents the digital economy development level of firm i in year t, while all other variables are defined as in Model (2).

5. Empirical results

5.1. Benchmark regression

Table 3 reports the regression results for Model (2). Columns (1) and (2) present the regression results for the full sample, where Column (1) excludes control variables while Column (2) includes them. The results indicate that the coefficient for MS^2 is –0.081, significant at the 1% level. This finding reveals a significant inverted U-shaped relationship between investment-financing term mismatch and firm performance. Simultaneously, the negative coefficient for MS indicates that on the left side of the inverted U-shaped curve, a one-unit increase in MS (i.e., a reduction in mismatch severity toward the matching value) leads to an increase in Gross Profit Margin (GPM). This suggests that for firms with severe mismatch, improving term mismatch conditions yields significant economic benefits.

Table 3. Benchmark regression

Variable	(1)	(2)	(3) Non-technology-based firms	(4) Technology-based firms
	GPM	GPM	GPM	GPM
MS	–0.164***	–0.130***	–0.126***	–0.081***
	(–43.29)	(–34.14)	(–30.93)	(–14.25)
MS^2	–0.100***	–0.081***	–0.061***	–0.028***
	(–24.05)	(–19.69)	(–18.86)	(–9.78)
SIZE		0.006***	0.007***	0.010***
		(5.90)	(6.38)	(4.12)
LEV		–0.165***	–0.155***	–0.167***
		(–37.04)	(–30.68)	(–17.15)
SOE		–0.031***	–0.030***	–0.023***
		(–11.09)	(–9.43)	(–4.11)
TOP		0.001***	0.001***	0.000***
		(12.30)	(9.23)	(3.11)
AGE		–0.003***	–0.001*	–0.006***
		(–9.78)	(–1.87)	(–4.94)
PRO	YES	YES	YES	YES
YEAR	YES	YES	YES	YES
Constant	0.314***	0.218***	0.161***	0.204***
	(42.55)	(9.70)	(6.50)	(3.70)
R^2	0.091	0.133	0.121	0.212
Observations	33,802	33,802	26,801	7,001

Calculations indicate that the inflection point of the curve occurs at approximately MS = –0.802. This suggests that the optimal state for maximizing corporate performance does not arise when maturities are perfectly matched (MS = 0), but rather when there is a slight "long-term financing for short-term investment" condition. The positive marginal effect to the left of the inflection point (MS < –0.802) suggests that reducing an overly conservative strategy enhances performance. Conversely, the negative marginal effect to the right (MS > –0.802) indicates that aggressive "short-term borrowing for long-term investment" damages performance. Further increasing MS may instead introduce unnecessary risks or transaction costs due to financing structure adjustments (e.g., increasing short-term debt), yielding negligible or even negative performance improvements. For firms with MS > 0 operating in a "short-term borrowing for long-term investment" state, higher MS values indicate deeper engagement in this strategy. Negative marginal effects indicate that refinancing risks and liquidity risks associated with such aggressive financial strategies begin to dominate, severely eroding corporate profits. Therefore, in this region, the deeper the "short-term borrowing for long-term investment" strategy, the greater the damage to performance.

To formally test the existence of this inverted U-shaped relationship, we conduct a U-test. The results, presented in Table 4, show that the relationship between Investment-Financing Maturity Mismatch and firm performance initially increases and then declines, confirming the existence of an inverted U-shaped relationship. Therefore, H1 receives further empirical support.

To test H2, we divide the sample into technology-based firms (firms listed on the STAR Market and ChiNext) and non-technology-based firms. Columns (3)–(4) in Table 3 report the empirical results for each group. The results indicate that, after controlling for various factors, the coefficients of the quadratic term for Investment-Financing Maturity Mismatch are significantly negative for both technology and non-technology-based firms. This suggests that, regardless of firm type, a significant inverted U-shaped relationship exists between Investment-Financing Maturity Mismatch and firm performance. However, due to differences in the estimated coefficients of the linear and quadratic terms, the curve inflection points also differ across firm types.

For non-technology-based firms, the coefficient of Investment-Financing Maturity Mismatch is –0.126, while the coefficient of the quadratic term is –0.061. For technology-based firms, the coefficient of Investment-Financing Maturity Mismatch is –0.081, with a quadratic term coefficient of -0.028. Using these results, we plot the inverted U-shaped curves of Investment-Financing Maturity Mismatch and firm performance for tech and non-technology-based firms, as shown in Figure 1. The figure illustrates that the inflection points of the inverted U-shaped curves vary significantly across firm types.

