

The impact of financial leasing on the innovation achievements of artificial intelligence enterprises

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Abstract: The output of innovation achievements of artificial intelligence enterprises cannot be achieved without the support of capital, and financial leasing is playing a positive role in meeting the capital needs of enterprises and solving financing difficulties. Based on the data of AI A-share listed enterprises in China from 2007 to 2020, this thesis constructs A fixed effects model to make an empirical analysis of the relationship between financial leasing and AI enterprises' innovation achievements. The results show that: (1) After grouping regression based on the revenue growth rate (rgw), the regression results are significant, that is, the results of financial leasing adopted by AI enterprises are affected by financing constraints. (2) For AI enterprises with high financing constraints, financial leasing can promote the output of AI enterprises' innovation achievements by easing financing constraints. The research purpose and conclusion of this paper aims to explore the impact of financial leasing on the innovation of AI enterprises, hoping to provide a way for AI enterprises to better and more efficient financing to promote innovation performance and output of innovation results.

1. Introduction

Since 2018, artificial intelligence has been written into the government work report for several consecutive times, and the development of artificial intelligence industry has also risen to the national strategy, by 2025, China's artificial intelligence technology aims to reach the world-class leading level in some fields, and by 2030, strive to lead in more fields, and the foundation of this long-term goal cannot be separated from the innovation of artificial intelligence enterprises. As a strategic technical support for a new round of global scientific and technological revolution and industrial change, the innovation and development of artificial intelligence is the top priority for China to promote economic and social development, international strategic science and technology development, and reshape the international competition pattern. At present, the development of China's artificial intelligence industry is gradually trying to integrate with the real economy to create innovative applications. In the future, the development focus of China's artificial intelligence industry should still be placed on technological innovation, and strive to become a stable driving force to promote the high-quality development of China's economy as soon as possible.

As a new form of financial industry service, financial leasing integrates finance, trade and technology, and has gradually become the preferred solution to alleviate the financing difficulties of small and medium-sized enterprises. Relying on the steady development of China's real economy, financial leasing drives a large number of leasing companies to thrive in promoting technological innovation and improving resource utilization. The essential purpose of financial leasing is to solve the shortage of funds of enterprises. With its flexible financing method and long financing cycle, it can effectively solve the financing dilemma of some enterprises in terms of meeting the capital investment demand of enterprises, reducing risks and financing costs, and is regarded as one of the more effective financing methods. At present, the development of artificial intelligence enterprises in China is increasingly dependent on capital, and the problems of financing constraints, low financing efficiency and chaotic financing channels have become one of the key problems affecting the development of artificial intelligence innovation achievements.

Some scholars have considered the problems related to financing efficiency and innovation performance of AI enterprises, and tried to build an ideal financing ecology for AI enterprises. Zhang Xiaomong and Liu Xiangbo (2022) established a task-based model of financing constraints, endogenous artificial intelligence technology innovation and labor market friction, and concluded from the perspectives of financing constraints, intelligent production level, output and employment that loose financing constraints are conducive to enterprise AI technology innovation and thus improve the use of intelligent capital. And the conclusion that the effective use of the role of financial markets can accelerate the improvement of intelligent production levels and reduce the impact on employment^[1]. Dong Kunkun and Wang Qi (2021) analyzed social capital and enterprise innovation from the perspective of informal system by using the panel data model of AI enterprises listed on Shanghai and Shenzhen stock exchanges in China, and found that financing constraints had a significant inhibitory effect on AI innovation, and easing the financing constraints of social capital at the enterprise level would help improve the innovation performance of AI enterprises^[2]. Jiang Yan (2020) adopted Super-SBM and Logit models to study and found that the overall financing efficiency of China's AI industry is not high, and the asset-liability ratio, operating income growth rate and return on equity have significant impacts on the financing efficiency of AI listed enterprises^[3]. Geng Chengxuan, Zhou Chen, and Wu Zemin (2019) adopted the coupled coordination model to analyze the innovation capability and financing ecology of artificial intelligence industry. The research shows that the innovation capability and financing environment of China's artificial intelligence industry are in a state of basic coordination and moderate coordination for a long time, in which the incremental innovation resources have the most significant positive improvement effect on the coupled coordination^[4]. Liu Chao, Fu Ruoyu, Li Jiahui and Zhou Wenwen (2019) successively adopted DEA method, Malmquist index method and Tobit model to measure the financing efficiency of listed enterprises in the artificial intelligence industry in China, the financing changes of listed enterprises in the artificial intelligence industry and the influencing factors of financing efficiency. The results show that the financing efficiency of China's artificial intelligence industry is not high. The comprehensive technology efficiency is not high, and the capital structure, business capacity and growth of AI enterprises are significantly correlated with financing efficiency^[5]. XU K, GENG C, WEI X(2019) construct a financing ecological index system and analyze the financing ecology of China's strategic emerging industries in recent years. The results show that the financing efficiency of strategic emerging industries is significantly positively correlated with the internal financing ecology, and the external financing ecology is constantly improving. The collaborative optimization of endogenous factors and external financing ecology is more conducive to the improvement of financing efficiency of strategic emerging industries^[6].

