

Research on the Impact of Innovation Investment on the Enterprises Value of Chinese STAR Market

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Abstract: This paper explores the relationship between innovation investment and enterprise value of Chinese innovation board enterprises, as well as the adjustment effect of different equity incentive intensity and the validity period of equity incentive. After theoretical and empirical research, there is a significant relationship between the innovation investment and the enterprise value of the science and technology innovation board enterprises, and the equity incentive also affects this relationship to a certain extent. In this regard, this paper puts forward relevant suggestions from different angles, hoping to provide help to the future development and value enhancement of the science and technology innovation board enterprises.

Keywords: Innovation investment, Enterprise value, STAR Market enterprises, Stock ownership incentive.

1. Introduction

At present, China's economy is in the transition period of development. In order to deepen the basic institutional arrangements for the reform and opening up of the capital market and lead the transformation of economic development to innovation-driven development, the Science and Technology Innovation Board officially opened on July 22, 2019, and the registration system was piloted. In this context, technological progress and innovation and creation drive enterprise development and become the source of competitiveness of enterprises. How much revenue innovation investment can bring to the development of enterprises, and how research and development activities affect the value of enterprises, have also become hot topics. At the same time, in order to promote the development of enterprise innovation, STAR board for a number of system innovation, including equity incentive system, and equity incentive compared with other incentive mechanism not only period is longer, also can make the incentive object share enterprise surplus value, can affect the enthusiasm of the incentive object innovation, thus affect the enterprise value. Based on this, this paper explores the relationship between the innovation investment of the science and technology innovation board enterprises and its enterprise value, as well as the adjustment effect of different equity incentive intensity and the validity period of equity incentive.

Through theoretical and empirical research, there is a significant relationship between the innovation investment and the enterprise value of the science and technology innovation board enterprises, and the equity incentive also affects this relationship to a certain extent. In this regard, this paper puts forward relevant suggestions from different angles, hoping to provide help to the future development and value enhancement of the science and technology innovation board enterprises.

2. Research Hypothesis

2.1. The impact of innovation investment on the enterprise value of the STAR Market

2.1.1. The impact of R&D capital investment

Science and technology is the primary productive force, and promoting production progress by strengthening investment in scientific and technological innovation and research is conducive to economic and social development. At the same time, scientific and technological innovation is an important supporting force for the two centenary Goals. The severe international competition situation requires scientific and technological innovation to play a pillar role. The United States has always been a leader in innovative R & D investment, but China's total R & D investment is gradually increasing. According to China's R & D Fund Report (2020), China's R & D expenditure currently ranks second in the world, second only to the United States, and the total gap between the two sides is gradually narrowing. China and the United States are the only countries in the world with more than 300 billion US dollars in R & D expenditure, and the total R & D investment of the United States is more than half of the global R & D investment. China is paying more and more attention to the investment in innovation, research and development, and gradually forming a sound development situation driven by scientific and technological innovation. As the cornerstone of the innovation activities of science and innovation enterprises, the role of enterprises and even the country is of great significance to consolidating the foundation of building a world science and technology power and comprehensively promoting the construction of national science and technology innovation system. Government increasing innovation incentive policy, the investment in science and technology as a strategic investment to innovation enterprises to subsidize innovation in the society, zhongguancun is foster a large number of innovative enterprises, under the background of market economy environment, innovation become the survival of sustainable development, increase investment in innovation research and development is the key to the beginning. Enterprises' increasing investment in innovation and research and

development can not only form tangible or intangible resources with competitive advantages, not only bring advantages to enterprises themselves, but also provide reference experience for other enterprises to make social progress together.

The return of enterprise innovation investment can be divided into the following three aspects: First, Enterprises can carry out innovation activities through innovation investment and develop new production technologies and production methods that not only form their own resources but also help reduce their production costs, In the case that the original product is unable to obtain new growth points, Increase the profit acquisition margins, Obtain excess profits in the market for enterprises to further accumulate and develop capital to enhance enterprise value; next, When the current market is fully saturated or the market entry barriers are too high, Enterprises can get out of the current Red Sea market dilemma through new products into the blue ocean blank market to create new demand, This new product can be upgraded and refined with new product functions through new technology, It can also be to create new products for enterprises in the fiercely competitive market to find out the profit improvement caliber and then enhance the value of the enterprise; last, The state provides tax incentives for enterprises to invest in innovation, Allow companies to deduct another 75 percent of their r & d expenses on their tax returns, For the innovation investment that forms the capitalization of intangible assets and allows enterprises to amortize by 75%. To sum up, the returns brought by technological innovation and research investment to enterprises can provide a good path for the improvement of enterprise value through multi-angle analysis. By sorting out the research and analysis of R & D investment and enterprise performance and output results by domestic and foreign scholars, this paper first makes assumptions about the impact of r & D investment on enterprise value, and believes that R & D investment can significantly enhance the value of enterprises and provide a strong impetus for the development of enterprises.

