The Impact of Artificial Intelligence Strategy on Corporate Financial Performance—An Empirical Analysis Based on Listed Companies Panel Data

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Abstract. Through the statistics of 140 annual reports of board reports of 20 listed companies in the automobile manufacturing industry in the past seven years from 2013 to 2019, this paper finds that listed companies in the automobile industry generally pay attention to keywords such as "artificial intelligence", "new energy" and "automation". This shows that the management of listed companies generally believes that artificial intelligence is the development trend of the future industry. Further research investigates whether there is a relationship between corporate financial performance indicators (ROA and ROE) and corporate strategy by using the financial indicators of selected 20 listed companies. The results of the study show that there is a significant positive correlation between AI and ROA. In addition, there is a significant positive correlation between AI and ROE. Therefore, artificial intelligence can be placed in an important position in future company strategies, and the development of artificial intelligence strategies can effectively improve the company's financial performance.

Keywords: Artificial Intelligence · Financial Performance · Listed Companies · Strategy

1 Introduction

China is a major manufacturing country in the world. In the manufacturing field, manufacturing technology and artificial intelligence strategies are deeply integrated. Smart manufacturing is more narrowly an initiative to transform a manufacturing plant strategy from a cost center to a profitable one by combining industrial automation, IIoT and information technology (IT) including cloud services, 3D models and mobile computing Innovation hubs to bring about changes in manufacturing business strategies. As a new input factor, artificial intelligence has played a role in improving product quality, optimizing enterprise structure, and reducing enterprise costs in manufacturing. The manufacturing industry is the main body of the real economy. To revitalize the real

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economy, the manufacturing industry must be bigger and stronger. The automobile manufacturing industry is the core industry in the manufacturing industry, and the application prospects of artificial intelligence are more extensive. Investing in an AI strategy in the automotive industry can both reduce labor costs and increase productivity.

2 Literature Review

2.1 Research Review

At the intersection of artificial intelligence and manufacturing, a considerable amount of research has been done by predecessors [1]. For example, in the context of industrial intelligence, intelligence has a selective bias on the distribution of manufacturing enterprises, which will spread the traditional spatial distribution of enterprises, and at the same time, will bring together artificial intelligence application enterprises [7]. In the quality inspection of auto parts, the vision of the robot is used to replace the human vision, and the image acquisition device and information processing system are used to improve the efficiency and accuracy of parts inspection, optimize the time-consuming and labor-intensive manual processing, and the high cost of traditional inspection procedures The characteristics of [8]. There is a head effect in the application of artificial intelligence technology in China, and artificial intelligence technology has network externalities. The positive mechanism of relevant industrial policies is to reduce the cost of technology transformation, promote the formation of market expectations for listed companies, and make technology applications move towards a positive feedback loop [7].

Performance is significantly affected by low-cost and differentiation strategies in competitive strategies, and their processes are moderated by internal control [4]. In the research process of the determinants of the company's financial performance, the market concentration of the company's strategy will have a significant positive impact on the company's financial performance, and the company's debt ratio will have a significant negative impact on the company's financial performance [3].

2.2 Artificial Intelligence Strategy

Strategy is a practical strategy aimed at realizing relatively complex and difficult tasks, and its key lies in the complex and dialectical overall relationship among the four objectives, means, and benefits and costs [6]. The same is true for AI strategies as an emerging field. In China, from the economic, political and military perspectives, it is necessary to formulate corresponding strategies. The artificial intelligence strategy emerged as the times require. The artificial intelligence strategy helps China develop in this field in order to become a leader in the industry, that is, to apply artificial intelligence to promote national security and promote the development of artificial intelligence application value. These are all human functions. Strategy.

The research of the above-mentioned domestic scholars mainly focuses on the micro-level of the automobile industry, and the application of artificial intelligence technology solves the problem of low efficiency in the automobile manufacturing industry. Few [2]. At the same time, there is a lack of research on the impact on the economic level. This paper uses 20 A-share listed auto companies as research samples to study the impact of artificial intelligence strategies on corporate financial performance.

