

# A Study on the Correlation between R&D Investment and Financial Performance :A Case of the Chinese Automobile Manufacturing Industry

## ABSTRACT

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Under the background of economic globalization, China's manufacturing industry has always been one of the pillar industries of the national economy. The automobile manufacturing industry occupies a dominant position in the manufacturing industry. With the economic growth and improvement, the living standard of the population, people's demand for automobiles has gradually increased. Coupled with the current economic and social comprehensive green transformation and upgrading, for the automobile manufacturing industry, increasing R&D investment will help enterprises occupy the market and improve their financial performance. Therefore, this paper selects 64 Chinese A-share listed automobile manufacturers, with 320 samples. It uses Stata software to analyze the data of the relationship between R&D investment and various indicators. The empirical results show a negative correlation between R&D investment and the current financial performance of the automobile manufacturing industry. There is a lagging effect of R&D investment on the current financial performance of automobile manufacturing industry due to the existence of certain time problems with R&D projects. The negative impact of lag of period and a lag of two periods have a weakening trend. By studying and analyzing the data, it is hoped that suggestions related to R&D investment can be provided to the automobile manufacturing industry to promote the sustainable development of the enterprise.

**Keywords** research and development investment, financial performance, automobile manufacturing industry

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## 1. Introduction

Nowadays, under the background of science and technology globalization, with the rapid development of information technology, the competition among enterprises is becoming more and more intense, and strengthening investment in research and development has become one of the most important means for enterprise development. To meet market demand and occupy a leading position in the market, enterprises need to create products different from other enterprises from their point of view, enhance their self-advantage and competitiveness, and expand the market. Due to current resource and environmental constraints, the enterprise labor costs increase. The enterprise's existing production model has been unable to meet the needs of sustainable development, so the importance of scientific and technological innovation is also reflected [33-36]. "Innovation to drive development, development to create advantages" in the "14th Five-Year Plan" put forward in the guidance can also illustrate the importance of innovation and development. In recent years, China has put forward relevant tax policies, R&D investment funds can be used to make greater efforts to add deductions, which will enable enterprises to improve their independent research and development capabilities, and further enhance the ability to innovate. In this context, China's automobile manufacturing industry presents a good development trend.

In recent years, China's automobile manufacturing industry has increased sales in general to maintain the growth trend. With the domestic economic environment improving, the industry's operating income continues to increase, and China's automobile manufacturing industry is also increasing capital investment in R&D activities. R&D personnel are the soft power of the enterprise to carry out R&D activities, the independent innovation ability of the enterprise depends to a certain extent on the expertise of the R&D personnel, R&D results are reflected in the number of patents obtained by the enterprise. In recent years, the number of enterprise R&D personnel and the number of enterprise patents have increased year by year, indicating that the automobile manufacturing industry is paying more and more attention to R&D investment.

China's automobile manufacturing industry has been growing after a long period of development, has a better industrial foundation, has made certain achievements in the automobile field, and occupies an important position in China's modern economic growth and manufacturing industry. With China's green low-carbon development of the economic system and the current economic and social development of comprehensive green transformation, the automobile manufacturing industry is also facing industrial structure transformation and upgrading. Technological innovation is a key factor in promoting the sustainable development of the automobile manufacturing industry. Enterprises by increasing investment in research and development, can develop more advanced technology and product upgrades, to improve product performance and meet the growing demand of consumers. Enterprises focus

on R & D investment to improve the core competitiveness and not be eliminated by the competition in the industry. This paper takes the automobile manufacturing industry as an example, through the collection and analysis of relevant index data, the relationship between R&D investment and financial performance is sorted out to theoretically enrich and improve the important impact of R&D investment on the financial performance of enterprises in the automobile manufacturing industry. The relationship between R&D investment and financial performance is hereby empirically presented with specific and objective data. It can enrich the research on the impact of R&D investment on financial performance in the field of automobile manufacturing and provide suggestions for the sustainable development of automobile manufacturing enterprises.

