Digital Finance and Term Structure of Enterprise Debt Financing

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Abstract

This paper empirically analyzes the impact of digital finance on the term structure of corporate debt Financing, taking China's A-share listed companies from 2011-2021 as the research sample. The research shows that there is a negative correlation between the development of digital finance and the term structure of corporate debt Financing, and the conclusion is still valid after a series of robustness tests and endogenous treatment. It further analyzes the impact of the heterogeneity between high-tech enterprises and state-owned enterprises on digital finance and enterprise debt Financing. On the one hand, this study enriches the relevant research on digital finance and the term structure of corporate debt Financing, on the other hand, it provides reference and enlightenment for the high-quality development of enterprises.

Keywords

Digital finance; Term structure of debt Financing; High quality development.

1. Introduction

On the basis of traditional finance, digital finance is based on digital technology, utilizing the current popular big data and artificial intelligence to broaden the financial service system. Driven by digital technology and financial resources, digital finance has played an unprecedented role in promoting the economic development and structural transformation of enterprises. The current research on digital finance and the term structure of corporate debt Financing shows that digital finance improves corporate performance by improving market information transparency and business environment, but there is still a gap in how digital finance affects the term structure of corporate debt Financing. Therefore, how to effectively use digital finance to promote the high-quality development of enterprises and use financial instruments to serve the main body of enterprises, this paper selects the data of A-share listed companies in 337 prefecture level cities nationwide from 2011-2021 for empirical research to explore the relationship between digital finance and the term structure of corporate debt Financing. This paper empirically analyzes the impact of digital finance on the term structure of corporate debt Financing, taking China's A-share listed companies from 2011-2021 as the research sample. The research shows that the development of digital finance has a negative correlation with the term structure of corporate debt Financing, and the conclusion is still valid after a series of robustness tests and endogeneity treatment. It further analyzes the impact of the heterogeneity of high-tech enterprises and state-owned enterprises on digital finance and corporate debt Financing. On the one hand, this study enriches the relevant research on digital finance and corporate debt Financing, and on the other hand, it provides reference and enlightenment for the high-quality development of enterprises.

2. Journals reviewed

2.1. Research on Digital Finance

Exploring the research of digital finance from a macro perspective mainly manifests as its impact on the overall economy and industrial structure of a country. Firstly, at the overall economic level, due to the HP inclusive nature of digital finance, resources can be tilted towards impoverished areas, reversing the economic disparities caused by past geographical limitations. Wang Yongcang et al. (2020) found that the foundation of digital finance in the central and western regions is relatively weak, and there is ample development space. It can effectively utilize the promoting effect of digital finance on economic growth to promote regional economic construction. With the systemic circulation of the domestic economic system, digital finance can increase the income of the population in poor areas, thereby stimulating consumption and promoting regional economic growth, and the stimulating effect is more obvious in the coastal developed areas (Qian Haizhang et al., 2020). Bede et al. (2020) studied bank data in South Africa and found that compared to the instability of traditional finance, the inclusiveness of digital finance can promote long-term stable economic growth. Despite the differences in digital financial products among different income groups, the overall economic resilience has been improved.

Secondly, at the level of industrial structure, the emergence of digital finance has improved the efficiency of resource allocation in the market, provided convenience for financial activities of regions and enterprises, and reduced costs, thereby helping to optimize and upgrade the industrial structure (Tang Wenjin et al., 2019). Cheng et al. (2020) found through a study of 72 countries and regions that the negative impact of the financial industry gradually decreases with the help of the Internet and digital technology, thereby promoting the upgrading of industrial structure. Du Jinmin, et al.