Based on the above analysis, the following assumptions are proposed:

H1: The intensity of r & d investment can significantly improve the value of the STAR Market.

2.1.2. The impact of R&D personnel investment

General Secretary Xi pointed out: "Talent is the foundation of innovation, and innovation-driven development is essentially talent-driven development." In current technology innovation competition, the role of technology research and development personnel beyond reproach, in 2009 China total of 1.18 million, ten years after 61.9% growth reached 1.86 million, but relative to other countries investment or in the back, from our country's strategy of science and education to the talent power strategy to today's innovation driven development strategy, are inseparable from the role of "people". The proportion of the investment intensity of R & D personnel is an expression of the investment of R & D personnel in the academic field. Based on the assumption of homogeneity among R & D personnel, it reflects a certain scale effect of R & D personnel investment. R & D personnel can also be used as an internal resource of the enterprise to provide unique advantages for the enterprise's technological innovation activities, because the innovation activities are essentially driven by talents. As long as the r & d personnel resources are reasonably optimized, the full use of them will

help the enterprise's technological innovation activities. In the final analysis, the competition in the current world pattern is the competition of science and technology, but also the competition of talents. As the special human resources of R & D personnel, as the decisive factor of economic development, is the lifeblood of economic development under the current market economy conditions, and its position in innovation development is beyond reproach

The r & d activities of an enterprise include the research stage and the development stage, while the scope of the R & D investment mainly includes the personnel in the research stage, the personnel in the development stage and other related personnel belonging to the research and development activities. Li and Zhao Xiliang (2019) through research that human capital intensity rose 1%, will make the enterprise innovation quantity rose 0.19%, enterprise innovation quality rose by 0.16%, thus concluded that human capital can significantly improve enterprise innovation quantity and innovation quality some scholars research shows that the impact of innovation innovation is not simple promotion and inhibition but has a certain threshold effect, but for the enterprise value is improved. R & D personnel are the bridge to maintain the relationship between R & D activities and enterprise value. Only by the rational allocation and effective integration of innovative R & D personnel can they play an irreplaceable role in the promotion of enterprise value. In short, this paper believes that innovation personnel into the creation of enterprise value has a important role, research and development personnel is a kind of unique enterprise resources, through the organization of research and development personnel, make the research and development personnel and enterprise resources with full fusion, can quickly into productivity bring new value for the enterprise

Based on the above analysis, the following assumptions are proposed:

H2: The investment intensity of R & D personnel can significantly improve the enterprise value of the STAR Market.

2.2. The adjustment effect of equity incentive

For enterprises, innovation is a long-term activity. Innovation activities can enable enterprises to gain more competitive advantages, but at the same time, accompanied by greater time, material resources, manpower and capital investment, but may not bring benefits to enterprises, with greater uncertainty. The management of an enterprise plays the role of the decision maker in the innovation activities, while the core technical personnel are the executors of the innovation activities, both of which are important participants in the innovation activities. Due to the principal-agent problem, the management of the enterprise will pay more attention to the short-term performance of the enterprise for the consideration of remuneration, reputation and risk, and the willingness to carry out high-risk innovation activities will be low (Holmstrom, 1989), which will not be conducive to the long-term development of the enterprise. However, with the increase of the proportion of shares held by enterprise managers, the agency cost brought by innovation activities will gradually decrease (Chen Xiling, 2018), which can also improve the tolerance of failure in the short term, and in the long term, the incentive object can get more returns from equity incentive (Tian Xuan, 2018). In addition, compared with short-term incentive methods such as compensation incentive, equity incentive, by building a community of

interests between enterprise managers and owners, the managers of enterprises will reduce short-term behaviors from the perspective of making decisions (Manso, 2011). In addition, the returns of the motivated object are closely linked to the fluctuations of the stock price, which encourages the motivated object to take more risks for innovative activities and obtain long-term returns (Armstrong, 2012). From the perspective of non-management, such as core technicians, equity incentive will not only give them the possibility of personal wealth appreciation, but also may realize the identity transformation from employee to enterprise owner. To some extent, this will enhance their sense of identity and belonging to the enterprise, and promote their human capital to play a greater role. At the same time, it will also improve the cohesion and centripetal force of the team, maintain the stability of the core team, ensure the continuous progress of technological innovation activities, and thus affect the value of the enterprise.