## 2. Literature review

The key to high-quality economic development in the high-quality development of enterprises, and whether the enterprise can high-quality development is more concerned about the performance of the enterprise's internal drive, R & D investment is an important factor affecting this internal drive, so the relationship between R & D investment and enterprise performance has become a hot spot in academic research.

A part of the research concluded that there is a positive correlation between R&D investment and a company's financial performance, and increasing R&D investment can effectively improve the company's financial performance; [1] Li used the relevant data from the electronics and pharmaceutical industries to conduct empirical analysis, and the results found that there is a positive correlation between R&D expenditure investment and enterprise performance, but the significance of such a correlation is small. [2] Bogner and Bansal (2007) used regression analysis to find that R&D expenses have a positive impact on firms' innovation capability by analyzing data from '30022' patent records of 42 firms. [3] Some scholars studied the R&D investment data and financial data of 71 companies in the high-tech industry during 2003-2007, and empirically examined the positive correlation between R&D expenditure investment and the financial performance of high-tech companies. [4] There are also Ningbo regional science and technology-based enterprises as an example, through the analysis found that there is a two-way promotion relationship between the enterprise R & D investment and its asset size, and liability scale; enterprise R & D investment strength reflects the enterprise's innovation ability, its technological innovation ability for the enterprise's financial performance has a strong positive impact. [5] Yuan and other scholars analyzed the data of private technology companies in Guangdong Province and pointed out that research and development activities can positively affect the pre-tax profit of private enterprises as well as the total income of enterprises. [6] MiWenjing and other scholars found that technological innovation has a strong positive impact on the financial performance of listed companies in the manufacturing industry through the multivariate linear Sobel test empirical analysis [7] Li and other scholars analyzed the new energy automobile industry through the perspective of green technological innovation, and the results found that the enterprise research and development personnel and capital investment has a promotional effect on the performance of the enterprise. [8] Other scholars directly through empirical analysis conclude that the results of technological innovation have a very significant impact on financial performance. [9] Some scholars use typical correlation analysis and panel regression to analyze 80 sustainability reporting enterprises, and the study shows that the increase in the combination of engineering and technological innovation and financial performance leads to a corresponding rise in manufacturing employment.

Another part of the study concluded that there is a negative relationship between R&D investment and firms' current financial performance. [10] Verwaal (2017), using data from 223 listed manufacturing companies in the Netherlands, argued that listed companies would have higher cognitive and normative barriers in the process of global outsourcing knowledge exchange, which would lead to innovative activities that would negatively modulate the relationship between global outsourcing and financial performance of listed manufacturing companies. [11] Some scholars take the listed companies in the small and medium-sized plate of the Shenzhen Stock Exchange as a sample, adopt the annual statement data of four years from 2005 to 2008, and use the research methods of factor analysis and stepwise regression analysis to conclude that the proportion of research and development (technological innovation) expenses is significantly negatively correlated with the profitability of enterprises. [12] Su and Zhao studied the listed enterprises in China's high-end equipment manufacturing industry, and found that R&D intensity does not have a significant impact on the profitability of enterprises, as well as on the operating ability, solvency and development ability of enterprises will have a negative impact. [13] Zhang T et al. took the data of listed big data enterprises from 2011 to 2013 as a sample, and showed that the current operating performance of listed big data enterprises did not constitute an overall correlation with their current R&D investment and previous R&D investment; R&D investment could not have a significant impact on the profitability in the near future; current asset turnover and fixed asset turnover were both significantly negatively correlated with the current and previous R&D investment; and the current and previous R&D investment was significantly negatively correlated with the current and previous R&D investment. Relationship. [14] Yang et al. from the perspective of the pharmaceutical manufacturing industry, with 57 listed companies as a sample, the study show that pharmaceutical manufacturing enterprises' technological innovation investment has no significant impact on their financial performance in the short term. [15] Happy et al. from the perspective of small and micro enterprises, selected 205 enterprises as the research object, and showed that the intensity of R&D investment is significantly negatively correlated with the company's financial performance. [16] Li Xintong, Jiang Songqi, and Hong Xinyu By analyzing the solvency, profitability, operating capacity, and development capacity of Yili Group,

it was found that with the continuous increase of R&D investment, the benefits it brings are decreasing. [17] Zhang Zhihua et al. concluded that there is a negative impact on firm performance due to the existence of difficulties in R&D activities.

