Research on the "Stickiness" Relationship between R & D and Profitablity of "Unicon" Company—Data Based on the AI Concept Stocks

Huiling You, Qingjun Meng

School of Business, Hohai University, Nanjing, China
Email: 15850683075@163.com

Abstract

In this paper, based on the sample of the listed company of AI concept stocks from 2015 to 2017 as the panel data, research shows that R & D capital investment is negatively correlated with the profitability of the AI enterprise, and there is a lag effect. And R & D personnel inputs have nothing to do with profitability. AI listed companies have the problem of "investing more and output less" and limiting role of technical personnel. In this case, It's necessary for AI enterprise to strengthen their core technical capacity, allocate resources reasonably and play a long-term role in promoting profitability through R & D.

1. Introduction

Unicorns are a mythical creature, rare and noble. Aileen Lee, a famous American Cowboy Venture investor, classified private equity and public startups valued at more than $1 billion in 2013 and called them "unicorns". This is where the "unicorn" enterprises name comes from. In 2017, the number of "unicorn" enterprises in China grows rapidly and has strong vitality, in which artificial intelligence industry plays a particular role. In August 2017, "The Notice of the State Council on Issuing a New Generation of Artificial Intelligence Development Plan" [1] was issued to promote the development of AI. In the competition of AI enterprises, research activities are closely related to the profitability of enterprises. But R & D does not necessarily lead to technological changes that enhance corperate profitability. The relationship between R & D investment and enter-

prise profitability needs to be further studied to provide corresponding suggestions for the development of AI enterprises.

2. Theoretical Analysis and Research Hypothesis

Recent years, the academic comunity has a deep research on "unicorn" type innovative enterprises.

Fang Cao (2017) [2] argued that "unicorn" enterprises are subverting innovative technologies and leading industrial transformation. In the research on enterprise R & D investment, George Libik (1969) [3] pointed out that there was a significant positive correlation between enterprise R & D investment and the increase of enterprise value. B Lev (1999) [4] pointed out that there was a significant positive correlation between the company's investment in intangible assets, economic growth and corporate profits.

"Stickiness", originally a physics term, is a macroscopic property of a fluid associated with a certain relationship between the stress applied to the fluid and the resulting deformation rate, expressed as the internal friction of the fluid. When applied to other studies, it is shown as a driving relationship between the two. Huajing Li (2017) [5] studied new energy automobile enterprises from the perspective of green innovation, and believed that R & D investment had a positive effect on enterprise performance, namely, there was "stickiness". Sihai Li and Ping Zhou (2016) [6] found that there is a "stickiness" between R & D expenditure and enterprise performance, that is, R & D expenditure can promote enterprise performance.

However, Youhong Ben (2017) [7] in the study of pharmaceutical manufacturing enterprise, pointed out that R & D investment on enterprise performance has lagged relationship, and lag influence degree show growing based on the above analysis. Xiang Wu (2017) [8] pointed out in his research on R & D investment of a-share listed companies, that there was a lag between R & D expenditure and enterprise performance. Combining theory with practice, this paper puts forward the following assumptions:

H1: There is a positive "stickiness" between R & D investment and profitability of artificial intelligence enterprises.

H2: Research and development investment of listed artificial intelligence companies has a lagging effect on profitability and profitability.

3. Study Design

3.1. Sample Selection and Data Sources

By the end of 2017, there were 98 artificial intelligence concept stocks in Tonghuashun database.

Most of the artificial intelligence companies have been listed in recent years with short listing time, and most of the annual reports disclosed are from 2015 to 2017. As a result, 35 data samples were obtained after the elimination of companies with missing data for three consecutive years, and the relationship

between R & D investment and corporate profitability was empirically studied. The sample data came from the annual reports of listed companies disclosed by Juchao information network, Shanghai stock exchange website and Shenzhen stock exchange website. Data analysis is mainly processed by EXCEL and SPSS19.0 software.