Enterprises can bind the interests of the motivated objects through equity incentive, restrain their short-sighted behavior, and affect their enthusiasm for innovation activities, which will have a certain impact on the innovation investment of enterprises. However, when conducting equity incentive, the incentive intensity of enterprise choice will be different. The intensity of equity incentive not only affects the income obtained by the incentive object from the community of interests, but also has an impact on the enterprise innovation investment. Jensen And Meckling (1976) found that the higher the intensity of equity incentive, the closer the connection between the income of the incentive object and the stock price, and the higher the profit of the incentive object from the perspective of the enterprise owner. In addition, as long as the incentive object completes the agreed performance assessment target, it can obtain the stock of the company, so that the incentive object can share the surplus value of the enterprise, and then obtain more profits from it. In the long run, the R & D and innovation activities with long cycle and high risk can better enhance the competitiveness of enterprises, which is conducive to the long-term healthy development of enterprises. In addition, as the intensity of equity incentive, incentive object holdings will increase, the incentive object and shareholders in a state of community, in this state, "benefit convergence" utility will be higher than "profit trenches" utility (Wu Juan, 2017), the company's stock price fluctuations and the link between incentive object earnings fluctuations will be more closely. In order to obtain more income from the equity incentive, the incentive object will pay more attention to technological innovation and the long-term development of the company, promote the improvement of the company's stock price, and also have an impact on the value rate of the enterprise.

Based on the above analysis, the following assumptions are proposed:

H4: The greater the equity incentive intensity of enterprises in the STAR Market, the more conducive the enterprise innovation investment is to the improvement of enterprise value.

Technology innovation activities usually need a long time to bring returns to the enterprise, the design equity incentive plan to fully consider the process of innovation activities, set up the reasonable incentive period of validity, to make the incentive object can benefit from innovation activities, and better stimulate the motivation of innovation activities, further affect the efficiency of technology innovation. When

the validity period of equity incentive is short, the incentive object may pay more attention to the improvement of short-term performance, and avoid the technological innovation activities with large risk and long cycle, so as not to affect their own income, which may not be conducive to the enterprise innovation activities. However, with the extension of the validity period of equity incentive, the incentive objects will not only restrain their own short-sighted behavior, but also make them pay more attention to the role of innovation in the long-term development of enterprises. In addition, a reasonable validity period of equity incentive is also conducive to maintaining the stability of the core team. If the incentive object leaves within the validity period of the equity incentive, it is equivalent to giving up the income brought by the equity incentive, which increases the resignation cost of the incentive object to a certain extent. The stability of the core team is conducive to the orderly promotion of innovation activities, and will also be more conducive to the improvement of enterprise technological innovation efficiency. Therefore, the equity incentive lasting for a long time can not only enable the incentive objects to share the achievements of the innovation activities of the enterprises, but also retain talents and ensure the continuity and continuity of the innovation activities. Gopalan (2014) et al. studied the incentive for enterprise CEOs, and found that when the incentive time for CEO is long, the research and development intensity of enterprises will be improved. In addition, with the extension of the validity period of equity incentive, the incentive object will pay more attention to the long-term development of the enterprise when making decisions, and the motivated object will be more willing to innovate, which will be more conducive to enterprise innovation (Li Danmeng, 2017). Moreover, the longer the validity period of equity incentive, more constraints and restrictions will be brought to the incentive object, and equity incentive will also play a greater role (Huang Xinjian, 2020).

Based on the above analysis, the following assumptions are proposed:

H5: The longer the validity period of equity incentive, the more conducive the enterprise innovation investment is to the improvement of enterprise value.

3. Research Design

3.1. Enterprise value

According to the connotation analysis of the above enterprise value, the value of the science and technology innovation board enterprise is the market evaluation of the value of its tangible and intangible assets. The value of its tangible assets can be reflected by financial indicators, and the value of intangible assets mainly refers to the future value appreciation brought about by technology research and development and innovation. In order to avoid the one-sidedness of measuring enterprise value brought by a single index, refer to the practice of Chen Chen (2005), Tao Lijuan (2016) (2016), Yang Xue (2019) and Geng Jingjing (2019), and the factor analysis method is adopted to evaluate the enterprise value of the science and Technology innovation board. Factor analysis is widely used as a method to comprehensively evaluate multiple indicators. More data can be analyzed and processed, and finally form several important factors, and then calculate the comprehensive score. Its benefit is that it can help us to fully understand the characteristics of the research object. Based on this, this paper

combines the characteristics of technology innovation of enterprises, and evaluates the value of enterprises by establishing an index system including profitability, solvency, operation ability and development ability.

