

# *Innovation Investment and Debt Financing Capacity: Evidence from Chinese Listed Companies*

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**Abstract.** Under the background of an innovation-driven development strategy and continuous promotion of science and technology finance policy, R&D investment of enterprises is not only related to technology accumulation and long-term competitiveness, but also may affect the judgment of external capital providers on the growth potential and solvency of enterprises. This study builds firm-year panel data and uses regression models with year fixed effects and industry fixed effects to investigate the effect of business innovation investment on debt financing capacity using A-share listed companies from 2015 to 2024 as samples. It is found that innovation investment has a significant positive impact on the scale of debt financing. After adding control variables, this conclusion is still valid. After further grouping by firm size over the sample period, innovation investment significantly boosts debt financing scale in both large and small firm groups, and the inter-group difference test is significant at the 10% level. The robustness test uses lagging innovation investment, and the result is still significantly positive. Research shows that R&D investment can enhance the debt financing ability of enterprises through signaling and alleviating information asymmetry, and the effect is different among enterprises of different sizes.

**Keywords:** innovation investment, debt financing capacity, R&D expenses

## **1. Introduction**

For listed companies, innovation investment not only affects their future competitiveness but also alters the judgment of external capital providers, such as banks and investors, on corporate development prospects and solvency [1]. Continuous R&D investment by enterprises can convey to the external market that they attach importance to technology accumulation, product upgrading, and long-term development, so it may become an important factor affecting debt financing ability [2]. Studies have discussed the relationship between innovation and financing from the perspectives of financing constraints, information asymmetry, financial development, and patent signals, but there is still room for further expansion on whether R&D investment can be directly converted into corporate debt financing capabilities and whether there are differences among enterprises of different sizes [3]. On the one hand, innovation investment can reflect the growth potential of enterprises and help to enhance the judgment of financial institutions on the future operating ability of enterprises. On the other hand, extended cycles, significant risk, and unclear transformation of

accomplishments are also features of R&D efforts. Creditors will still consider factors such as corporate profitability, cash flow, and operating efficiency in the process of credit granting.

This paper's contribution is mostly evident in three areas. First, in terms of research objects, this study uses a sample of A-share listed businesses from 2015 to 2024, which may accurately represent the relationship between debt financing and innovation investment of Chinese listed companies. Second, in terms of research methodology, this work also performs an enterprise-scale heterogeneity test and a robustness test based on controlling for year fixed effects and industry fixed effects. Thirdly, in a practical sense, the conclusions of this paper help enterprises to understand the role of R&D investment in external financing, and also help financial institutions to more reasonably identify the innovation ability and growth potential of enterprises in the process of credit granting.

## 2. Theoretical analysis and hypothesis raising

Studies have shown that innovation activities are closely related to the financing environment of enterprises. Investments in R&D and innovation frequently result in funding shortages because of the high level of unpredictability, low collateral value, and severe information asymmetry of innovation projects [4]. R&D activities of young enterprises are more vulnerable to cash flow and external financing conditions, indicating the close relationship between innovation and financing [5].

Businesses can use observable behavior to communicate their quality to the external market [6]. Sustained R&D spending can show how much priority businesses place on technology accumulation and future development, even though R&D investment is not comparable to the final innovation results [7]. However, when they are unable to completely comprehend the true quality of businesses, external capital sources will be more cautious when evaluating company risks [8]. Because of the risks associated with R&D, innovation investment may therefore become both a growth signal and an uncertainty [9]. The research on patent signals, intellectual property pledge, and financing constraints also shows that innovative achievements can alleviate the difficulty of information identification of external capital providers to a certain extent [10]. Accordingly, the following hypothesis is put forth in this paper:

H1: Enterprise innovation investment will have an impact on enterprise debt financing ability.

## 3. Research design

The research sample for this study involves A-share listed firms between 2015 and 2024, excluding the missing samples of the financial industry, ST enterprises, and key variables, and finally forms the panel data at the company annual level. Considering the influence of extreme values of variables, this paper shrinks the tails of the 1% and 99% quantiles of continuous variables. X uses innovation investment, Y uses debt financing capacity, and the definition of variables is shown in Table 1.

Table 1. Variable definition

Type	Name	Symbol	Measurement
Explained variable	Debt financing capacity	debt_scale	ln (Total liabilities+1)
	Ratio of assets to liabilities	finance	Total assets divided by total liabilities
Explanatory variable	Innovation investment	innovation	ln (R&D expenses+1)
	R&D investment intensity	rd_intensity	R&D expenses/operating income

Table 1. (continued)

	Profitability	roa	Total net profit/assets
	Growth	growth	Operating income growth rate
Controls variable	Cash flow level	cashflow	Operating cash flow as a percentage of total assets
	Asset turnover	asset_turnover	Total operating income/assets
	Enterprise size grouping	large	By median size

To evaluate how innovation investment affects the capacity to finance debt, this paper constructs a fixed effect model, such as Model (1):

$$debt\_scale_{i,t} = \alpha + \beta innovation_{i,t} + \gamma controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

Among them,  $\mu$  represents the fixed effect of enterprises, and  $\lambda$  represents the fixed effect of years. This paper uses enterprise-level clustering and robust standard errors to reduce the impact of internal correlation on standard errors in the same enterprise.