Table 4. U-test examination

Variable	Lower bound	Upper bound
Interval	–1.243	0.314
Slope	0.070	–0.181
t-value	9.392	–29.788
P>|t|	3.12e-21	8.6e-193

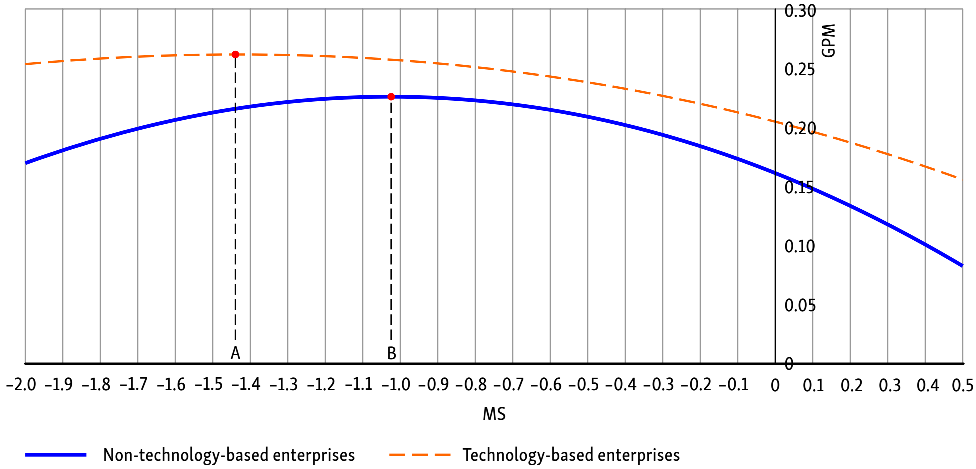

Figure 1. Inverted U-shaped relationship between investment-financing maturity mismatch and firm performance (tech and non-technology-based firms)

Using a simple calculation derived from the estimated coefficients of the linear and quadratic terms, we estimate the financing-maturity equilibrium point for non-technology-based firms to be approximately –1.03 (Point B) and for technology-based firms to be approximately –1.44 (Point A). As MS shifts from long-term loans for short-term investments to short-term loans for long-term investments, technology-based firms' performance peaks at MS = –1.44 (still within long-term loans) and then declines; non-technology-based firms peak later at MS = –1.03 after a longer evolution. Thus, technology firms encounter the performance decline earlier due to higher risks and tighter financing constraints. Even when still in the long-term loan range, a decrease in long-term fund surplus can trigger their performance decline. Non-technology firms, with more stable operations and financing environment, tolerate a deeper mismatch evolution over a longer period. This validates H2.

5.2. The moderating effect of digital economy development

Extending Model (2), we incorporate interaction terms between Investment-Financing Maturity Mismatch and digital economy development (MS × DEDIC) as well as the squared term of Investment-Financing Maturity Mismatch and digital economy development (MS^2 × DEDIC) and conduct a regression analysis. Column (1) of Table 5 presents the regression results. The findings indicate that the coefficient of MS^2 continues to be significantly negative, suggesting that despite advancements in the digital economy, the relationship between Investment-Financing Maturity Mismatch and firm performance retains its inverted U-shape. Furthermore, digital economy development exerts a moderating effect on the relationship between Investment-Financing Maturity Mismatch and firm performance.

To examine the specific moderating effect of digital economy development on the inverted U-shaped relationship, we simplify Model (3) and derive the following equation:

$$GPM = \beta_0 + \beta_1 MS + \beta_2 MS^2 + \beta_3 MS \times \mathit{DEDIC} + \beta_4 MS^2 \times DEDIC + \beta_5 DEDIC. \quad (4)$$

The analysis is as follows:

First, concerning the impact of the development of the digital economy on the shape of the "inverted U-shaped" curve, Eq. (4) indicates that firm performance follows a quadratic function of investment and financing maturity mismatch. Theoretically, the curvature at the vertex influences the smoothness of the curve. Accordingly, the second derivative of Eq. (4) is taken using the curvature calculation method to obtain curvature $C = \frac{\partial^2 GPM}{\partial MS^2} = 2\left(\beta_2 + \beta_4 DEDIC\right)$. Additionally, the results in column (1) of Table 5 provide the value of C < 0. From a curve property perspective, according to the curvature formula $k = \frac{\left|y''\right|}{\left(1 + y'^2\right)^{\frac{3}{2}}}$, a larger curvature k indicates a greater degree of bending. Thus, a larger |C| corresponds to a greater curve curvature, whereas a smaller |C| results in a smoother curve. In this study, given that the digital economy, as a moderating variable, significantly influences the smoothness of the curve, calculations were conducted based on the aforementioned methodology to derive $\frac{\partial C}{\partial DEDIC} = 2\beta_4$. According to Table 5, β_4 is 0.069, implying that an increase in digital economy development enhances curvature C. Since C < 0, the value of |C| decreases, leading to a smoother "inverted U-shaped" curve.