3 Methods and Discussion

The research is based on used data sourced from the annual reports of 20 public companies in the auto industry. This article obtains and organizes the annual reports of 20 A-share listed auto companies from 2013 to 2019, and obtains 140 annual reports. The company's profitability performance indicators (ROA, ROE) are used as dependent variables, and the explanatory variables are the importance of artificial intelligence strategy. In order to avoid the effects of irrelevant variables, the word frequencies of "new energy" and "automation" are also counted. In this paper, the frequency of the appearance of the keyword "artificial intelligence" in the annual report is used as an operable variable to measure the importance of the artificial intelligence strategy of listed companies. In the processing method of statistical frequency, the TextRank algorithm is used to extract the specified keyword "artificial intelligence" in the annual report for statistical analysis. The TextRank algorithm is improved from Google's web page importance ranking algorithm. It uses the intrinsic relationship between words to extract keywords. The statistical results are shown in Table 1.

Table 2 shows the variables used in the study.

In this study, we use panel data to verify whether ROE and ROA are related to the strategic importance of artificial intelligence. Stata16 statistical software for data analysis, we focus on using two methods for analyzing panel data, they are fixed effects regression and random effects regression. Panel data were analyzed using two models, and an empirical study of the relationship between the dependent variables ROE and ROA and the independent variables was conducted. The research data comes from the company's annual reports.

Table 1. Word Frequency Statistics

Key words	frequency
artificial intelligence	381
new energy	296
automation	342

Table 2. Variables

Variables	Abbreviation
Return on Assets	ROA
Return on Equity	ROE
artificial intelligence strategy	AI
Assets and liabilities	DAR
basic earnings per share	EPS
P/E ratio	PE

Table 3. Descriptive Statistics

Variables	Observations	Mean	Std. Dev.	Min.	Max.
ROA	140	3.81	5.15	−20.07	18.70
ROE	140	1.44	3.68	−32.78	48.17
EPS	140	0.59	0.89	−1.7	3.08
ALR	140	64.81	14.64	31.69	95.60
PE	140	3.41	1.22	1.47	9.41
AI	140	3.17	1.83	0	8

The hypotheses to be tested in the study are:

H1: There is relationship between ROA and AI.
H2: There is relationship between ROE and AI.

The control variable selects the asset-liability ratio, basic earnings per share and price-earnings ratio, which have a significant impact on ROE and ROA [5]. To investigate the relationship between ROA, ROE and its explanatory variables, the following models are developed:

$$\mathrm{ROA}_{it} = \beta + \beta_1 \mathrm{AI} + \beta_2 \mathrm{DAR} + \beta_3 \mathrm{EPS} + \beta_4 \mathrm{PE} + \mu_{it}$$
$$\mathrm{ROE}_{it} = \beta + \beta_1 \mathrm{AI} + \beta_2 \mathrm{DAR} + \beta_3 \mathrm{EPS} + \beta_4 \mathrm{PE} + \mu_{it}$$

Table 3 presents the descriptive statistical analysis of the data. From 2013 to 2019, the dependent variables ROA, ROE and explanatory variables EPS, ALR, PE, AI minimum, maximum, average and standard deviation. According to the average ROA and ROE, the income of the 20 enterprises accounts for about 3.81% of the total assets and 1.44% of the total share capital. Both ROA and ROE are positive returns. This means that the data points are distributed within a certain range, from a minimum value of −20.07 to a maximum value of 18.70. There is also an indicator EPS, whose average value is also positive. Table 3 presents a measure of profitability in the sample, showing the volatility of returns over a seven-year period.

4 Analysis and Discussion

This section includes panel data regression results for selected 20 public companies in the auto industry from 2013 to 2019. This study examines the impact of AI on ROE and ROA. In this study, we performed the Hausman test to decide whether to use a fixed-effects model or a random-effects model. The Hausman test is a common test for selecting the optimal model for testing in fixed and stochastic models. In the Hausman test, the null hypothesis states that the difference in coefficients between the fixed-effects model and the random-effects model is systematic [1]. The results of the Hausman test are shown in Table 4.