[18] Some scholars, after analyzing the data of enterprise R&D investment through empirical evidence, found that R&D investment will have a lagging effect on enterprise financial performance, and the impact of the time limit is more than ten years. [19] Zhang R (2016) also found through empirical research that corporate R&D expenditure has a significant lag effect on financial performance. [20] Wu Z and Liu Yanna (2021) found that there is a lagged effect of R&D investment on corporate performance. [21] Hao Ting's empirical study of the pharmaceutical industry shows that R&D investment has a certain lag on the value of the company, there is a one-period lag. This lag will make R&D investments with a positive impact on the financial performance of the lagged periods. [22] Chen takes machinery, medicine, electronic and information equipment, automobile, and information service industries as an example, and through the research, he believes that R&D investment will not have a significant impact on the financial performance in the current period, but can have a significant positive impact on the financial performance improvement in the lag period of 1-2 years. [23] Some scholars selected 278 listed enterprises in strategic emerging industries to do quantitative analysis of the data, and found that the enterprise R & D investment significantly affects the financial performance of enterprises in the current period, and the impact of negative, but can be lagged for two periods of financial performance has a significant positive impact. [24] There are also scholars through the manufacturing industry in Hubei Province listed companies to study, through empirical research found that the manufacturing industry in Hubei Province, listed companies in the R & D expenditure investment intensity and the current period of enterprise financial performance are negatively correlated with the lag of a period of enterprise financial performance has a significant positive impact. [25] More scholars through the strategic emerging industries innovation investment on financial performance impact research empirical evidence found that innovation investment and enterprise financial performance of the current period significantly negative correlation, lag innovation investment and enterprise financial performance is positively correlated with the lag phase, lag phase II to promote the effect is more significant. [26] Zhao Meng takes Company K as an example, analyzes its R&D investment and financial performance in 2016-2021, and finds that the R&D investment of this pharmaceutical enterprise has a positive impact on its financial performance, but there is a lag, and this positive impact will be gradually obvious in the later period.

Based on the above analysis of the literature, it is concluded that the enterprise's R&D investment is closely related to its financial performance, although some scholars believe that the enterprise's R&D investment has a positive impact on financial performance, most scholars believe that the enterprise's R&D investment has a certain negative impact on the financial performance of the current period. Due to the large time span of R&D projects, it is difficult to widely spread to the market in the short term to form a scale effect, so scholars found that the impact of R&D investment on financial performance also has a lag. Since academics have taken a certain industry as the landing point, or specific research for a certain industry, this paper tries to explore the impact of R&D investment on the financial performance of listed companies of automobile manufacturing enterprises based on the existing research results of academics and taking China's automobile manufacturing industry as the research object, in view of which, this study puts forward the following main hypotheses:

Hypothesis 1: There is a negative relationship between R&D investment and the current financial performance of China's automobile manufacturing industry.

Hypothesis 2: There is a lag in the impact of R&D investment on the current financial performance of China's automobile manufacturing industry.

### **3. Methodology**

#### **3.1 Sample Selection and Data Sources**

In this paper, the empirical data of the A-share listed automobile manufacturing industry from 2018-2022 is selected as the research sample, and the data of R&D investment, financial performance, and control variables of automobile manufacturing sample enterprises from 2018-2022 are collected. Data on R&D investment, financial performance, enterprise size, gearing ratio, asset turnover ratio, and gross operating margin were obtained from the Cathay Pacific database (CSMAR), and 64 listed automobile manufacturing enterprises were selected through screening and were statistically analyzed using Stata and SPSS software, and data processing and calculations were performed using Excel software.