3.2. Variable Definition

According to the Table 1, R & D investment of enterprises is mainly reflected in capital investment and personnel investment. R & D capital investment is measured by relative indicators, namely the ratio of R & D investment to main business income (RDI). R & D personnel investment is measured by the ratio of R & D personnel to staff (RDP).

Profitability also refers to the ability of an enterprise to obtain profits, which reflects the financial performance of the enterprise and reflects the ability of the company to create profits within a certain period of time. The total Return on Assets index is selected and measured by the profits created by assets.

The control variables included company SIZE and LEV. Total assets are selected to measure the size of the company. The asset-liability ratio can not only reflect the solvency of enterprises, but also show the financial status. This index is generally selected to measure the financial level of a company.

3.3. Model Design

Based on research objectives and research assumptions, a multivariate linear regression model of R & D investment and profitability is constructed.

$$Y_i = \alpha_1 + \beta_1 \text{RDI}_i + \beta_2 \text{RDP}_i + \beta_3 \text{SIZE}_i + \beta_4 \text{LEV}_i$$

This model is used to test the relationship between R & D investment and profitability. Y represents the profitability of each company, and ROA is used as its measurement index; α is the regression coefficient reflecting the correlation, ε is the random error.

4. Empirical Analysis

4.1. Descriptive Statistics of Samples

It can be seen from Table 2 that the R & D investment gap of the listed companies

Table 1. Variable names and expressions.

Variable	Name	Symbol	Variable definition
explain variable	R & D investment intensity	RDI	R & D investment/main business revenue
	R & D personnel input intensity	RDP	R & D personnel/total number of enterprises
explained variable	total return on assets	ROA	net profit/average total assets explained
control variable	scale of company	SIZE	the natural logarithm of the total assets
	asset-liability ratio	LEV	liabilities/assets

of artificial intelligence is huge. The minimun is 0 while the maximum is 80%, accounts for the majority of their expenses. From the average investment of research and development, R & D fund intensity of artificial intelligence enterprises is high. The average investment intensity of R & D personnel increases year by year, indicating that the number of R & D personnel in enterprises is relatively in a booming state. In general, the research and development investment of artificial intelligence enterprises is increasing. To a certain extent, this indicates that the research and development investment of the listed companies of artificial intelligence has been continuously strengthened and the investment in research and development has been attached great importance.

4.2. Regression Analysis

According to Table 3, the correlation coefficient between R & D investment intensity and total return on assets was negative and passed the 5% significance test. It indicates that the investment of research and development funds will not bring profit to enterprises, but will have a significant negative effect. This is different from the general conclusion that increased investment in research and development can bring benefits. In lag issue on the total return on assets of influence,

Table 2. Descriptive statistical characteristic table of samples from 2015 to 2017.

Variable	Year	Samples	Maximun	Minimun	Average	Standard Deviation
	2015	35	72.75%	0%	10.0191%	13.5448%
RDI	2016	35	48.43%	0.05%	9.6806%	10.4992%
	2017	35	66.35%	0.06%	10.8514%	13.4104%
	2015	35	80.89%	0.00%	24.6031%	20.7205%
RDP	2016	35	67.62%	0.12%	25.9943%	20.1104%
	2017	35	77.45%	0.13%	31.0380%	21.8761%

Data source: SPSS 19.0 software.

Table 3. Regression results of the impact of R & D investment on total asset return in 2015-2017.

	Influence of the current period					Hysteresis phase effect		
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig	B	t	Sig
	B	standard error	trial version					
(Constant)	7.694	0.890		8.648	0.000	6.251	4.829	0.000
RDI	−13.208	3.102	-0.498	−4.258	0.000	−6.894	−1.284	0.204
RDP	0.956	1.928	0.061	0.496	0.621	1.622	0.503	0.617
LEV	−0.077	0.019	-0.425	−4.154	0.000	−0.074	−2.601	0.012
SIZE	0.960	0.511	0.186	1.879	0.063	1.656	2.131	0.037
Adjusted R squared			0.280				0.063	
Value of F			11.116				2.152	

Dependent variable: ROA; Data source: SPSS 19.0 software.

significantly decreased, related F statistics current is greater than the lag issue, R & D capital investment has certain hysteresis. The correlation coefficient of R & D staff's investment intensity was positive, but it did not pass the significance level. It indicates that the investment of R & D personnel in the listed company of artificial intelligence has nothing to do with the profitability of the enterprise.