Profitability is mainly measured by return on equity (ROE), return on total assets (ROA) and operating profit margin (OPR); solvency is generally divided into short term and long term, measured by current ratio (CR) and equity ratio (DER)

respectively; operating capacity is replaced by fixed asset turnover and total asset turnover. The higher the turnover rate of fixed assets (FATO), the higher the utilization rate of fixed assets, the better the management level. The higher the total asset turnover (TATO), the faster the capital turnover, the higher the operational efficiency; development capacity is reflected by operating income growth rate (OIGR) and asset growth rate (TAGR).

Table 1. Enterprise value measures

Value measurement	Specific index name and calculation method	Variable naming
profitability	Return on equity = net profit / average owner's equity	ROE
	Return on total assets = (total profit + financial expenses) / average total assets	ROA
	Operating profit margin = operating profit / operating income	OPR
debt paying ability	Current ratio = current assets / current liabilities	CR
	Title ratio = total liabilities / total owner's equity (net assets)	DER
operation capacity	Fixed assets turnover rate = operating income / average total fixed assets	FATO
	Total asset turnover rate = operating income / average total assets	TATO
Development ability	Growth rate of operating income = (operating income of current period-operating income of base period) / operating income of base period	OIGR
	Asset growth rate = (total assets of current period-total assets of base period) / total assets of base period	TAGR

3.2. Innovation investment

Innovation input (RD). Regarding the measurement of innovation input, considerable measurements are provided in existing studies. For example, the ratio of R&D investment to total assets (Li Jian et al., 2021; Xu Yupeng et al., 2021), the ratio of R&D investment to operating income (Du Shanzhong, 2021; Zhu Hang et al., 2016), the ratio of the number of R & D personnel to the number of total employees, etc. This paper draws on the construction method of scholar Zheng Jian (2007) on technology innovation efficiency evaluation index system, and measures the innovation investment through the proportion of R & D investment in the current period in the total assets (R&D1) and the proportion of the number of R&D personnel in the total number of employees (R&D2).

3.3. Stock ownership incentive

Compared with compensation incentive short-term incentive, equity incentive through the construction of enterprise managers and the interests of the community, makes the enterprise managers and owners target function, enterprise managers will pay more attention to the long-term development of enterprises, to be incentive object increase the innovation of the enterprise, thus affect the overall value of the enterprise. Moreover, the characteristics of the equity incentive, such as the incentive intensity and the validity period of the incentive, will have an impact on the enterprise value.

The explanatory variables selected in this paper include: (1) equity incentive intensity (EI1). The ratio of the number of shares using the equity incentive to the total equity capital when issuing the equity incentive plan represents the equity incentive intensity (EI1) in%; (2) the validity period of the equity incentive (EI 2). The effective number of years of the equity incentive plan represents the validity period of the equity incentive (EI2) in the year. In addition, this paper only considers the first equity incentive plan published by the enterprise in that year.

3.4. Controlled variable

Capital composition. The capital structure of this paper is expressed by the asset-liability ratio. It reflects the proportion of enterprises to obtain funds through borrowing, which is an indicator to measure the level of corporate debt. It also measures the operating ability of creditors, and also provides a basis for creditors to borrow money. Based on the agency theory, capital structure plays a certain role in the decision of management and operation, which is conducive to the increase of enterprise value.

Scale. In this paper, the total assets are selected. The size of the enterprise affects the decision makers' investment of innovation to some extent. At the same time, the scale of the enterprise directly affects the decision-making ability, which will affect the value of the enterprise. Smaller enterprises are lack of resources in working capital management, and consider more safety issues in enterprise development. Relatively speaking, large-scale enterprises have better credit, rich resources, and have the ability to adopt some better working capital management policies, and these factors will eventually have an impact on enterprise value.

Share ratio of major shareholders. This paper uses the percentage of the largest shareholder and the total share capital of the company as the control variable and adds to the regression model. The initial innovation investment only means that the shareholders and creditors have the innovation investment in the technology, product or management of the enterprise, and does not involve the relationship between the capital structure and corporate governance at all. Through the previous reading of the literature, we can know that the enterprises with concentrated equity have a low agency cost, and due to the incentive effect of the major shareholders on the management, the major shareholders are also easy to make decisions, which will enhance the value of the enterprise.