Table 5. Moderating effect of digital economy development level

Variable	(1)	(2) Non-technology-based firms	(3) Technology-based firms
	GPM	GPM	GPM
MS	–0.143***	–0.138***	–0.095***
	(–22.90)	(–21.40)	(–8.20)
MS^2	–0.097***	–0.075***	–0.039***
	(–13.96)	(–14.34)	(–5.71)
MS×DEDIC	0.055**	0.056**	0.048
	(2.55)	(2.33)	(1.43)
MS^2×DEDIC	0.069***	0.065***	0.036*
	(2.81)	(3.29)	(1.76)
DEDIC	0.002	0.016	–0.020
	(0.19)	(1.48)	(–1.14)
Control	YES	YES	YES
PRO	YES	YES	YES
YEAR	YES	YES	YES
Constant	0.215***	0.161***	0.171***
	(9.58)	(6.46)	(3.22)
R^2	0.133	0.121	0.210
Observations	33,802	26,801	7,001

Second, we analyze the impact of the development of the digital economy on the turning point of the "inverted U-shaped" curve. According to the properties of quadratic functions, the turning point of the curve corresponds to the value of the core explanatory variable when the first derivative equals zero. We define this turning point as MS*, thereby obtaining $MS^* = \frac{-\beta_1 - \beta_3 DEDIC}{2(\beta_2 + \beta_4 DEDIC)}$. Furthermore, by differentiating DEDIC, we obtain $\frac{\partial MS^*}{\partial DEDIC} = \frac{\beta_1\beta_4 - \beta_2\beta_3}{2(\beta_2 + \beta_4 DEDIC)^2}$. Substituting it into the equation yields $\frac{\partial MS^*}{\partial DEDIC} < 0$. Therefore, as the development of the digital economy progresses, the turning point of the "inverted U-shaped" curve between investment and financing maturity mismatch and firm performance shifts to the left.

Finally, we examine the impact of the development of the digital economy on the overall level of the "inverted U-shaped" curve. Let the firm performance in regions with a high level of digital economy development ($DEDIC_h$) be denoted as GPM_h, and the firm performance in regions with a low level of digital economy development ($DEDIC_l$) be denoted as GPM_l. Substituting these values into Eq. (4) and rearranging yields Eq. (5). Since $DEDIC_h - DEDIC_l$ is always greater than zero, if Eq. (6) remains positive, then $GPM_h > GPM_l$ is valid, indicating that the "inverted U-shaped" curve shifts upward overall.

$$GPM_h - GPM_l = \left(\beta_3 MS + \beta_4 MS^2 + \beta_5\right)\left(DEDIC_h - DEDIC_l\right); \quad (5)$$

$$f\left(MS\right) = \beta 3MS + \beta 4MS^2 + \beta 5. \quad (6)$$

From the results in Column (1) of Table 5, we derive: β_3 = 0.055, β_4 = 0.069, β_5 = 0.002. Substituting these coefficients into Eq. (6) and solving for the critical points using the properties of quadratic functions, we find that when: MS < –0.761 or MS > –0.036, GPM_h – GPM_l is positive, indicating an upward shift of the curve. Conversely, when –0.761 < MS < –0.036, leading to a downward shift of the curve.

We use the data from Table 3 and Table 5 to plot the relationship between financing-investment maturity mismatch and firm performance before and after the adjustment of digital economy development levels, as shown in Figure 2.

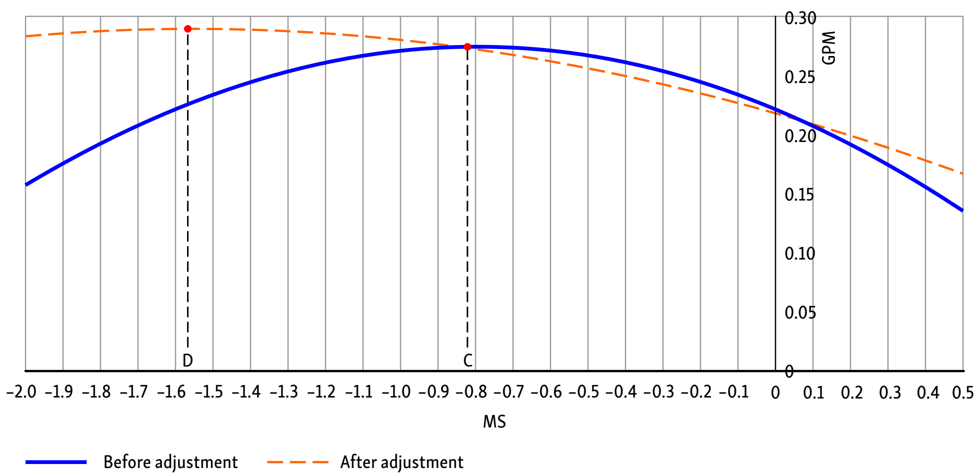

Figure 2. Moderating effect of digital economy development on the inverted U-shaped relationship between investment and financing maturity mismatch and corporate performance

The Figure 2 shows that after the moderating effect of digital economy development, the curve becomes smoother, and its inflection point shifts leftward. Before moderation, the inflection point was at an MS value of –0.802 (Point C), whereas after moderation, it shifted to –1.571 (Point D). In summary, digital economy development flattens the inverted "U-shaped" relationship between investment and financing maturity mismatch and corporate performance while shifting its inflection point to the left, thereby supporting H3.