2.2. Research on Enterprise debt Financing

At present, the influencing factors on enterprise debt Financing structure can be divided into two levels: macro industry and micro enterprise. First, there is a balanced relationship between the macro-economy and the debt Financing structure. When the regional economic development level is good and the financial industry is booming, enterprises' long-term debt Financing level will be driven, while when the monetary policy is loose, enterprises' short-term debt Financing will be improved (Zhang Changhai et al., 2016). Huang Juying et al. (2014) found through their research on government behavior that monetary policy was also affected by the quality of local governments. Similarly, in the face of inflation, high government quality can introduce countermeasures to promote the long-term debt Financing level of enterprises. In addition, economic transactions in regions with high degree of marketization are frequent, which shortens the term of enterprise debt Financing. Government intervention can adjust the term of enterprise debt Financing, and the quality of the legal environment also indirectly affects the degree of government intervention. Therefore, the macro environment has a greater impact on the term of enterprise debt Financing (He Chang et al., 2019). Based on different industries, as well as different scales and liquidity of funds, all have a significant impact on the maturity of enterprises' debt Financing. For the regulated industry, the economic decisions made by the management are more cautious, and in order to avoid capital dispersion, they prefer more stable long-term debt Financing (Smoth et al., 2016).

Second, at the micro level of enterprises, Zhai Shuping et al. (2019) explored the relationship between enterprise strategy and the term structure of debt Financing. When the enterprise strategy is more radical, there are certain risks, and then daily funds can be obtained by increasing the proportion of short-term debt Financing. At the same time, management's influence on corporate governance will also affect the term structure of corporate debt

Financing. Enterprises with high governance level have more strict control and supervision over management's decisions. Banks and other financial institutions are more confident and will also provide debt Financing with a longer term (Scherr et al., 2018).

3. Theoretical analysis and hypothesis formulation

The development of digital finance has made the financial industry more promising, with more investors investing in financial institutions, changing the previous monopoly of large banks in financing. Small and medium-sized banks and non-financial institutions are flourishing, greatly alleviating the problem of short-term financing difficulties for enterprises. When enterprises urgently need repayment funds and cannot turn them around, there are more financing channels to choose from, and digital finance can help enterprises transition to difficult financial periods. Zhang Jianhua et al. (2019) found that the short loan term is mostly due to high financing costs or the lack of financing channels. The development of digital finance allows enterprises to obtain short-term funds without pressure, leading to an increase in short-term loans and exacerbating the problem of investment term mismatch, which is not conducive to long-term investment structure planning for enterprises.

The development of digital finance provides a large number of financial products, financial technology, and financial services, lowering the threshold for corporate loans. While providing convenience, it undermines the financing cost and difficulty of enterprises, leading to excessive investment that is not conducive to their development. Sun Zhihong et al. (2018) found that the booming development of the financial industry has led to more diversified products, and various investment needs have emerged in the market. Enterprises can choose different risk financial products to combine according to their own needs. When making choices in the face of heterogeneous risks, because the low cost of borrowing may lead enterprises to choose high-risk assets in order to obtain high returns and reverse the negative to positive net present value of enterprises. However, high-risk investment is not conducive to enterprises making correct financial investment decisions. The failure of high-risk investment directly leads to the risk of bankruptcy of enterprises, and the success of investment will also cause enterprises to have a fluke mentality, which will aggravate excessive investment and make the term structure of enterprise debt Financing more chaotic.

Although the development of digital finance has great potential, the current level of technological development is still incomplete, and there are loopholes in relevant control and legal supervision. In addition, the development trend of digital finance in recent years has been good, and local governments and regulatory departments have provided loose policies for its development, providing a relatively comfortable environment for digital finance (Zhang Yong et al., 2017). Due to the relative tolerance and lack of regulation in the overall environment, excessive investment by enterprises can lead to resource mismatch. The current big data risk management and control is also not perfect. When collecting data for enterprises, they can only provide investment related relationships for enterprises, ignoring the causal analysis of funds, which will also lead to insufficient funds for enterprises and affect reproduction. Based on this, this article proposes research hypothesis 1:

H1: There is a negative correlation between digital finance and enterprise debt Financing structure.