Enterprise growth ability. This paper chooses the growth rate of net assets to measure it. Enterprises have strong growth ability, but also have great development potential. Some scholars also point out that growth enterprises will invest heavily in innovation activities. When the capital market is

more effective, the stock price will rise, and its corporate value will increase. So it is very necessary to control the growth rate of net assets.

Table 2. Summary table of variable definitions

Type of variable	Variable name	Variable code	Variable measurement method
Explained variable	enterprise value	CV	Factor analysis method is used to obtain the comprehensive score of enterprise profit, debt repayment, operation and development ability.
Explanatory Variable	Innovation investment	RD1	R & D investment / total assets
		RD2	Total number of r & d staff / total number of employees of the enterprise
Regulated Variable	Equity incentive intensity	EI1	Number of shares of the equity incentive / total share capital when the equity incentive plan is issued
	Validity period of equity incentive	EI2	Number of effective years of the equity incentive plan
Controlled variable	asset-liability ratio	LEV	asset-liability ratio
	scale	CSize	Natural logarithm of the total assets
	Net asset growth rate	GROWTH	(Net assets at the end- -net assets at the beginning) / 100% of net assets at the beginning
	The largest shareholder shareholding ratio	F1	The proportion of the largest shareholder's holdings in the total share capital of the enterprise

3.5. Model Design

In order to test the relationship between enterprise innovation investment and enterprise value, the following two multivariate regression models are set up in this paper. In the following model, RD represents the level of enterprise innovation investment, CV represents enterprise value, EI represents the equity incentive of the enterprise, RDI represents the interaction item of enterprise innovation investment and equity incentive, and Control represents all control variables. At the same time, this paper also controls the year and industry virtual variables.

For assumptions 1,2, and 3;

$$CV_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \gamma_i Controls_{i,t} + \varepsilon_{i,t}$$

For assumptions 4,5:

$$CV_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \alpha_2 EI \times RD + \gamma_i Controls_{i,t} + \varepsilon_{i,t}$$

4. Empirical Analysis

4.1. Factor Analysis

In order to measure the enterprise value of the explained

variable, this paper needs to extract the public factor of the selected nine indicators. First of all, KMO and Bartlett tests should be conducted to determine whether they are suitable for factor analysis research. The extracted factor was rotated based on the PCA of the index to obtain higher interpretability to identify the common factor. Finally, the weight of the factor is determined according to the proportion of the rotating variance contribution to the cumulative variance contribution, so as to build the comprehensive score function.

4.1.1. KMO and Bartlett tests

After KMO and Bartlett tests were available, KMO value =0.712, the significance level of Bartlett's spherical test was 0, indicating that the selected indicators and data are well related and significance, and factor analysis can be performed.

4.1.2. Factors were extracted by principal component analysis

The common factor was extracted based on the eigenvalue greater than 1, and the total variance interpretation is shown in Table 3 below.

Table 3. Interpretation of the Total Variance

ingredient	Initial eigenvalue			The sum of the load squares was extracted			Sum of the rotating load squares		
	amount to	variance percentage	accumulative total%	amount to	variance percentage	accumulative total%	amount to	variance percentage	accumulative total%
1	3.32292	33.23	33.23	3.32292	33.23	33.23	3.17532	31.75	31.75
2	1.89327	18.93	52.16	1.89327	18.93	52.16	1.97862	19.79	51.54
3	1.48185	14.82	66.98	1.48185	14.82	66.98	1.36878	13.69	65.23
4	1.03639	10.36	77.34	1.03639	10.36	77.34	1.21170	12.12	77.34
5	0.93094	10.31	87.65						
6	0.68383	6.84	94.49						
7	0.48935	4.89	99.39						
8	0.05893	0.59	99.97						
9	0.00252	0.03	100.00						

It can be seen from Table 5-1: among the silver factors of these 9 variables, there are 4 factors with the initial eigenvalue greater than 1 before rotation, and the variance contribution rate is 33.23%, 18.93%, 14.82%, and 10.36% respectively,

explaining 77.34% of the total variance of the original variables, and the overall interpretation degree is high. Therefore, the four principal components extracted basically include the main information of all the variables, which can

be used as common factors.

4.1.3. Principal component factor interpretation

To select the typical variables in each common factor, the

common factor can be rotated. In this paper, the variance maximum method adopts the orthogonal rotation to obtain the rotation component matrix, as shown in Table 4.