## 4. Empirical results

### 4.1. Descriptive statistics

The descriptive statistics of the primary variables in the regression sample are shown in Table 2. It can be seen that the sample observations after tail reduction are 32211, which is consistent with the observations of subsequent benchmark regression. The sample businesses' average asset-to-liability ratio is 0.4222, indicating that the average debt level of sample enterprises is about 42.22%. The average debt financing scale is 21.3619, and the average innovation investment is 14.0258, indicating that the sample enterprises as a whole have a certain R&D investment basis. After shrinking, the maximum and minimum values of continuous variables in this paper converge significantly, indicating that the influence of extreme values has been controlled to a certain extent.

Table 2. Descriptive statistics

Variable	Observations	Average	Standard	Min	Max
finance	32,211	0.4222	0.2058	0.0555	0.9413
debt_scale	32,211	21.3619	1.6442	17.8593	25.9647
innovation	32,211	14.0258	7.6923	0	21.7072
size	32,211	22.3756	1.2932	19.9867	26.3746
roa	32,211	0.0278	0.0738	-0.3227	0.1988
growth	32,211	0.1307	0.3752	-0.6294	2.1873
cashflow	32,211	0.0487	0.0669	-0.1559	0.2422
asset_turnover	32,211	0.5828	0.3937	0.0654	2.4224

### 4.2. Benchmark regression results

The test findings of enterprise-scale heterogeneity and the benchmark regression of enterprise innovation investment on debt financing scale are presented in Table 3. Column (1) excludes control

variables and only controls for year and industry fixed effects. The outcome demonstrates that, at the 1% level, the coefficient of innovation investment is 0.107, which is significantly positive. After further adding control variables such as profitability, growth, cash flow, and asset turnover in column 2, the innovation investment coefficient is still 0.104 and is significantly positive at the 1% level. This indicates that higher R&D investment is associated with a larger debt financing scale. Innovation investment can signal corporate technology accumulation, growth potential, and sustainable operational capacity to external capital providers, thereby enhancing corporate debt financing capacity.

Table 3. Benchmark regression and test results of enterprise size heterogeneity

Variable	(1) Debt financing scale	(2) Debt financing scale	(3) Big business group	(4) Small business group
innovation	0.107*** (22.12)	0.104*** (20.94)	0.064*** (13.27)	0.035*** (8.12)
roa	-	-2.150*** (-11.17)	-2.640*** (-11.59)	-2.606*** (-17.59)
growth	-	0.173*** (7.14)	0.090*** (3.55)	0.170*** (8.01)
cashflow	-	0.848*** (4.38)	0.438** (2.03)	-0.017 (-0.11)
asset_turnover	-	0.501*** (8.09)	0.288*** (4.95)	0.520*** (9.33)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	32,211	32,211	17,012	15,199
R <sup>2</sup>	0.2793	0.3012	0.3006	0.1531
Intergroup difference test	-	-	F=2.93, P=0.0868*	

Note: the value of T in brackets. \*\*\*, \* \* and \* are significant at 1%, 5% and 10% levels, respectively. Regression uses the robust standard error of enterprise-level clustering, as shown below.

To further examine the heterogeneous effect of firm size on the relationship between innovation investment and debt financing capacity, this paper divides the full sample into large-firm and small-firm groups based on the median firm size during the sample period and conducts grouped regressions. Columns (3) and (4) display the outcomes. The regression results, which include 0.064 for the large enterprise group and 0.035 for the small enterprise group, demonstrate that the coefficient of innovation investment is considerably positive at the statistical threshold of 1%. The promotion effect of innovation investment on debt financing scale is stronger in large enterprises, and the scale of enterprises will significantly adjust the relationship between innovation investment and debt financing capacity, according to the comparison of coefficient sizes. The regression coefficient of innovation investment in the large enterprise group is significantly higher than that in the small enterprise group. The F value of the difference test between groups is 2.93, and the corresponding p value is 0.0868, which is significant at the 10% statistical level. The main reason for this heterogeneous result is that there are differences in the credibility and risk characteristics of

R&D signals between the two types of enterprises. Large enterprises usually have a better corporate governance system, more stable operating cash flow, and more mature R&D management experience, stronger sustainability of R&D investment, lower uncertainty of achievement transformation, and financial institutions are more willing to provide debt financial support. Small enterprises generally have inherent problems such as a high degree of information asymmetry, insufficient mortgageable assets, and weak ability to resist risks. For the sake of credit risk prevention and control, financial institutions have relatively limited recognition and credit intensity of R&D investment in small enterprises.