Furthermore, we analyzed the moderating effect of digital economy development separately for technology-based and non-technology-based firms. The results, presented in Columns (2)–(3) of Table 5, show that the coefficients of the MS2*DEDIC term are all statistically significant. This indicates that digital economy development moderates the inverted U-shaped relationship in both firm types. However, following the analytical approach above, we find that the strength of this moderating effect varies across firm types.

In terms of curve shape, the relationship in technology-based firms is flatter. Regarding the inflection point, after moderation, it is positioned at an MS value of –4.1 for non-technology-based firms and –7.83 for technology-based firms. This suggests that the moderating effect of digital economy development is more pronounced in technology-based firms than in non-technology-based firms, thereby confirming H4.

Note that the inflection points from the moderating effect model are much lower than the sample's minimum MS – i.e., extrapolations beyond the sample range. This occurs because introducing the cross-product terms of digital economy with MS and its square means the inflection point formula depends not only on the MS coefficients but also on those of the moderating variable and cross-terms. Nevertheless, it still conveys core economic meaning.

5.3. Robustness tests

To test the robustness of our baseline regression results, we conduct a series of robustness checks, with the results shown in Table 6.

5.3.1. Adding lagged terms

MS_{it} and $MS^2{}_{it}$ are substituted with MS_{it-1} and $MS^2{}_{it-1}$ as the core explanatory variables, and the model is re-estimated. (2). This adjustment is justified because investment and financing decisions in period $t - 1$ precede performance in period t, making them less susceptible to reverse influence from current-period performance. This helps us more clearly identify the causal effect of investment-financing maturity mismatch on corporate performance. Column (1) of Table 6 reports the regression results. The results indicate that the coefficient for the square of the lagged term mismatch remains significantly negative at the 1% level.

5.3.2. Modify the measurement method of the dependent variable

Adopting the method of Saputra et al. (2022), we use ROA (Return on Assets) and ROE (Return on Equity) as measures of corporate performance. Columns (2)–(3) of Table 6 show that the inverted "U-shaped" relationship between investment-financing maturity mismatch and corporate performance remains significant, verifying H1.

5.3.3. Controlling for higher-order fixed effects

Considering that investment-financing maturity mismatch may be influenced by industry-level policy changes, we include interaction terms for province-year, industry-year, and industry-province pairs in Model (2). From Columns (4)–(6), the inverted "U-shaped" relationship is significant at the 1% level, further confirming H1.

5.3.4. Modify the measurement method for independent variable

Although we have made every effort to ensure the accuracy of MS measurements, measurement errors may still occur. To mitigate this issue, we have modified the MS calculation method. MS′ is now defined as the ratio of the funding gap for long-term investments supported by long-term financing to the average of short-term loans at the beginning and end of the year, with the denominator representing the average short-term loans over a fiscal year. The inverted U-shaped conclusion presented in this paper remains valid.

$$MS^{'} = \frac{INV - \left(\Delta LONGDEBT + \Delta EQUITY + OCF + SCF\right)}{\left(SHORTDEBT_t + SHORTDEBT_{t-1}\right) \times 0.5}. \tag{7}$$

5.3.5. Changing the way digital economy variables are measured

We replaced provincial digital economy indicators with the digital transformation index (DIG) of listed companies and conducted another adjustment effect test. This variable was calculated by summing the word frequencies related to artificial intelligence, blockchain technology, cloud computing, big data, and digital technology applications in corporate annual reports, serving as a measure of a company's digital transformation level. The test results are shown in Table 6's column (8). Digital development alters the shape of the inverted U-curve and shifts its inflection point, thereby revalidating H3.

5.3.6. Generalized moment estimation

To further mitigate issues arising from dynamic endogeneity due to lagged dependent variables, unobserved individual heterogeneity, and potential reverse causality in core explanatory variables, this study employs a System Generalized Method of Moments (GMM) to test the benchmark regression results, as shown in Column (9) of Table 6. The results indicate that a significant inverted U-shaped relationship still exists between investment-financing term mismatch and firm performance, suggesting no endogeneity issues.

6. Further analysis

The empirical analysis above verifies that, in the context of the digital economy, there exists an inverted U-shaped relationship between investment-financing maturity mismatch (i.e., the mismatch between the terms of investments and financing) and corporate performance. This relationship differs between technology-based firms and non-technology-based enterprises. Therefore, what is the inflection point of the curve for all listed companies on the Shanghai and Shenzhen stock exchanges, where investment-financing maturity mismatch impacts corporate performance? What are the inflection points for technology-based and non-technology-based companies? What are the underlying mechanisms driving these effects? This section tests and analyzes these issues.