4. Research Design

4.1. Variable Definition

Enterprise debt Financing structure. To ensure the availability of data, the ratio of long-term borrowings to total liabilities is used to measure the debt Financing structure of enterprises.

The development level of digital finance. This paper refers to the research of Guo Feng et al. (2020), and uses the financial data collected in the "Peking University Digital Inclusive Finance Index" to measure the development level of digital finance. The time span of the city level index covered by this data is 2011-2021. The data reflects that China's digital finance has maintained a relatively high development momentum despite the unstable external economic environment in recent years, reflecting the strong resilience and unstoppable development of digital finance. This article selects digital finance related data from A-share listed companies in 337 prefecture level cities as the core explanatory variable to reflect the coverage, depth of use, and degree of digitization of digital finance.

4.2. Model Building

To verify the impact of digital finance on the term structure of corporate debt Financing, the following benchmark regression model is constructed:

$$Y1_{i,t} = \alpha_0 + \alpha_1 X_{j,t} + \sum \alpha_i \times Controls_{i,t} + \sum Year + \sum Industry + \varepsilon \qquad (1)$$

$Y1_{i,t}$ represents the term structure of enterprise debt Financing, $X_{j,t}$ represents the digital financial index.

5. Empirical Results and Analysis

5.1. Descriptive Statistics

Table 1 shows the descriptive statistics of the main research variables in this article. From the table, it can be seen that the average x value of the development level of digital finance is 2.157, the maximum value is 3.453, and the minimum value is 0.567, indicating that the overall development level of enterprise digital finance in the sample data is low and uneven, with significant differences. The average value of corporate debt Financing structure Y1 is 0.124, which is closely related to the maximum and minimum value, indicating that there is no significant heterogeneity in the financing structure of the sample companies.

Table 1: Descriptive statistics

Variable	N	Mean	p50	SD	Min	Max
Y1	16492	0.124	0.0740	0.146	0	0.886
x	16492	2.157	2.222	0.766	0.567	3.453
Size	16492	22.620	22.430	1.339	20.170	26.210
ROA	16492	0.032	0.031	0.056	-0.222	0.177
Growth	16492	0.177	0.109	0.401	-0.554	2.378
TobinQ	16492	1.823	1.473	1.056	0.857	6.939
INST	16492	0.423	0.433	0.229	0.003	0.877
Mfee	16492	0.083	0.067	0.063	0.009	0.384
BM	16492	1.361	0.888	1.364	0.087	7.074
Board	16492	2.150	2.197	0.199	1.609	2.708

5.2. Regression Analysis

Table 2 shows the fixed effect regression results of digital finance on the term structure of debt Financing.(1) is the preliminary regression result of digital finance and enterprise debt Financing structure, which only controls the year and industry fixed effects; Column (2) includes other control variables that may have an impact on the regression results. The correlation coefficients of the digital finance index in the two column regression results are -0.022 and -0.020, respectively, and both are significantly negatively correlated at the 1% level. It shows that the development of digital finance may improve the business environment of

enterprises, reduce the business risk of enterprises and optimize the structure of enterprise debt Financing, which verifies the research hypothesis 1 of this paper.

Table 2: Benchmark Regression Results

	(1) Y1	(2) Y1
x	-0.022***	-0.020***
	(-4.305)	(-3.847)
ROA		-0.096***
		(-4.960)
Growth		0.018***
		(6.849)
TobinQ		-0.004***
		(-3.210)
Size		0.013***
		(10.697)
INST		-0.004
		(-0.851)
Mfee		0.197***
		(10.961)
BM		0.007***
		(6.676)
Board		0.002
		(0.458)
_cons	0.153***	-0.154***
	(15.729)	(-5.363)
N	16492.000	16492.000
r2	0.230	0.257
r2_a	0.228	0.255
Year	Yes	Yes
Industry1		Yes

5.3. Robustness test

In order to test the reliability of regression results, this paper conducts the following robustness tests on empirical results:

Firstly, replace the measurement indicators of the dependent variable. This paper uses the ratio of non current liabilities to total liabilities to measure the corporate debt Financing structure (Y1_1). Based on this retest, the regression results are shown in column (1) of Table 3 respectively. The relationship between digital finance and the term structure of enterprise debt Financing has not changed significantly.

