



How Can Digital Technology Innovations Reduce the Risk of Corporate Default?

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Abstract. As a key driving force to promote the digital economy and economy, can the strong radiation linkage effect of digital technological innovation play a role in corporate debt default risk? In order to address this issue, this paper selects Chinese listed enterprises from 2010 to 2023 as the object, empirically analyzes the effect and path of digital technological innovation on corporate default risk. The study shows that digital technology innovation can significantly reduce corporate debt default risk.

Keywords: digital technology innovation; default risk; information transparency

1 Introduction

In recent years, the digital economy, with big data and cloud computing as its signature technologies, has shown explosive growth, and has gradually become an important engine for driving high-quality economic development by continuously empowering the transformation and upgrading of the real economy. China has placed digital technology innovation as a strategic priority, and has made efforts to cultivate new forms of productivity based on the digital economy. As the most active field of technology iteration, digital innovation now serves as the foundational driving force propelling digital economic advancement, owing to its extensive practical applications across industries.

On the one hand, digital technology shows multi-dimensional governance effects: it can not only alleviate information asymmetry and improve the quality of internal control of enterprises, but also simultaneously improve the quality and efficiency of innovation. This technological empowerment enables enterprises to develop new markets and consolidate competitive advantages in an increasingly competitive environment, while releasing positive signals to stakeholders and realizing the dual governance goals of enterprise value enhancement and default risk reduction. On the other hand, the high capital density, long R&D cycle and strong market uncertainty inherent in digital technological innovation are causing enterprises to face multi-dimensional governance difficulties: firstly, the persistent capital and technological inputs are exacerbating the financial load of the enterprises, especially for R&D-intensive SMEs to form a cash-flow squeeze effect; secondly, the high degree of uncertainty in the process of technological

achievement marketization may trigger an escalation of debt default risk in the event of project failure or lagging commercialization, which may lead to an increase in debt default risk and a reduction in the risk of default. Second, the high degree of uncertainty in the process of marketization of technological achievements may trigger the escalation of debt default risk in case of project failure or lagging commercialization, thus threatening the normal operation of enterprises. This “innovation investment-risk accumulation” transmission mechanism has become a key proposition of corporate governance in the digital economy ecosystem that needs to be solved urgently.

Therefore, this paper research how digital technology innovation affects corporate default risk. It is expected to produce the following contributions: enriching the articles in the field of economic impact brought by digital technology; enriching the practical theory of reducing corporate default risk, which is more important for listed companies and relevant departments.

2 Theoretical Analysis and Research Hypothesis

For a long time, how to promote digital technological innovation is a core topic of common concern between academia and industry. It has been shown that digital technology can not only effectively alleviate the problem of information asymmetry and mitigate the agency problem arising from information asymmetry^[1] (Lv Kangyin et al., 2025). At the same time, accelerating the development of digital technology, enterprises can carry out refined management of business management activities and improve the internal transparency of enterprises^[2] (Wang Mengying, 2025). The alleviation of information asymmetry can compress the space for manipulation by enterprise insiders, further alleviate the enterprise agency problem and reduce the internal control cost, and avoid the risk of default due to the agency problem. Lower internal control costs mean that the enterprise operation is more efficient, the funds can be more reasonably allocated and utilized, to avoid the waste of funds due to internal mismanagement, operational inefficiency and other problems, to improve the quality of the enterprise's internal control, and the higher quality of the internal control can provide a systematic guarantee to reduce the risk of default^[8] (Li Meng and Wang Jin, 2020). At the same time, digital technology innovation can effectively create value for enterprises^[3] (Huang Bo et al., 2023), which can not only enhance the enterprise's market competitiveness and broaden revenue channels, but also enhance the ability to resist risks, forming from “efficiency optimization” to “value appreciation” of the double anti-default barrier, and ultimately build a technology-driven risk prevention and control system. In addition, digital technology mitigates internal and external information asymmetry, improves corporate information transparency, and also improves the quality of corporate ESG disclosure^[6] (Liu Di et al., 2024), while higher ESG disclosure can improve corporate reputation, ease corporate financing constraints, and help enterprises draw external resources, which can incentivize and constrain the fulfillment of debt covenants, and reduce the risk of corporate debt defaults^[4] (Yang Renfa et al., 2024).

While mitigating information asymmetry and improving the quality of enterprise internal control, digital technology can also effectively improve the quality of enterprise

innovation and innovation efficiency, allowing enterprises to expand new markets and master competitive advantages in an increasingly competitive market, sending positive signals to the outside world, increasing enterprise value and reducing the risk of enterprise default^[7] (Meng Qingbin et al., 2019). Digital technology can empower the digital transformation and upgrading of enterprises, drive enterprises to realize refined management, improve enterprise operation efficiency, reduce enterprise operation risk, and provide a strong guarantee for the timely payment of principal and interest on maturing debts^[9] (Wang Shouhai et al., 2022). Based on the above analysis, this sub-proposes hypothesis H1:

H1: Digital technology innovation can effectively reduce enterprise default risk. Research Design and Modeling

3 Research Design

3.1 Sample Selection and Data Sources

This research utilizes publicly traded firms in China's A-share market from 2010 through 2023 as the foundational dataset, and drawing on existing studies, we do the following when screening the research sample: (1) exclude ST-type and financial companies (2) exclude observations with missing data.