This paper screens the sample data of China's A-share listed automobile manufacturing enterprises for the five-year period from 2018 to 2022 according to the following rules: (i) Remove the enterprises with ST and \*ST in the data sample, that have abnormal business conditions and abnormal financial data, and if they are not removed, this part of the data will have an impact on the overall data. (ii) In order to ensure the complete continuity of the sample data, enterprises with partially missing sample data during 2018-2022 are excluded. (iii) Enterprises with missing variables such as R&D investment and financial performance are excluded. Finally, 64 valid enterprises were obtained, forming 320 valid data analysis values, and the continuous variables were shrink-tailed at the 1% and 99% levels.

## 3.2 Variable Description

### 3.2.1 Explained Variables

The explanatory variables in this paper are enterprise performance, the main purpose of enterprise R&D investment is to realize the improvement of profitability, and profitability is closely related to the return on total assets, he can also show the overall development of the enterprise, so this paper selects the return on total assets to explain the financial performance of the enterprise, expressed by ROA. Enterprise net assets net interest rate (ROE) can be used to measure the level of corporate management, but also can reflect the comprehensive situation of the enterprise in a year, this paper's robustness test will be ROA replaced by the ROE variable.

### 3.2.2 Explanatory variables

The explanatory variable of this paper is R&D investment, which is studied through the literature with reference to the study of [27][28][29], so this study applies the ratio of R&D investment to operating income to explain R&D investment, which is denoted by R&D.

### 3.2.3 Control variables

In order to make the results of the study more reliable, the study was carried out through the literature, mainly referring to the study of [30][31], the following variables were selected as control variables in this paper:

#### 3.2.3.1 Firm size

Different firm sizes can have different impacts on the financial performance of firms, and firm size is used as one of the controlling factors, which is expressed in terms of the logarithm of total assets, denoted by SIZE.

#### 3.2.3.2 Gearing ratio

The asset-liability ratio can show that the solvency of an enterprise is also a creditor's right people, investors, and operators attach great importance to the index, referring to the previous scholars' research, select assets and liabilities as one of the control factors, the rate is represented by LEV.

#### 3.2.3.3 Total Asset Turnover (TAT)

The value of the enterprise lies in the speed and efficiency of the assets to create income, and the total asset turnover refers to the ability of the enterprise to create income per unit of assets in a certain period, which is expressed by TAT.

#### 3.2.3.4 Gross Profit Margin

Operating gross margin can not only measure the profitability of enterprises, but also the ability to see brand value, which can reflect an indicator of future profitability and growth potential. It's represented by GPM.

## 3.3 Model Construction

Many scholars have studied the relationship between R&D investment and financial performance, so this paper chooses the following model to study the relationship between R&D investment and corporate financial performance:

$$ROA_{it} = \alpha_0 + \alpha_1 R\&D_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 TAT_{it} + \alpha_5 GPM_{it} + \beta_{it}$$

In order to test whether there is a lag period of R&D investment on the corporate financial performance of automobile manufacturing companies, the following model is developed:

$$ROA_{it-1} = \alpha_0 + \alpha_1 R\&D_{it-1} + \alpha_2 SIZE_{it-1} + \alpha_3 LEV_{it-1} + \alpha_4 TAT_{it-1} + \alpha_5 GPM_{it-1} + \beta_{it-1}$$

In the model,  $i$  is the firm;  $t$  is time;  $\alpha_1$  Measures the effect of R&D investment on firm performance;  $\alpha_2$  Measuring the effect of firm size on financial indicators.  $\alpha_3$  Measures the effect of gearing ratio on financial indicators.  $\alpha_4$  Measuring the impact of total gearing ratio on financial indicators.  $\alpha_5$  Measuring the effect of gross operating margin on financial indicators.

## 4. Results

**Table 1** Descriptive statistics (N=320)

Variable	Mean	Std.dev.	Min	Max.
ROA	0.0372	0.0630	-0.7139	0.1889
ROE	0.0573	0.1533	-1.4106	0.2938
R&D	5.0455	2.9280	0.4700	30.0000

SIZE	23.0045	1.4048	20.6017	27.5470
LEV	0.4726	0.1648	0.0973	0.7989
TAT	0.6795	0.2752	0.1209	1.8307
GPM	0.2066	0.0904	-0.2882	0.4769

Note: For variable codes, please refer to 3. Description of the study design

The wide distribution of data of each variable in Table 1, it shows that there are large differences in both financial performance and objective business conditions of different enterprises. Before the regression analysis, the main data index fitness of the regression formula was tested, and the VIF of each variable was between 1.2-2.25, less than 10, so it can be shown that there is no obvious homogeneity between the variables, and the F-value was 31.05 Adjusted R-squared was 0.3202 Through the test, the multiple regression analysis can be carried out.