Second, considering that the development of digital finance affects the continuity of enterprise debt Financing, the regression results of the explanatory variable digital finance lag one period, as shown in column (2) of Table 3, the lag coefficient of digital finance (L.x) is -0.020, which is significantly negatively correlated at the level of 1%, confirming the hypothesis of 1.

Third, considering that the financial crisis and the COVID-19 have interfered with long-term credit, financial institutions are more cautious about borrowing funds, and have a negative

impact on corporate debt Financing, so the sample data of 2011 and 2019-2021 are excluded for regression. At the same time, considering that most industries are closely related to information technology, communication engineering, etc., and indirectly related to digitization, this article only retains sample data from the manufacturing industry for regression. The overall regression coefficient is shown in the last column of Table 3, which verifies the robustness of the conclusions of the article.

Table 3: Robustness Test

	(1) Y1_1	(2) Y1	(3) Y1
x	-0.027***		-0.014***
	(-4.356)		(-2.616)
ROA	-0.060**	-0.063***	-0.138***
	(-2.501)	(-2.740)	(-6.514)
Growth	0.016***	0.020***	0.022***
	(5.243)	(6.200)	(7.450)
TobinQ	-0.005***	-0.006***	-0.001
	(-3.580)	(-4.022)	(-0.719)
Size	0.033***	0.013***	0.013***
	(22.079)	(9.012)	(9.716)
INST	-0.004	-0.009	-0.003
	(-0.657)	(-1.577)	(-0.618)
Mfee	0.428***	0.226***	0.214***
	(18.881)	(10.213)	(9.663)
BM	0.001	0.006***	0.005***
	(0.395)	(5.236)	(3.592)
Board	-0.007	0.005	-0.009
	(-1.054)	(0.799)	(-1.471)
L.x		-0.020***	
		(-3.392)	
_cons	-0.500***	-0.147***	-0.196***
	(-14.288)	(-4.436)	(-6.581)
N	16492.000	164920.000	16492.000
r2	0.301	0.269	0.081
r2_a	0.300	0.267	0.079
Year	Yes	Yes	Yes
Industry1			

5.4. Endogeneity Testing

When examining the impact of digital finance development on the term structure of corporate debt Financing, there may be endogenous bias. Although digital finance, as a macro variable, is less affected by the micro behavior of enterprises, there may still be endogeneity issues caused by missing variables or measurement errors, and there may be a two-way causal relationship between economic development and digital finance. Therefore, this article uses the instrumental variable method for further testing, using a total of 368 cities to measure their spherical distance from Hangzhou as the instrumental variable for endogeneity treatment in

digital finance. The development level of digital finance in each city is directly related to the overall digital finance in China, but the development of digital finance in each region will not affect the economic level of other cities. The spherical distance of each city can be used as an effective tool variable for digital finance. The calculation process of instrumental variables in this article is to observe the longitude and latitude of each city and calculate its spherical distance from Hangzhou. The regression result after recalculation is shown in Table 4. The regression coefficient of column (2) is -0.103, which indicates the negative relationship between digital finance and the term structure of enterprise debt Financing, and confirms the hypothesis of the article.