2. Theoretical Analysis

The output of innovation achievements of artificial intelligence enterprises cannot be achieved without the support of large amounts of funds. When the internal financing ecology of artificial intelligence enterprises is not enough to alleviate the problem of capital shortage, artificial intelligence enterprises also need to seek the help of external financing environment. However, AI enterprises have greater R&D risks in external financing environment, as well as problems such as lack of collateral and information asymmetry, which directly lead to high financing costs for AI enterprises, difficulty in obtaining external financing, and high financing constraints, thus further affecting the output of innovation achievements of AI enterprises. Considering that the main mechanism of financial leasing to promote innovation is to alleviate financing constraints, financial leasing itself can show a more obvious role for enterprises with higher financing constraints. This paper tries to explore whether financial leasing will promote the output of innovation achievements of artificial intelligence enterprises by easing financing constraints.

To sum up, this paper puts forward the following hypothesis:

H 1: Financial leasing will have a positive impact on the innovation achievements of AI enterprises with high financing constraints, that is, financial leasing can promote the output of innovation achievements of AI enterprises by easing financing constraints.

3. Variable Description and Model Construction

3.1. Variable Selection

In this paper, AI A-share listed enterprises in China from 2007 to 2020 are selected as the initial research samples and the text and data retrieval results with the data of listed companies, the panel data of 325 sample observations of 56 AI enterprises was finally obtained. This paper takes the number of Patents for AI enterprises as the explained variable to measure the innovation achievements of AI enterprises. The core explanatory variable is financial lease. Based on the combination of the financial annual report of the listed company and manual collection and summary, whether the artificial intelligence enterprise has financial lease in that year can be obtained. The artificial intelligence enterprises with financial leasing in the current year are assigned a value of 1, otherwise 0, so as to obtain the 0-1 virtual variable *lease_dummy* of financial leasing and artificial intelligence enterprise innovation. The control variables used in this paper include: firm size (*ln_assets*), leverage ratio (*lev*), return on total assets (*ROA*), revenue growth rate (*rgw*), and Tobin's Q (*TQ*).

3.2. Model Setting

Based on the research of existing literature and the definitions of variables given above, this paper constructs the following regression model to test the relationship between financial leasing and the innovation achievements of artificial intelligence enterprises. The regression model is as follows:

$$Patents_{it} = \beta_0 + \beta_1 lease_dummy_{it} + \beta_2 ln_assets_{it} + \beta_3 lev_{it} + \beta_4 ROA_{it} + \beta_5 rgw_{it} + \beta_6 TQ + \varepsilon_{it} \quad (1)$$

In the above formula: *i* represents the *i*th artificial intelligence enterprises; *t* is the year *t*; ε_{it} is a random disturbance term.

3.3. Descriptive Statistics

Table 1: Descriptive statistical results.

variable	N	mean	p50	sd	min	max
Patents	404	6.691	0	25.670	0	239
lease_dummy	404	0.074	0	0.263	0	1
ln_assets	404	21.498	21.348	1.019	17.879	24.360
lev	404	0.359	0.324	0.230	0	2.394
ROA	404	0.010	0.037	0.241	-3.565	0.357
rgw	348	0.795	0.133	9.149	-0.960	168.498
TQ	370	2.458	1.834	3.311	0.920	57.624

It is not difficult to see from Table 1 that the mean value of the interpreted variables "Patents" is 6.691, the maximum value is 239.000, and the standard deviation is 25.670, indicating that there are big differences in the number of innovation patents obtained by AI enterprises in this study. The number of innovation patents obtained by AI enterprises as a whole is not enough, and the mean value cannot reach more than 50. The maximum value, minimum value and standard deviation of the core explanatory variable lease_dummy are 1, 0 and 0.263, indicating that there is a certain gap between whether AI enterprises obtain funds through financial leasing.