**Table 2**Regression results of the impact of R&D investment on current period financial performance

(N=320)

variant	Unstandardized coefficient		t	Sig.(p-value)	VIF
	B	standard error			
R&D	-0.0040	0.0011	-3.68	0.0003***	1.20
SIZE	0.0060	0.0028	2.13	0.0342**	1.88
LEV	-0.1437	0.0265	-5.42	0.0000***	2.25
TAT	0.0485	0.0133	3.66	0.0003***	1.57
GPM	0.2270	0.0466	4.88	0.0000***	2.10
D-W Value			2.02		
F Value			31.05***		
Adj_R <sup>2</sup>			0.3202		

Note 1: For variable codes, please refer to 3. Description of the study design

Note 2: \*\*\*, \*\*, and \* represent tests at the 1%, 5%, and 10% levels, respectively, significantly correlated

As can be seen from Table 2, the D-W value was 2.02 indicating that the data had on autocorrelation and the model is all constructed. The F-value was 31.05 and the P-value was 0.0000, indicating significant variables. It indicates that research and development investment (R&D) at the 1% level has a significant negative impact on the current period illustrative financial performance (ROA), and the enterprise R&D investment cannot be fully converted into outputs, confirming that hypothesis one is valid. In terms of control variables, enterprise size product (SIZE) positively affects financial performance (ROA) at the 1% level, total asset turnover (TAT) and gross operating margin (GPM) extremely affect financial performance (ROA) at the 1% level, and gearing ratio (LEV) has a significant negative effect on financial performance (ROA) at the 1% level.

**Table 3**Regression results of the effect of R&D investment on financial performance in the lagged period

(N=256)

variant	Unstandardized coefficient		Standardized coefficient	t	Sig.(p-value)
	B	standard error			
R&D L.	-0.0029	0.0007	-0.1849	-4.27	0.0000***
SIZE	0.0073	0.0019	0.2126	3.82	0.0002***
LEV	-0.1098	0.0183	-0.3742	-5.99	0.0000***
TAT	0.0499	0.0089	0.2816	5.60	0.0000***

GPM	0.3271	0.0305	0.6083	10.71	0.0000***
D-W Value			1.85		
F Value			41.01***		
Adj_R <sup>2</sup>			0.5726		

Note 1: For variable codes, please refer to 3. Description of the study design

Note 2: \*\*\*, \*\*, and \* represent tests at the 1%, 5%, and 10% levels, respectively, significantly correlated

**Table 4 Regression results of the impact of R&D investment on financial performance in lag two (N=192)**

variant	Unstandardized coefficient		Standardized coefficient	t	Sig.(p-value)
	B	standard error	Beta		
R&D L2.	-0.0021	0.0007	-0.1456	-3.05	0.0026**
SIZE	0.0056	0.0021	0.1692	2.74	0.0068**
LEV	-0.0944	0.0201	-0.3280	-4.69	0.0000***
TAT	0.0589	0.0093	0.3430	6.33	0.0000***
GPM	0.3435	0.0314	0.6612	10.93	0.0000***
D-W Value			1.77		
F Value			31.96**		
Adj_R <sup>2</sup>			0.6131		

Note 1: For variable codes, please refer to 3. Description of the study design

Note 2: \*\*\*, \*\*, and \* represent tests at the 1%, 5%, and 10% levels, respectively, significantly correlated

As seen in the regression results of lag one and lag two, the D-W values of lag one sample and lag two are 1.85 and 1.77 respectively, indicating that none of the data is autocorrelated and the model is well constructed, the regression coefficient of R&D investment in lag one is -0.0029, the T-value is -4.27, the F-value was 41.01, and the P-value is 0.0000, indicating significant variables, and that of R&D investment in lag two is -0.0021, T-value is -3.05, the F-value was 31.96, and the P-value is 0.0026, indicating significant variables. Lag one and lag two R&D investment (R&D) on corporate financial performance (ROA) still a negative impact, which may be due to the return cycle of R&D investment being longer, R&D investment in the output lagged one and lagged two cannot be fully converted, so resulting in the impact of the lagged one and lagged two is still a negative impact on the financial performance. Therefore, the impact of lag one and lag two on financial performance is still negative.