Table 6. Robustness tests

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GPM	ROA	ROE	GPM	GPM	GPM	GPM	GPM	GPM
MS_{t-1}	–0.035***								
	(–13.17)								
MS^2_{t-1}	–0.011***								
	(–5.43)								
MS		–0.237***	–0.538***	–0.131***	–0.131***	–0.131***		–0.119***	–0.122***
		(–117.89)	(–103.53)	(–34.16)	(–34.32)	(–34.24)		(–29.60)	(–6.30)
MS^2		–0.194***	–0.453***	–0.081***	–0.081***	–0.081***		–0.060***	–0.101***
		(–89.31)	(–80.09)	(–19.70)	(–19.71)	(–19.70)		(–18.84)	(–5.26)
MS′							–0.180***		
							(–12.95)		
MS'^2							–0.200***		
							(–9.23)		
L.GPM									0.750***
									(25.01)
MS*DIG								0.000*	
								(1.69)	
MS^2*DIG								0.000*	
								(1.71)	
Control	YES	YES	YES	YES	YES	YES	YES		
PRO	YES	YES	YES	YES	NO	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES	NO	YES	YES	YES
IND	NO	NO	NO	NO	YES	YES	NO	NO	NO
PRO*YEAR	NO	NO	NO	YES	NO	NO	NO	NO	NO
IND*YEAR	NO	NO	NO	NO	YES	NO	NO	NO	NO
PRO*IND	NO	NO	NO	NO	NO	YES	NO	NO	NO
Constant	0.121***	–0.110***	–0.315***	0.270***	0.209***	0.224***	0.018	0.182***	
	(5.06)	(–16.29)	(–23.18)	(6.98)	(9.32)	(9.99)	(0.52)	(8.00)	
R^2	0.110	0.375	0.269	0.133	0.133	0.132	0.097	0.118	
Observations	31.940	33.802	33.802	33.802	33.802	33.802	33.802	33.802	31.940

6.1. Testing the curve inflection points for all enterprises and subgroups of enterprises

Using the previously collected panel data and applying threshold estimation methods, we estimate the inflection points of the inverted U-shaped curve, where investment-financing maturity mismatch affects corporate performance. Building on model (2) and drawing on the methods from Hansen (1999) and Wang (2015), we construct the following econometric model:

$$GPM_{it} = \alpha_0 + \alpha_1 \times MS_{it} \times I(MS_{it} < \gamma) + \alpha_2 \times MS_{it} \times I\left(MS_{it} \geq \gamma\right) + \\ \sum \alpha_3 Controls_{it} + PRO + YEAR + \varepsilon_{it}. \quad (8)$$

In Eq. (8), γ represents the threshold value to be estimated, $I(\cdot)$ is an indicator function, and other variables have the same meanings as in Model (2). Testing for the presence of a threshold effect in Eq. (8) involves examining whether the α coefficients differ significantly. The null hypothesis is H0: $\alpha_1 = \alpha_2$, while the alternative hypothesis is H1: $\alpha_1 \neq \alpha_2$. Hansen (1999) proposes the LM test statistic as follows: $F_1 = \left(S_0 - S_1\left(\hat{\gamma}\right)\right) / \sigma^2$ where S_0 represents the sum of squared residuals when no threshold effect is present, and $S_1\left(\hat{\gamma}\right)$ is the sum of squared residuals when a threshold effect is introduced. A p-value below 0.1 leads to the rejection of the null hypothesis, confirming the existence of a threshold effect. If the threshold effect test rejects the null hypothesis, a subsequent test verifies the validity of the estimated threshold value. This is done using the Likelihood Ratio (LR) test statistic, given by: $LR\left(\gamma\right) = \left[S_1\left(\gamma\right) - S_1\left(\hat{\gamma}\right)\right] / \sigma^2$. At a 5% significance level, the critical value for LR is 7.35. If LR = 7.35, the null hypothesis cannot be rejected, suggesting that the threshold estimate is valid.

The test results based on the threshold model (Table 7) indicate: First, in the full sample (including both tech and non-technology-based firms), there exists a significant single-threshold effect between investment-financing maturity mismatch and firm performance, exhibiting an inverted U-shaped relationship, which further supports Hypothesis H1. Second, the inflection point for the full sample occurs at MS = –0.592, a negative value. This indicates that the optimal financial strategy is not absolute maturity matching (MS = 0), but rather permits a certain degree of "long-term financing for short-term investment". All confidence intervals are significantly negative, strongly supporting the conclusion that the inflection point lies in the negative interval. For non-technology firms, the threshold value is MS = –0.44, indicating they can maintain relatively stable performance below this threshold, reflecting relatively stable cash flows and lower refinancing risks. For technology-based firms, the threshold is MS = –0.51, lower than non-technology firms. This indicates they face negative term mismatch effects earlier, likely due to characteristics such as substantial R&D investment, long project cycles, high uncertainty, and difficulty in external financing. Consequently, they rely more heavily on short-term debt to support long-term projects, reaching liquidity risk thresholds faster. This result supports Hypothesis H2.