4. Empirical Results and Analysis

Therefore, this paper uses the fixed effects model for regression and analysis. The regression results of the fixed effects model are as follows:

Table 2: Regression results of fixed effect model

	rgw<-0.0346023	rgw>=-0.0346023
	Patents	Patents
lease_dummy	19.459**	-3.478
	(6.473)	(7.412)
ln_assets	-2.961	1.474
	(2.588)	(2.993)
lev	-12.308	13.659
	(9.660)	(18.291)
ROA	-3.704	17.397
	(8.281)	(40.545)
rgw	17.283	-0.360
	(10.967)	(1.055)
TQ	0.145	0.759
	(0.466)	(1.462)
_cons	74.645	-31.556
	(55.970)	(62.758)
N	80	245

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

To test hypothesis H1: Financial leasing will have a positive impact on the innovation achievements of AI enterprises with high financing constraints, that is, financial leasing can promote the output of AI enterprises' innovation achievements by easing financing constraints. This paper

divides the samples into two groups according to the rgw. It is believed that the samples with a lower rgw have more serious financing constraints, while the samples with a higher rgw have lower financing constraints. The group regression results are shown in the table above.

As can be seen from the first column of Table 2, for AI enterprises with sample rgw less than -0.0346023, that is, AI enterprises with high financing constraints, the regression coefficient of financial leasing on the innovation achievements of AI enterprises is 19.459, which is significantly positive at 1% confidence level. It indicates that there is a significant positive correlation between financial leasing and the innovation achievements of artificial intelligence enterprises, that is, financial leasing does promote the output of innovation achievements of artificial intelligence enterprises by easing financing constraints. Hypothesis H1 is supported by empirical results. As can be seen from the second column, for AI enterprises with rgw greater than or equal to -0.0346023 in the sample, that is, AI enterprises with low financing constraints, the regression coefficient of financial leasing on the innovation achievements of AI enterprises is -3.478. The above grouping regression results show that the financial leasing of samples with low rgw significantly promotes the output of innovation achievements, while the other group with high rgw is not, which confirms that financial leasing indeed promotes innovation by easing financing constraints, and the promotion effect is more obvious for enterprises with high financing constraints.

The reasons for the above results may be as follows: financing constraints limit the influence of external funds on the innovation achievements of AI enterprises, while financial leasing promotes the output of innovation achievements by easing the financing constraints of AI enterprises. This is because AI enterprises with higher financing constraints generally have higher financing costs, weaker fund repayment ability, and less access to external financial leasing, which has an inhibiting effect on enterprise innovation. When artificial intelligence enterprises with high financing constraints obtain financial leasing, the difficulty of obtaining innovation investment funds is reduced, and the output of innovation achievements is further promoted, that is, financial leasing relieves financing constraints and thus promotes innovation.

5. Enlightenment and Suggestions

Based on the analysis of the above research results, for AI enterprises with low rgw, that is, AI enterprises with high financing constraints, financial leasing can promote the output of innovation achievements of AI enterprises by easing financing constraints. Based on the analysis of the above research conclusions, this paper puts forward the following policy suggestions from the perspectives of how financial leasing can further improve the output of innovation achievements of AI enterprises, how to alleviate financing constraints, improve financing efficiency, and create better financing channels and environment for AI enterprises to promote innovation:

(1) China should improve the deployment of financial leasing business in the artificial intelligence industry to effectively alleviate the financing problems faced by enterprises and the financing constraints that exist.

Artificial intelligence will still be the national strategic development goal of China's science and technology revolution, and promoting the innovation and development of artificial intelligence enterprises will help realize the strategic blueprint of China's digital development and industrial change, and promoting the innovation achievements of artificial intelligence enterprises will inevitably be inseparable from the internal and external financing environment and a large amount of capital support. Financial leasing enterprises should actively publicize relevant business knowledge, strengthen its positive role in improving AI enterprise innovation, easing financing constraints, improving financing efficiency, etc., so that more AI enterprises can enhance their professional knowledge about financial leasing business, realize the advantages of financial leasing, and be willing

to participate in it.

(2) Financial leasing business should advance with The Times, establish a sound management and system, adopt a variety of financial leasing methods, and strengthen business development.

A single financial leasing business structure is not enough to support the financing needs of AI enterprises with high financing constraints. It is only by formulating a business model that meets the development of both enterprises and implementing multiple financial leasing methods, that the financing and innovative development needs of AI enterprises can be better met and the high financing constraints of the enterprises themselves can be alleviated, so that they can further cooperate with AI enterprises to create an excellent financing ecology and help their innovative development.

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