However, a comprehensive comparison of the current period, lag one period and lag two period found that although the financial performance of enterprises is negative, but there is in growth, indicating that the increase of enterprise R&D investment will inevitably enhance the enterprise's financial performance, but China's automobile manufacturing enterprises research and development investment (R & D) on enterprise performance (ROA) of the impact of a serious lag, the hypothesis that the second is established.

variant	Model (1)	Model (1)	Models (2)
	the current period	one period behind	Phase II lag
	ROE		
R&D	0.001*** (-0.0174)	0.002** (-0.0116)	0.017** (-0.0079)
SIZE	0.2 (-0.0542)	0.066* (0.0841)	0.158 (0.0812)
LEV	0.009*** (-0.3857)	0.08* (-0.2426)	0.438 (0.1229)
GPM	0.054* (0.5443)	0.00*** 1.2986	0.001*** (0.7903)
TAT	0.217 (0.0989)	0.185 (0.0904)	0.151 (0.09)
Constant	1.3601	-2.0527	-2.04
Adjusted R <sup>2</sup>	0.1842	0.2033	0.1488

F	6.2	5.87	3.02
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**Table 5 Robustness test regression table**

Note 1: For variable codes, please refer to 3. Description of the study design

Note 2: \*\*\*, \*\*, and \* represent tests at the 1%, 5%, and 10% levels, respectively, significantly correlated

The purpose of the robustness test is to verify the reliability of the conclusions. The robustness test in this paper adopts the method of varying the parameters of the explanatory variables, and analyzes whether the regression results are consistent with the previous results to illustrate the generality of the conclusions. The sales of enterprise products, and service status reflect the business situation of the enterprise, and profitability is the ability of the enterprise to earn profits through the sale of products and services, so the enterprise net assets net interest rate (ROE) that is used to measure the level of management of the enterprise, but also used to reflect the enterprise's comprehensive situation over the year. This ratio reflects the results for the operator as a summary of the past business situation, which helps the operator to make important decisions, by China's listed companies have long been attached importance. Therefore, this paper replaces the indicator of total net assets (ROA), which is a measure of the financial performance of the dependent variable of the enterprise, with the enterprise's return on net assets (ROE).

From the data in the whole table, it can be concluded that research and R&D in the current period will have an impact on the financial performance of China's automobile manufacturing industry, and after the explanatory variables are replaced, the regression coefficient of research and development investment (R&D) in the current period in the model (1) on the financial performance (ROE) is -0.0174, which is a significant negative impact at the level of 1%, and the goodness of fit is 0.1842, which indicates that R&D investment increases by 1 unit, the financial performance of the firm in the current period decreases by 0.0174. therefore hypothesis 1 passes the robustness test.

The regression coefficient of the model (1) changes from -0.0174 to -0.0116 in the lagged period, which indicates that although R&D investment has a significant negative impact on the financial performance in the lagged period, this impact has a tendency to weaken and R&D investment has a significant impact on the financial performance (ROE) at the 5% level. The goodness of fit is 0.2033, which indicates that an increase of 1 unit in research and development investment (R&D) reduces the financial performance of the enterprise in the current period by 0.0116.

The regression coefficient in lag two of the model (2) changes from -0.0116 to -0.0079, which also indicates that the negative impact of research and development investment (R&D) on financial performance (ROE) in lag one or two is weakened. And the period of research and development investment (R&D) on financial performance (ROE) in the 5% level of significance, the fit is 0.1488, indicating that research and development investment (R&D) to improve 1 unit, the enterprise's financial performance in the current period will be reduced by 0.0079. Therefore, Hypothesis 2 passes the robustness test.