Table 4. Composition Matrix After the Rotation

	ingredient			
	1	2	3	4
net margin	0.3056	0.9184	-0.0183	-0.0555
Basic earnings per share	0.8346	0.1732	0.0704	-0.1953
net profit growth rate	0.9026	0.0049	-0.0395	0.1417
EPS growth rate	0.8895	0.0107	-0.0606	0.1607
total assets	-0.0616	0.9542	0.0041	-0.0314
dividend payout ratio	-0.0693	0.1462	0.8034	0.2333
Share of tradable shares	0.0150	-0.0973	0.0384	0.8900
Daily turnover rate	0.2558	-0.3505	0.6156	-0.2692
The biggest rise or fall	-0.0938	-0.1042	0.5722	-0.4080

Table 4 shows that the factor names the factor. The first main factor has a large load in basic earnings per share, net profit growth rate and growth rate of earnings per share; the second main factor has a large load in net profit and total assets; the third main factor has a larger load in dividend distribution rate, average daily turnover rate and maximum rise and fall; and the fourth main factor has a large load in

tradable shares.

4.1.4. The factor score calculates the final value of the enterprise

The final result of identifying the factors with the component matrix is presented in the factor score coefficient matrix, as shown in Table 5-3

Table 5. Component Score Coefficient Matrix

	ingredient			
	1	2	3	4
net margin	0.03237	0.45921	0.03346	-0.01357
Basic earnings per share	0.50802	0.05845	0.03998	-0.26866
net profit growth rate	0.00000	0.00000	0.00000	0.00000
EPS growth rate	0.29757	-0.06080	-0.02946	0.13390
total assets	0.29374	-0.05755	-0.04220	0.14717
dividend payout ratio	-0.08990	0.50695	0.06419	0.00390
Share of tradable shares	-0.04583	0.14381	0.65564	0.31474
Daily turnover rate	0.02911	-0.02059	0.14660	0.76249
The biggest rise or fall	0.09000	-0.17087	0.40212	-0.15036

4.1.5. The Composite Score Function

Based on the coefficient results in Table 5-3 above, the comprehensive score function expression of the sum of enterprise value can be listed as follows. Then, the financial indicators of each sample are inserted into the expression, and the enterprise value data of the corresponding sample can be obtained.

$$CV = (31.75 * f_1 + 19.79 * f_2 + 13.69 * f_3 + 12.12 * f_4) / 77.34$$

4.2. Descriptive Statistics

Descriptive statistical analysis of the sample data using STATA software and the results are shown in Table 6 below:

Table 6. Descriptive Statistics

variable	sample capacity	average value	standard deviation	least value	median	crest value
CV	494	0.010	0.493	-2.335	-0.029	2.201
RD1	494	0.05775	0.141742	0.00712	0.03850	2.695974
RD2	494	29.83233	18.27422	0.20780	23.35	90.32
EI1	494	1.56000	1.20000	0.10200	2.3432	6.100
EI2	494	5.03000	0.98000	3.00	5.00	8.00
LEV	494	0.33212	0.19015	0.05220	0.29120	0.91021
CSize	494	21.6550	0.85700	20.11600	21.47000	26.16100
GROWTH	494	0.23523	0.49462	-1.39259	0.38259	4.72941

The descriptive statistics results of the main variables in this study are shown in Table 5-4. Among them, the mean value of enterprise value (CV) is 0.010, the standard deviation is 0.493, the minimum value is -2.335, and the maximum value is 2.201, indicating that the enterprise value between

different enterprises varies greatly. In the innovation investment (RD1&RD2), the mean RD1 is 0.058. The standard deviation is 0.142, the minimum value is 0.007, the maximum value is 2.696, the mean RD2 is 29.832, the standard deviation is 18.274, the minimum value is 0.208, and

the maximum value is 90.32, indicating that the innovation investment varies greatly and the innovation level between different enterprises. The average equity incentive intensity (EI1) is 1.560, the standard deviation is 1.200, the minimum value is 0.102, and the maximum value is 6.100, indicating the difference of equity incentive intensity between different enterprises. The average validity period of equity incentive (EI2) is 5.03, the standard deviation is 0.98, the minimum value is 3, and the maximum value is 8, indicating that the validity period of equity incentive is different between

different enterprises. Other variables were consistent with the findings of previous studies.