### 4.3. Robust test

This research additionally substitutes the current innovation investment with its one-period lagged value for regression in order to evaluate the robustness of the benchmark results. The results of Table 4 show that the coefficient of lagging innovation investment in the first period is 0.098, and it is significantly positive at the 1% level, indicating that the previous innovation investment of enterprises can still significantly increase the scale of debt financing in the current period. The benchmark conclusion of this study has strong robustness, and the results demonstrate that the promotion effect of innovative investment on debt financing ability is not limited to the current era but has some permanence.

Table 4. Robustness test results

Variable	Lagging behind the first phase of innovation investment
L1_innovation	0.098*** (20.37)
Controls	Yes
Year FE	Yes
Industry FE	Yes
Observations	32,191
R <sup>2</sup>	0.2912

### 5. Conclusion

This study examines how enterprise innovation investment affects debt financing capacity using a sample of A-share listed corporations from 2015 to 2024. The results show that: first, innovation investment has a significant positive impact on the scale of corporate debt financing, indicating that R&D investment can enhance the recognition of external capital providers of enterprises by transmitting their technological capabilities, growth potential, and future competitive advantages. Secondly, the enterprise size heterogeneity test shows that innovation investment in the large enterprise group and the small enterprise group significantly promotes the scale of debt financing, and the difference test between groups is significant at the 10% level, indicating that enterprise size will affect the intensity of transforming innovation investment into financing capacity. Thirdly, the results of the robustness test demonstrate that the extent of debt financing is still greatly encouraged by the lagged first phase of innovation investment, suggesting some stability in the paper's conclusion.

The practical enlightenment of this paper mainly includes three aspects. While increasing R&D investment, enterprises should strengthen the disclosure of innovative achievements, patent layout,

and achievement transformation instructions, so that R&D investment can be more easily understood and recognized by financial institutions. For financial institutions, when evaluating the debt financing capacity of enterprises, they should not only rely on asset size and collateral, but also pay due attention to R&D investment, technology accumulation, and the quality of intellectual property rights. Policy authorities should further improve the systems of intellectual property pledge financing, credit evaluation for technology-based enterprises, and technology finance services, and reduce information identification costs in the financing process of innovative enterprises. This paper has certain limitations. Because the current patent quantity and patent quality data are not complete, innovation ability is mainly measured by R&D costs. Future research can further analyze the specific mechanism of transforming innovation investment into financing ability by combining patent types, patent citations, intellectual property pledge data, and enterprise life cycle characteristics.

## References

- [1] Fang, F. and Chen, D. (2025) Can executive equity incentives enhance corporate debt-paying ability? —an analysis based on the moderating mechanism of patient capital. *International Review of Economics and Finance*, 102, 104347-104347.
- [2] Lu, J. (2024) Analysis of the relationship between innovation investment and enterprise performance. *Modern Business*, (20), 69-72.
- [3] Zheng, C.L., Zhang, M.X. and Liu, S.Q. (2023) Research on the impact of innovation investment on enterprise debt repayment. *Management and Science and Technology of Small and Medium-Sized Enterprises*, (9), 36-39.
- [4] Blair, Q.P. and Chung, W.B. (2025) Job market signaling through occupational licensing. *Review of Economics and Statistics*, 107(2), 338-354.
- [5] Clausen, S. and Flor, R.C. (2015) The impact of assets-in-place on corporate financing and investment decisions. *Journal of Banking and Finance*, 61, 64-80.
- [6] Brown, J.R., Fazzari, S.M. and Petersen, B.C. (2009) Financing innovation and growth: cash flow, external equity, and the 1990s R&D boom. *Journal of Finance*, 64(1), 151-185.
- [7] Yuan, L., Zhou, Y. and Dai, P.Y. (2024) Research on the impact of patent pledge on technological innovation of enterprises. *Scientific Research Management*, 45(6), 174-182.
- [8] Hsu, P.H., Tian, X. and Xu, Y. (2014) Financial development and innovation: cross-country evidence. *Journal of Financial Economics*, 112(1), 116-135.
- [9] Lee, K.Y. (2025) Can Green patents alleviate corporate financing constraints? — empirical test based on double difference. *Journal of Henan Normal University (Philosophy and Social Sciences Edition)*, 52(1), 91-98.
- [10] Liu, C.R. and Tian, X. (2024) The impact of patent pledge on enterprise innovation. *Accounting Research*, (2), 99-112.