In summary, the results of the robustness test results are consistent with the findings of this paper, proving that hypothesis 1 and hypothesis 2 pass the robustness test, that is, there is a negative correlation between R & D investment and China's automobile manufacturing industry's current financial performance, and there is a lag in the impact of R & D investment on China's automobile manufacturing industry's current financial performance.

## 5. Conclusion

Tracing back to the development mechanism of the enterprise, the current R&D activities are still debatable due to the need for a large amount of capital injection, the long R&D cycle, and the ultimate success of the project. Therefore, for the different roles of R&D investment on the financial performance of enterprises, this paper takes the listed companies in the automobile manufacturing industry in Shanghai and Shenzhen A-shares as the main body of research from 2018 to 2022, under the panel data sample excluding ST and \*ST, and based on the R&D investment of China's listed companies from 2018 to 2022, the size of the enterprise's asset size, the return on total assets, the asset-liability ratio, the turnover rate of total assets, and the gross operating profit rate data for empirical analysis, which is a more objective and real response to the impact of R&D investment on the financial performance of companies listed in the domestic automobile manufacturing industry. This paper first briefly analyzes through descriptive statistics, and then uses regression analysis to find that research and (R&D) have a negative correlation of 1% significance level on the current financial performance, and the enhancement of research and development investment in the current year can't effectively improve the performance of the enterprise, so this paper accepts the hypothesis that the first.

The financial performance of enterprises has upward space, indicating that from the R & D input stage to the successful transformation of the results of the stage requires a longer period of time, the early stage is in the input stage, and the late stage for the output stage, so this paper and according to the benchmark regression analysis, found that there is a significant lag between the enterprise R & D investment (R & D) and financial performance, so this paper accepts the results of the hypothesis two. Finally, this paper takes the replacement of the explanatory variables ROA robustness test, there is also a significant relationship, so hypothesis one and hypothesis two are through the test, at the same time, the results of this paper also reflect the lagged one period and lagged two

periods of R & D inputs on the financial performance of the enterprise also have a negative impact, but this negative impact has a tendency to weaken, which is due to a long period of time after the accumulation of the level of R & D of the enterprise is constantly improving, the success rate is constantly improving, it is estimated that the R & D level is increasing, the R & D level is increasing. This is because, after a long period of accumulation, the level of R&D of the enterprise is increasing, the success rate is increasing, and the possibility of producing R&D results is estimated to increase, which will bring great profits to the enterprise.

## 6.Recommendation

The empirical results show that the R&D investment of China's automobile manufacturing enterprises is negatively correlated and lagged with the current period of corporate financial performance, so the company should do a good job of budgeting and cost control before carrying out the R&D project, and pay attention to both the R&D investment and the long-term sustainable development of the enterprise, to avoid the lag period is too long, which leads to a greater impact on the enterprise's finances. Companies can pay attention to market trends, competition and technological development in the next 5-10 years

There should be a lag, so the company then R & D investment should have good patience, continuous investment of funds and personnel, do not rush, short-term did not see the return to give up a large number of previous investments. When all the R & D investment can be converted into output, you can enjoy the brand awareness, reputation, market competitiveness, revenue and profits due to R & D for the enterprise.

With China's 5G, big data, artificial intelligence, cloud-native, edge computing and other technologies through the research and development, production and other aspects of energy vehicles, automobile manufacturing enterprises should pay more attention to research and development investment, strengthen independent innovation, overcome the industry's own weaknesses and lack of items, grasp the historical opportunity of new energy vehicles, improve innovation performance, and obtain greater market benefits.

Avoid blind expansion. From the descriptive analysis it can be seen that the enterprise scale of the automobile manufacturing industry is expanding year by year,[24] although the reason for the reduction of enterprise financial performance does not necessarily include the expansion of enterprise scale, but the expansion of the scale involves the long-term development, which needs to be carefully considered, clear research and development focus and direction of the enterprise and avoid blind research and development investment.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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