VARIABLES	(1) first stage x	(2) second stage Y1
x		-0.103***
		(0.017)
ROA	0.089***	-0.088***
	(0.027)	(0.020)
Growth	0.003	0.018***
	(0.004)	(0.003)
TobinQ		-0.003***
		(0.001)
Size		0.015***
		(0.001)
INST		-0.003
		(0.005)
Mfee		0.217***
		(0.019)
BM		0.006***
		(0.001)
Board		-0.005
		(0.005)
Instrumental variable	-0.077***	
	(0.002)	
Constant	1.132***	-0.122***
	(0.018)	(0.030)
Observations	16,492	16,492
R-squared	0.943	0.245

Table 4: Tool Variable Y1

5.5. Heterogeneity Analysis

From the basic regression and related tests, the previous paper has verified that there is a significant negative correlation between digital finance and the term structure of enterprise debt Financing, but no group regression has been conducted for enterprises. Therefore, this

paper conducts a heterogeneity test from whether high-tech enterprises and whether the nature of property rights belongs to state-owned and non-state-owned enterprises. The results are shown in Table 5.

5.5.1. High tech enterprises

Columns (1) and (2) show whether high-tech enterprises have a relationship between digital finance and enterprise debt Financing structure. Under the grouping of high-tech enterprises, the correlation coefficient between digital finance and enterprise debt Financing structure is not significant, which may be that high-tech enterprises can reasonably allocate debt resources with the help of digital finance, and its negative correlation effect is not obvious; The regression results under the grouping of non high-tech enterprises meet expectations.

5.5.2. Properth Nature

Compared to state-owned enterprises, the two regression results of non-state-owned enterprises are more significant, indicating that non-state-owned enterprises are more flexible and free in capital allocation and investment decision-making. It can be concluded that non high-tech and non-state-owned enterprises can better solve the term structure problem of debt Financing when using digital finance, while the impact of high-tech and state-owned enterprises is not significant.

Table 5: Grouping Inspection

	(1)	(2)	(3)	(4)
	Y1	Y1	Y1	Y1
	High tech enterprises	non high-tech enterprises	state-owned enterprises	non-state-owned enterprises
x	-0.001	-0.029***	-0.018**	-0.026***
	(-0.117)	(-4.527)	(-2.049)	(-4.149)
ROA	-0.142***	-0.075***	-0.155***	-0.059***
	(-4.456)	(-2.999)	(-4.125)	(-2.618)
Growth	0.029***	0.013***	0.018***	0.017***
	(6.555)	(4.214)	(3.914)	(5.744)
TobinQ	-0.006***	-0.003*	-0.005**	-0.006***
	(-2.976)	(-1.827)	(-2.189)	(-4.278)
Size	0.018***	0.012***	0.014***	0.012***
	(8.211)	(7.521)	(6.857)	(7.901)
INST	-0.007	-0.002	-0.027***	0.015**
	(-0.870)	(-0.384)	(-2.805)	(2.437)
Mfee	0.231***	0.196***	0.248***	0.225***
	(7.438)	(8.280)	(7.392)	(10.334)
BM	0.003	0.009***	0.008***	0.000
	(1.111)	(7.103)	(5.309)	(0.250)
Board	-0.003	0.005	0.051***	-0.035***
	(-0.352)	(0.717)	(6.021)	(-5.396)
_cons	-0.427***	-0.115***	-0.259***	-0.067*
	(-3.474)	(-3.253)	(-5.496)	(-1.838)
N	4803.000	11689.000	7137.000	9355.000
r2	0.078	0.289	0.346	0.139

r2_a	0.074	0.287	0.343	0.135
Year	Yes	Yes	Yes	Yes
Industry1	Yes	Yes	Yes	Yes

6. Inspiration

Based on the above conclusions, this article draws the following insights: firstly, we must firmly grasp the development potential of digital finance, utilize the HP characteristics of digital finance to better serve enterprises and drive economic growth; Secondly, while experiencing the dividends of digital finance, enterprises should maintain investment vigilance, prevent the disordered financing term structure caused by excessive investment, and conduct investment and financing reasonably; Thirdly, while vigorously developing digital finance, the government should not only provide incentive policies, but also build a system for enterprise supervision and assistance to provide environmental protection for solving the problem of financing term structure.

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