4.3. Correlation Analysis

In order to test whether there is multicollinearity between the variables, the correlation analysis of the main variables in the model is conducted. The correlation coefficient between each variable is lower than 0.5, which proves that the model is less affected by multicollinearity. The test results of Pearson correlation coefficient are shown in Table 7 below:

Table 7. Correlation analysis

	CV	RD1	RD2	EI1	EI2	LEV	CSize	GROWTH	F1
CV	1								
RD1	0.3233*	1							
RD2	0.4123**	0.346***	1						
EI1	0.051**	0.3532*	0.1083*	1					
EI2	0.013*	-0.1197*	0.0973*	-0.1240	1				
LEV	-	0.091***	0.116***	0.094***	-	1			
CSize	0.169***				0.096***		1		
GROWTH	-	0.362***	0.250***	-0.094**	-	0.250***		1	
F1	0.195***	0.080***	0.096***	-	0.163***	0.076***	-0.026		1
	0.019			0.077***	-0.026				
	0.088**	0.133***	0.031	-0.099**	-0.043	-0.098**	-0.015	-0.080**	
									1

Note: * p < 0.1, ** p < 0.05, and *** p < 0.01

4.4. Analysis of the Regression Results

Table 8 reports the relationship between hypotheses 1 to 5, namely, innovation investment, equity incentive, and the enterprise value of the science and technology innovation board.

(1) Analysis of the relationship between control variables and the value of the science and innovation board. This paper uses OLS regression to test the relationship between control variables and the innovation board enterprises. According to the column (1) shown in Table 8, The regression coefficient of the asset-liability ratio (Lev) is -0.003, And were significant at the 5% significance level, This indicates a negative correlation between the asset-liability ratio and the enterprise value of the science and technology innovation board, The results indicate that the higher the asset-liability ratio, The lower the value of the science and technology innovation board enterprises; The regression coefficient of enterprise size (CSize) is 0.162, And were significant at the 5% significance level, This indicates a positive correlation between the size of the enterprise and the enterprise value of the science and technology innovation board, the results show that, The larger the business size, The smaller the value of the science and technology innovation board enterprises; The regression coefficient of net asset growth rate (Growth) is 0.184, And were significant at the 1% level of significance, This indicates a positive correlation between the growth rate of net assets and the value of the science and technology innovation board, the results show that, The greater the net asset growth rate, The greater the value of the science and technology innovation board enterprises; The regression coefficient of the largest shareholder (F1) is 0.501, And were significant at a significance level of 10%, This indicates that there is a significant positive correlation between the shareholding ratio of the largest shareholder and the value of the science and technology innovation board, the results show that, The higher the shareholding ratio of the largest shareholder, The greater the value of the science and technology innovation

board enterprises.

(2) The impact of innovation investment on the enterprise value of the science and Technology Innovation Board. For hypothesis (1), this paper continues to use OLS regression to add innovation input (ED1), and the specific results are shown in column (2) in Table 8. According to column (2) in Table 8, the regression coefficient for innovation input (RD1) is 0.609 and is shown at the 5% significance level, verifying the hypothesis (1). The results show that for every 10% increase in RD1 (R & D investment / total assets), the value of the science and technology innovation board enterprises increased by 6.09%. For the control variables, this paper finds that the asset-liability ratio (Lev) and the enterprise value of the science and technology innovation board, the negative correlation between the enterprise size (CSize) and the enterprise value of the science and technology innovation board, and the net asset growth rate (Growth) and the enterprise value of the science and technology innovation board. There is a positive correlation between the shareholding ratio of the largest shareholder (F1) and the enterprise value of the science and technology innovation board.

For hypothesis (2), OLS regression is continued to add innovation input (ED2), and the specific results are shown in columns (6) in Table 8. According to the columns (6) in Table 8, the regression coefficient for innovation input (RD2) is 0.552 and appears at the significance level of 1%, testing the hypothesis (2). The results show that every 10% increase in RD2 (total r & d staff / total number of employees) increases the value of the science and technology innovation board by 5.52%. For the control variables, this paper finds that the asset-liability ratio (Lev) and the enterprise value of the science and technology innovation board, the negative correlation between the enterprise size (CSize) and the enterprise value of the science and technology innovation board, and the net asset growth rate (Growth) and the enterprise value of the science and technology innovation board. There is a positive correlation between the

shareholding ratio of the largest shareholder (F1) and the enterprise value of the science and technology innovation board.