3.2 Definition of Variables

3.2.1 Explained Variables.

Enterprise Default Risk (EDF), referring to the research design of Guo Jingxian and Gong Wenjie (2023), the debt default risk of firms is measured by the corporate default distance.

3.2.2 Explanatory Variables.

In terms of the construction of digital technology innovation (innovation) indicators, referring to the research method of Zheng Panpan^[5] (2023), the digital technology innovation is measured by extracting the keywords reflecting digital technology innovation in the annual report of the enterprise, and calculating the ratio of the total word frequency of the core keywords to the total number of words in the text of the annual report.

3.3 Modeling

In order to explore the correlation mechanism between digital technology innovation and corporate default risk, this paper constructs model to carry out empirical analysis:

$$EDF_{i,t} = \partial_0 + \partial_1 Innovation_{i,t} + \partial_i Controls_{i,t} + \sum Year + \sum Ind + \varepsilon_{i,t}$$

In this model, EDF represents firm default risk and Innovation represents firm digital technology innovation,

4 Empirical Findings

4.1 Baseline Regression Analysis

Table 1 reports the main regression results, where column (1) indicates that only year and individual effects are controlled for, and further relevant control variables are added in column (2). The regression coefficients of innoation in columns (1) and (2) of Table 3 are -0.026 and -0.056, which are both significantly negative, validating Hypothesis H1 of this paper.

Table 1. Benchmark regression results

	(1)	(2)
	EDF	EDF
innoation	-0.026* (-1.762)	-0.056*** (-3.777)
Observations	34116	34116
R ²	0.034	0.050

4.2 Robustness Tests

4.2.1 Explanatory Variables Lagged.

In order to further examine the lagged effect of digital technological innovation, this paper lags the independent variable innoation by 1-3 periods. The regression results are shown in Table 2, the regression coefficients of Innoation with lag 1-3 periods are -0.061, -0.053 and -0.052 respectively, which are all significantly negative, confirming the hypothesis H1.

Table 2. Lag test of explanatory variables

	EDF	EDF	EDF
	One-period behind	Two-periods behind	Three-phase behind
innoation	-0.061*** (-3.568)		
innoation		-0.053*** (-2.833)	
innoation			-0.052*** (-2.614)
Observations	29053	25285	22087
R ²	0.055	0.056	0.057

4.2.2 Instrumental Variables Approach.

In order to deal with the potential bias that may result from omitted variables and endogeneity issues, the instrumental variables approach to validate the robustness of the findings. As shown in Table 3, the two-stage regression analysis reveals that the coefficients of the innovation variables show a significant negative relationship at the 1% significance level, thus supporting the core findings. It confirms that digital technological innovation can effectively reduce corporate default risk, indicating that hypothesis H1 still holds after considering the possible variable omission problem and endogeneity problem.

Table 3. Instrumental variable method test

VARIABLES	(1)	(2)
	innonation Phase I	EDF Phase II
iv_mean	0.9241*** (0.007)	
innonation		-0.0473*** (0.010)
Observations	34,049	34,049
R-squared	0.405	0.090

4.3 Further Tests-Moderating Effect of Information Transparency

High transparency exposes a firm's debt default to investors, regulators and the public, and external pressure will play a monitoring role. At the same time, increased information transparency makes the flow of information between departments within the enterprise smoother, improves operational efficiency, and reduces the risk of default due to internal mismanagement^[10](Liang Shangkun et al., 2024) Therefore, this paper believes that the higher the transparency of the enterprise, digital technology innovation is more effective in reducing the risk of corporate default. The coefficients of the cross-multiplier terms of Innovation and Capacity in the following table 4 are significantly negative, which confirms that the higher the transparency of enterprises, the more effective digital technological innovation is in reducing the risk of corporate default.

Table 4. Moderating effect of information transparency

	EDF
innovation	-0.035* (-1.908)
innovation *opacity	-0.013* (-1.818)
opacity	0.005*** (5.789)
N	34116
R ²	0.051

5 Conclusion

The above findings and conclusions of this paper have more important insights for listed companies and related departments. Digital technology innovation is the key hand to crack the risk of corporate default. In order to accelerate the digital technology innovation of enterprises, support the digital transformation and refined management of enterprises, guide enterprises to build an internal risk assessment model, incorporate the ability to apply digital technology into the internal control system of enterprises, and reduce the risk of default due to sloppy management from the source.

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