Notably, the inflection points obtained from the threshold model (e.g., –0.592 for the full sample) differ from those derived from the quadratic regression (e.g., –0.802). This discrepancy is not contradictory but stems from their distinct logics. Quadratic regression assumes a continuous smooth parabola, capturing the overall pattern, yet its inflection point is sensitive to functional form and extreme observations. Threshold regression, in contrast, is data-driven – it does not pre-specify a functional form but searches for structural breakpoints that minimize residual sums of squares, thereby identifying the actual point at which performance changes significantly. Therefore, from a policy recommendation perspective, the threshold model's inflection point offers more practical reference value.

As shown in Figure 3 (from left to right: full sample, non-technology firms, and technology firms), the inflection point for non-technology firms lies to the right of –0.5 and below the LR =7.35 line, while that for technology firms is to the left of –0.5 and also below this line. This not only validates the accuracy of the inflection point estimates in Table 7 but also indicates that technology-based firms possess a more left-shifted maturity mismatch threshold, leading to earlier performance declines, thereby further supporting Hypothesis H2.

Table 7. Threshold effect test

Model	Hypothesis	p-value	Bootstrap count	Threshold estimate	Confidence interval
All firms	H0: linear model	0.000	300	–0.592	[–0.747, –0.497]
	H1: single threshold				
Non-tech Firms	H0: linear model	0.000	300	–0.442	[–0.699, –0.394]
	H1: single threshold				
Tech firms	H0: linear model	0.000	300	–0.512	[–0.736, –0.437]
	H1: single threshold				

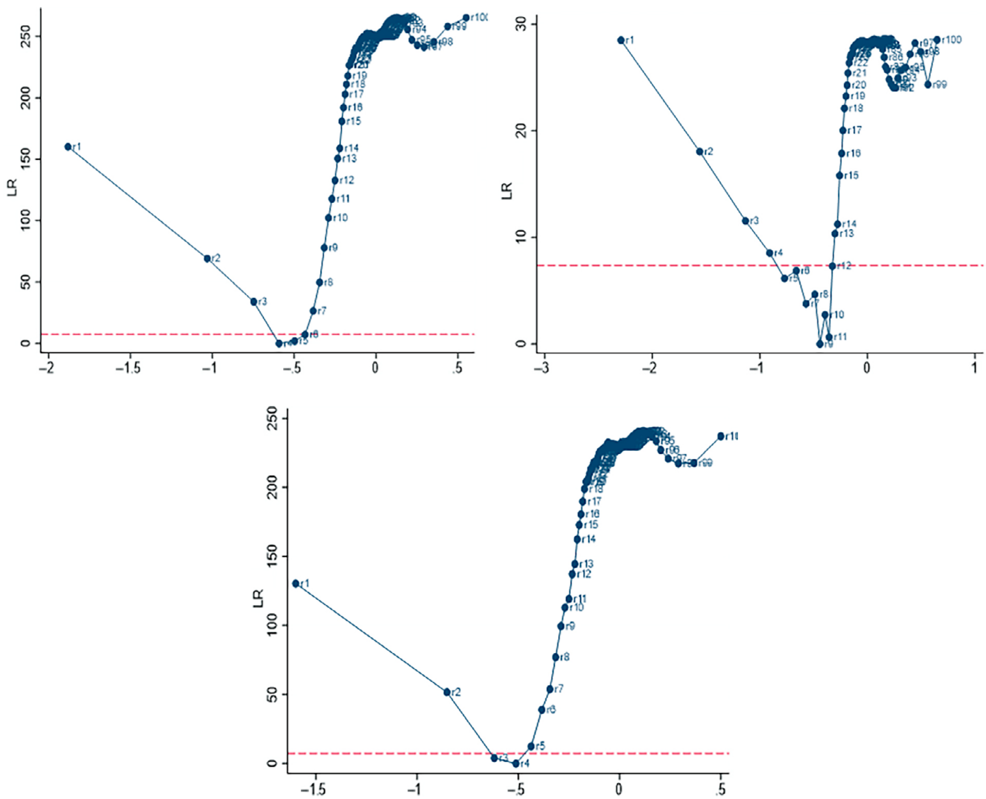

Figure 3. LR chart of curve inflection points

6.2. Mechanism analysis of enterprise heterogeneity in curve inflection points

First, we consider the role of Internal Controls (IC). High-quality internal controls mitigate agency problems and information asymmetry, thereby enhancing investment efficiency and reducing the negative impact of irrational maturity mismatches on performance (Nocco & Stulz, 2022; Tang et al., 2024). We measure IC using the Debao China Listed Companies Internal Control Index.