(3) The regulating effect of equity incentive intensity. For hypothesis (4). On the basis of columns (2) and (5), the interaction items of innovation investment and equity incentive intensity (RD1 EI 1 and RD2 EI 1) are added respectively. The specific results are shown in Table 8. As shown in Table 8 (3), the regression coefficient of interaction term between innovation input and equity incentive intensity (RD1 EI 1) is 0.033 and is significant at 1%. As shown in Table 8 (6), the regression coefficient of innovation input and equity incentive intensity (RD2 EI 1) is 0.061 and significant at 1%, indicating that equity incentive intensity will enhance the positive correlation between innovation investment and

STAR board value.

(4) Adjustment of the validity period of equity incentive. For hypothesis (5). On the basis of columns (2) and (5), the interaction items of innovation investment and equity incentive intensity (RD1 EI 2 and RD2 EI 2) are added respectively. The specific results are shown in Table 8. As shown in Table 8 (4), the regression coefficient of interaction term between innovation investment and equity incentive intensity (RD1 EI 2) is 0.017, and significant at 5%. As shown in Table 8 (5), the regression coefficient of innovation investment and equity incentive intensity (RD2 EI 2) is 0.017, which is significant at 5%, indicating that the validity period of equity incentive will enhance the positive correlation between innovation investment and the value of STAR board enterprises.

Table 8. The Regression Results

VARIABLE S	(1)	(2)	(3)	CV (4)	(5)	(6)	(7)
RD1		0.609**(3.71)	0.623** (3.42)				
RD2					0.552*** (4.38)	0.676** (3.09)	
EI1×RD1			0.033*** (2.68)				
EI2×RD1				0.017** (2.09)			
EI1×RD2						0.061***(6.18)	
EI2×RD2							0.017** (2.09)
EI1	0.051* (0.056)	0.053* (0.051)	0.050* (0.052)	0.048* (0.057)	0.051* (0.056)	0.054* (0.056)	0.056* (0.060)
EI2	0.021* (0.472)	0.022* (0.501)	0.013* (0.512)	0.014* (0.508)	0.018* (0.501)	0.021* (0.478)	0.023* (0.511)
LEV	-0.003** (-1.30)	-0.002***(- 1.60)	-0.002***(- 1.71)	-0.002***(- 1.70)	-0.001***(- 1.67)	-0.001***(- 1.65)	-0.001***(- 1.66)
CSize	0.162** (0.066)	-0.005*** (-5.331)	-0.004** (-4.911)	-0.004** (-4.922)	-0.003*** (-4.789)	-0.005*** (-5.389)	-0.004*** (-5.378)
GROWTH	0.184*** (0.016)	0.002** (2.2)	0.001** (2.078)	0.001** (2.066)	0.002** (2.199)	0.002** (2.168)	0.002** (2.169)
F1	0.501* (3.03)	0.709*** (3.53)	0.612** (3.01)	0.687** (3.23)	0.694** (3.02)	0.634*** (3.22)	0.633*** (3.21)
Industry	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES
Obs ervations	494	494	494	494	494	494	494
R -squared	0.188	0.198	0.189	0.189	0.191	0.191	0.190
F	3.017	3.017	3.017	3.017	3.017	3.017	3.017

5. Summary

This paper takes 501 listed enterprises on the STAR Market as the research object, and studies the impact of innovation investment on enterprise value, the lagging effect of innovation investment and the effect of innovation incentive through the empirical methods of descriptive statistics, correlation analysis and regression analysis. Finally, the following research conclusions are obtained:

First, innovation investment has a significant positive impact on the enterprise value of the science and technology innovation board. Through STAR Market enterprise r&d investment strength, r & d investment strength correlation with enterprise value regression analysis, regression results support hypothesis H1, and the results on the level of 1%, namely the enterprise increase investment intensity of research and development activities, can better development industry leading production process, production technology, make the enterprise has a certain competitive advantage, can better advantage in the fierce market competition, and promote the promotion of enterprise value.

Second, the intensity of equity incentive will significantly

enhance the positive correlation between innovation investment and the enterprise value of listed enterprises on the science and Technology Innovation Board. It shows that the intensity of equity incentive will enhance the relationship between the interests of senior executives and the stock price. This will lead to the convergence of benefits, and executives will pay more attention to the impact of innovation investment on enterprise value for their own interests.

Third, the validity period of equity incentive will significantly enhance the positive correlation between innovation investment and the enterprise value of the science and technology innovation board. This shows that the longer the validity period of equity incentive, the longer it can restrain senior executives, promote senior executives to pay more attention to long-term interests, and enhance the promotion effect of innovation investment on the value of the science and technology innovation board.

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