Table 4. Estimated Results (Dependent Variable - ROA)

	β	Robust Std.Err.	t	P>|t|
AI	0.540	0.169	1.23	0.062
EPS	5.368	0.606	8.86	0.000
ALR	-0.062	0.047	-1.32	0.204
PE	-0.010	0.658	-1.73	0.099
_cons	4.732	2.961	1.60	0.127
sigma_μ	2.663			
sigma_e	2.088			
rho	0.619			
R-squared				
within	0.694			
between	0.642			
overall	0.647			
Hausman fixed random specification test				
Hausman(chi^2) (4)				
Prob>chi^2	27.26			
	0.000			
Modified Wald Test				
Prob>chi^2				
	0.000			
Autocorrelation Test				
Durbin-Watson				
Baltagi-Wu LBI	0.864			
	1.125			

When choosing a model, if the p-value is higher than 0.05, it means that it is not significant, and the null hypothesis is true. After this, we should choose a random-effects model; in contrast, if the p-value is lower than 0.05, it means that the effect is significant. At this time, we choose fixed effects. In the Hausman results, the p-value is less than 0.05, indicating that we should choose a fixed-effects model. However, the problem of heteroscedasticity is easily ignored in the traditional Hausman test results. In order to determine whether the problem of heteroscedasticity exists, we carried out an improved Wald test. The p value of the test results is significant, so there is a problem of heteroscedasticity. In the test of the fixed effect model, it is found that the dw value $= 0.864 < 2$, so it indicates that there are both the problems of autocorrelation, heteroscedasticity and autocorrelation exist at the same time, and the results are found as follows:

We tested the hypothesis results. Here is a significant positive correlation between ROA and AI. Although the p-value is only 0.062, the p-value < 0.10 can be regarded

Table 5. Estimated Results (Dependent Variable - ROE)

	β	Robust Std.Err.	t	P>|t|
AI	6.397	4.783	3.02	0.003
EPS	25.767	5.822	4.43	0.000
ALR	-0.696	0.592	-1.18	0.241
PE	-0.207	0.003	-6.95	0.000
_cons	26.587	39.256	0.68	0.500
sigma_μ	21.708			
sigma_e	33.631			
rho	0.294			
R-squared				
within	0.442			
between	0.727			
overall	0.402			
Hausman fixed random specification test				
Hausman(chi^2) (4)				
Prob>chi^2	16.71			
	0.000			
Modified Wald Test				
Prob>chi^2				
	0.000			
Autocorrelation Test				
Durbin-Watson				
Baltagi-Wu LBI	1.275			
	1.311			

as marginally significant. H1 was confirmed. This shows that the importance of artificial intelligence strategy has a significant positive impact on the ROA of enterprises. However, the hypothesis of H1 is accepted.

Table 5 shows the estimated results of ROE. Similar to the results in Table 4, we also used the Hausman test, and then made a comparison between the fixed-effects model and the random-effects model. We performed the modified Wald test again. According to the results of this Wald test, the problem of heteroscedasticity still exists. In the autocorrelation test, we look at our fixed effects model again, and the obtained dw-value = 1.275, which indicates that there is also an autocorrelation problem. However, the hypothesis of H2 is accepted.

5 Conclusions

In this study, EPS, ALR, PE and AI were used as independent variables, and the dependent variables ROE and ROA were analyzed by panel data analysis. According to the research results, there is a significant positive correlation between ROA and AI, that is,

the importance of artificial intelligence strategy has a significant positive impact on the total return on assets of enterprises. Similarly, ROE and AI have a significant positive correlation. Relationship, that is, the importance of artificial intelligence strategy has a significant positive impact on the company's return on equity. This article uses the automobile industry as an analysis to show that with the rapid development of artificial intelligence and the gradual intelligentization of production factors, in the management of manufacturing enterprises, artificial intelligence strategies should be put on the agenda and more attention should be paid to it. The urgent need for transformation is now an important message. In the process of upgrading and transformation of the manufacturing industry, artificial intelligence has contributed greatly.

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