Second, we examine market competition (HHI). Intense competition pressures firms to allocate resources more cautiously, reduces information asymmetry, and curbs overinvestment, all of which can delay the negative consequences of maturity mismatch (Parnell et al., 2015; Sheng & Ding, 2024). We measure competition using the Herfindahl Index, where lower values indicate greater competition.

Following Newton et al. (2016), we split the sample into high and low groups based on the annual median of IC and HHI, and then re-estimate the threshold model. The results, presented in Table 8, show that in companies with high internal control and high market competition, the inflection point of the inverted U-shaped curve arrives later. Figure 4 (From left to right, these are curve inflection points for firms with high internal controls, low internal controls, high market competition and low market competition) further validates the accuracy of this inflection point.

Table 8. Mechanism test

Model	Hypothesis	p-value	BS count	Inflection point estimate	Confidence interval
High internal control	H0: linear model H1: single threshold	0.000	300	–0.470	[–0.567, –0.403]
Low internal control	H0: linear model H1: single threshold	0.000	300	–0.678	[–0.857, –0.560]
High market competition	H0: linear model H1: single threshold	0.000	300	–0.417	[–0.509, –0.373]
Low market competition	H0: linear model H1: single threshold	0.000	300	–0.467	[–0.559, –0.399]

6.3. Analysis of interaction mechanisms

The preceding analysis separately verified the independent effects of internal corporate governance and external environment on the inflection point location of the inverted U-shaped relationship between investment-financing maturity mismatch and corporate performance. To gain deeper insight into the underlying mechanisms, this paper further explores potential interactive effects among internal governance, external market environment, and digital economic development. Such interactions help reveal more complex synergistic or substitution mechanisms behind the heterogeneity inflection point.

We examined these effects by introducing interaction terms into the baseline model (Model 2). Specifically, we constructed the following model:

$$\begin{aligned}&GPM_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 MS^2_{it} + \alpha_3 IC_{it} + \alpha_4 DEDIC_{it} + \\&\alpha_5 IC_{it} \times DEDIC_{it} + \sum \alpha_6 Controls_{it} + PRO + YEAR + \varepsilon_{it};\end{aligned} \tag{9}$$

$$\begin{aligned}&GPM_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha 2 MS^2_{it} + \alpha_3 HHI_{it} + \alpha_4 DEDIC_{it} + \\&\alpha_5 HHI_{it} \times DEDIC_{it} + \sum \alpha_6 Controls_{it} + PRO + YEAR + \varepsilon_{it}.\end{aligned} \tag{10}$$

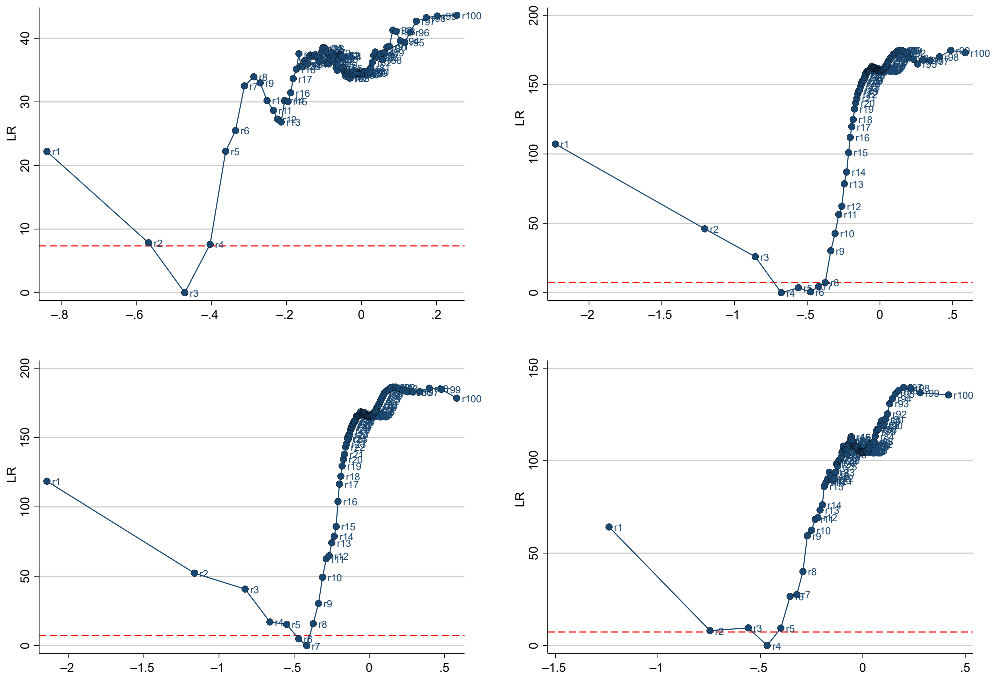

Figure 4. Mechanism analysis – curve inflection point LR chart

Columns (1)–(2) of Table 9 present the results of the Analysis of Interaction Mechanism, which show a significantly positive coefficient for IC*DEDIC, indicating a complementary effect between IC and DEDIC. The impact of the digital economy is more pronounced in intensely competitive environments. Firms facing greater competitive pressure are better positioned to optimize their investment and financing structures through digital means, mitigating the negative effects of maturity mismatch, with the inflection point shifting to the right.