5. Conclusion

This paper through the empirical analysis of the relationship between R & D and profitability of the AI enterprise, draws the following conclusions. First, there is a significant negative correlation between the investment intensity of research and development funds in the listed companies of artificial intelligence and the return rate of total assets; that is to say, there is a "sticky" relationship between R & D funds and profitability, which indicts these companies have not fully utilized and played the role of the funds. Second, the investment intensity of R & D personnel is not correlated with the return rate of total assets; the characteristic of "stickiness" is not significant. This may be because the listed companies of artificial intelligence fail to turn the new resources and technologies brought by the researchers into profits.

6. Some Suggestions for AI Enterprise

For enterprises, the success of R & D investment requires collaborative innovation and mutual promotion of various factors, which means "sticky" content.

6.1. Increase Government Support, Build a Fair Competition Environment

The research and development activities of "unicorns" require a large amount of capital support and investment. This requires the government to increase support, through financial subsidies and other measures, to narrow the funding gap and improve the efficiency of enterprise R & D investment. Improve relevant laws and regulations, strictly standardize industry policies to build a good environment of fair competition for AI enterprises.

6.2. Rational Allocation of Innovative Resources and Achieve Sustainable Development of Enterprises

AI companies need to manage research and development investment, make reasonable planning, apply it to the field needed. Rationally allocate resources, improve the efficiency of R & D funds, pay attention to the efficiency of input and output, and avoid the situation of "high input and low output". We will not only focus on short-term interests, but also on long-term development. We will continue to play the role of R & D investment, develop new products and achieve innovation and development.

6.3. "Stick" to Market Demands and Improve Core Technologies

The core ability of the listed company of artificial intelligence concept shares lies in its grasp and development and application of advanced knowledge technology. It is necessary to focus on the cultivation of core technologies，form unique competition edge. Paying attention to market demand and considering from the standpoint of consumers, AI companies should develop products and technologies to meet consumers' needs, so as to obtain customers' stickiness and achieve greater benefits.

6.4. Develop "Mutually Beneficial Cooperation" and Integrate Innovative Resources

An enterprise has limited resources and technology. But it can form its own innovation resources by cooperating with other enterprises, universities and research institutes. Form a powerful advanced system of research, development, production and integration. Through mutually beneficial cooperation, integration of innovation resources, and establishment of strategic innovation alliance, the production and R & D investment of artificial intelligence technology will be promoted.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] (2017) Notice of the State Council on Issuing the New Generation of Artificial Intelligence Development Plan.
http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm

[2] Cao, F. (2017) How Can Unicorns Lead Disruptive Innovation. *High Technology and Industrialization*, **1**, 18-21.

[3] Libik, G. (1969) The Economic Assessment of Research and Development. *Management Science*, **16**, 33-66.

[4] Lev, B. (1999) R & D and Capital Market. *Journal of Applied-Corporate Finance*, **11**, 21-35.

[5] Li, H.J., Zheng, J. and Li, Y.X. (2017) R & D Investment and Enterprise Performance of New Energy Automobile Enterprises. *China Science and Technology BBS*, **1**, 76-81.

[6] Li, S.H. and Zou, P. (2016) Research on Stickiness of Enterprise R & D Performance—Empirical Evidence from Listed Companies of High and New Technology. *Scientific Research Management*, **2**, 37-46.

[7] Ben, Y.H. (2017) A Study on the Effect of R & D Investment on the Lagging Performance of Chinese Enterprises—A Case Study of Pharmaceutical Manufacturing Enterprises. *Price Theory and Practice*, **4**, 155-158.

[8] Wu, X. (2017) Corporate Governance, R & D Investment and Corporate Performance. *Accounting Communication*, **30**, 32-36.