6.4. Quantile regression

The results are shown in Columns (3)–(5) of Table 9. Regardless of whether the firm exhibits lower or higher performance, the inverted U-shaped relationship between investment-financing term mismatch and firm performance holds true. However, the specific shape and inflection points exhibit significant asymmetry. We find that at the 25th percentile, the inflection point roughly occurs at MS = –1.256; at the 50th percentile, it occurs at MS = –0.99; and at the 75th percentile, it occurs at MS = –0.942. This indicates that for low-performing firms, the negative impact of maturity mismatch emerges earlier, contrasting with high-performing firms. Poorer-performing companies are more sensitive and vulnerable to aggressive financing strategies.

Table 9. Interaction mechanism and quantile regression

Variable	(1)	(2)	(3)	(4)	(5)
	GPM	GPM	GPM	GPM	GPM
			(25%)	(50%)	(75%)
MS	–0.199***	–0.192***	–0.200***	–0.211***	–0.198***
	(–31.49)	(–30.64)	(–19.34)	(–31.24)	(–34.44)
MS^2	–0.097***	–0.091***	–0.079***	–0.106***	–0.105***
	(–19.04)	(–18.00)	(–9.50)	(–19.51)	(–22.69)
IC	0.000				
	(0.06)				
HHI		–0.076***			
		(–9.07)			
DEDIC	0.118***	0.059***			
	(3.64)	(9.28)			
IC×DEDIC	0.005***				
	(3.39)				
HHI×DEDIC		–0.214***			
		(–12.57)			
Control	YES	YES	YES	YES	YES
PRO	YES	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES
Constant	0.345***	0.311***	0.391***	0.339***	0.220***
	(19.34)	(18.24)	(13.95)	(18.46)	(14.07)
R^2	0.231	0.211	0.125	0.122	0.114
Observations	33,802	33,802	33,802	33,802	33,802

7. Conclusions and discussion

Using data from Shanghai and Shenzhen A-share companies, this study examines the relationship between investment-financing maturity mismatch and corporate performance, finding an inverted U-shaped relationship influenced by company nature. Technology-based firms experience the negative impact of maturity mismatch earlier, lacking government guarantees and facing severe financing constraints, making them prone to liquidity risks. The digital economy flattens the curve and shifts the inflection point left, reducing sensitivity to mismatch but causing the negative impact to emerge earlier for technology-based firms. It also shifts the curve upwards when the mismatch indicator is higher, with effects more pronounced for technology-based firms . Differences in the curve arise from internal control and market competition. Strong internal controls enhance the positive role of the digital economy in mitigating mismatch impacts, especially in competitive markets. Quantile regression shows low-performing firms are more sensitive to maturity mismatch.

Based on our findings, we propose the following policy recommendations:

For policymakers: Policymakers should establish an information-sharing platform between government, enterprises, and banks to monitor major science and technology projects for maturity mismatches like "short-term loans for long-term investments". Introducing fintech subsidies and tax incentives can encourage financial institutions to develop medium-to-long-term digital credit products tailored for technology-based firms. Additionally, new internal control and audit standards compatible with the digital economy should be developed to align corporate governance with digital advancements.

For enterprises: Enterprises should enhance the use of digital tools for managing investment and financing maturity structures, such as AI-driven cash flow forecasting systems. Technology companies should secure long-term financing early, while non-technology enterprises should maintain flexibility to manage mismatch risks. Strengthening audits within a digital environment ensures long-term capital aligns with strategic projects.

For financial institutions: Financial institutions need to develop digital financial products tailored for technology-based firms , focusing on medium-to-long-term financing based on intellectual property and future revenue. Utilizing big data for risk management can improve accuracy in assessing repayment capabilities and maturity risks. Additionally, encouraging the development of innovative financial instruments like medium-to-long-term bonds can support technology companies' R&D, easing maturity mismatch pressures.

Although this study analyzes and examines the relationship between investment-financing maturity mismatch and corporate performance in the digital economy, it has some limitations: it only uses data from Chinese A-share listed companies from 2010 to 2022, excluding non-listed companies, so the universality of the conclusions requires verification. The study explores the impact of internal control and market competition on heterogeneity turning points, but does not consider multiple factors such as monetary and industrial policies, and future research could incorporate more variables. The median-based grouping method may not capture subtle differences within groups, necessitating more refined methods. The digital economy is rapidly evolving, and the indicator system based on historical data may not reflect the latest trends, requiring continuous updates to data and indicator systems.

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Disclosure statement

The authors declare no competing interests.

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