

The impact of environmental protection standards on the automobile capital market

-- An Event Study Based on "China VI" Emission Standards

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Abstract. The "China VI" emission standards put forward higher requirements for technological innovation and source pollution control in the automotive industry. This paper uses event study methodology and multiple regression model to explore the impact of the promulgation of the "China VI" emission standards on the stock price of the auto industry. The study found that: (1) the promulgation of the "China VI" emission standards with the characteristics of command-and-control environmental regulation has produced a beneficial boost to stock returns; (2) the effect is heterogeneous in the upstream, midstream and downstream industries of automobiles, and the nature of enterprises' property rights. (3) The solvency, development ability, and profitability of an enterprise are the key factors that affect the cumulative abnormal rate of return. Based on this, this paper puts forward policy suggestions such as paying attention to the capital market effect of command-and-control regulation.

Keywords: "China VI" Emission Standards; Event Study; Multiple Regression; Cumulative Abnormal Returns.

1. Introduction

At present, motor vehicle emissions have become one of the main sources of air pollution. Taking Beijing PM_{2.5} as an example, in 2017, the contribution of mobile sources, mainly motor vehicles, to local pollution has risen to 45% [1]. In this regard, China has made great efforts to deal with the problem of motor vehicle emissions. At the end of 2013, the "Ten Air Policy" policy issued by the State Council [2] and the "China V" emission standard implemented in 2009 have significantly alleviated the pollution problem of motor vehicles. On July 1, 2020, China officially implemented a new generation of light-duty vehicle emission standards - the national sixth-stage vehicle pollutant emission standards. Compared with "China V", the CO restrictions of "China VI" A have been tightened by 30%, while the CO, THC and NMHC restrictions of "China VI" B, which will be implemented in 2023, have been reduced by 50%, NO_x restrictions have been reduced by 42%, and PM restrictions have been reduced by 33%. This move has a non-negligible impact on the automobile manufacturing industry. The automobile industry must carry out a wide range of technological innovations to meet the newly introduced "China VI" standard. As a more stringent emission standard, "China VI" aims to effectively implement the Law of the People's Republic of China on the Prevention and Control of Air Pollution, which plays an important role in protecting the environment and promoting the effective transmission of environmental regulations to light vehicle manufacturers. As a result, it is of great significance to study the impact of the introduction of this standard on the comprehensive strength of automobile enterprises.

2. Literature Review

The transmission of environmental regulation to corporate performance is mainly through two factors: cost and productivity. The "Porter Hypothesis" believes that appropriate environmental regulation measures can promote technological innovation of enterprises, thereby increasing the productivity of enterprises and offsetting the costs of enterprises in environmental remediation, that is, the productivity factor is greater than the cost factor. However, this hypothesis is subject to a lot

of controversy at home and abroad [3]. There are three theories in dispute, and the impact of environmental regulation on different enterprises is also heterogeneous. Regarding the "repression argument", Gray et al. [5] studied the paper, oil and steel industries in the United States and found that high abatement costs would significantly reduce productivity and growth rates; Stanwick [6] found that a firm's performance is negatively correlated with its environmental performance; Pedro [7] studied the impact of the "Clean Air Act Amendment" promulgated in the United States on the productivity of coal-fired enterprises in 1990 and found that the environmental regulation method reduced the productivity of enterprises by about 2.5%; Vargas et al. [8] also found that the economic performance of manufacturing industry showed a nonlinear downward trend with the change of environmental regulation intensity. For the "promotion argument", Berman et al. [9] found that the total factor productivity of the oil industry continued to increase under the increasingly stringent environmental regulations in the United States from 1979 to 1992; Lanoie [10] studied about 4,200 EU member states data and supported "Porter Hypothesis"; Yu et al. [11] studied the relationship between environmental regulation, technological innovation and business performance of Chinese industrial enterprises, and found that there is an innovation-induced effect in environmental regulation, and the impact on different industrial business performance is different; Zhang et al. [12] draw the conclusion that there is a stable positive relationship between the intensity of environmental regulation and enterprise productivity by using the questionnaire information of enterprises in 12 cities; Qin [13] found that companies attaching importance to environmental issues are conducive to the realization of the overall performance of the company by analyzing five companies in the metal manufacturing industry. In addition to the above two viewpoints, most of the latest researches hold the "uncertainty argument". Fu et al. [3] found that the impact of environmental regulation on the international competitiveness of China's industry is "U" shaped; Wang [14] believed that the positive and negative relationship between the economic benefits and environmental costs of enterprises in the first period is the result of mutual constraints of various factors, which mainly depend on the response strategies of enterprises to changes in the external environment; Wang [15] also found that the environmental performance of green technology innovation has a "U"-shaped relationship with economic performance.

The effect of environmental regulation has different effects on different industries and enterprises of different nature, so it is extremely important to find out its heterogeneity and distinguish it. In traditional heavy industries (including petroleum and metal manufacturing), Berman [9], Qin [13], and Wang [16] all believe that environmental regulation is conducive to companies' green innovation, thereby promoting corporate performance. In terms of agriculture, Xu [17] studied the performance of 315 new agricultural management entities under environmental regulation and found that both formal and informal environmental regulation influenced their green development behavior; Gong [18] concluded that the impact of mandatory environmental regulation on agricultural performance is negative in the short term and positive in the long term by studying different regions. In high-tech enterprises, Wang [19] found that command-based management negatively affects performance, while incentive-based management and sustainable development of enterprises are in a "U" shape.

Existing literature mainly focuses on institutional analysis, and there is little analysis of the effects of environmental regulation in different industries, and even less research that combines a specific policy and a specific industry. Therefore, this paper adopts event study methodology and uses the data of China's A-share market before and after the promulgation of the "China VI" emission standard to study the changes in corporate performance of China's automobile manufacturing industry under the policy.

3. Methodology and Data

3.1 Event Study

Event study methodology was proposed by Dolly in 1933 and expanded by Fama, Fisher and others [20], and was first applied to the financial field. It is an econometric method to study the degree

and duration of the impact of an economic event on the price of a security or asset, and to test the results. Many scholars have used event study methodology to explore the impact of policy implementation on corporate performance. Among them, the changes in corporate performance under sudden environmental regulations have become one of the research focuses. This paper regards the new "China VI" standard as a policy, and explores the performance changes of automobile companies under this policy.

3.1.1 Basic Assumptions

The three basic assumptions of the event research method: First, the financial market should be efficient, that is, everyone is rational, and the price of stocks or securities can fully reflect all public market information; Second, the events studied are sudden and unpredictable, so that abnormal returns can measure the degree to which stock prices reflect the occurrence of events; Finally, there is no mixing effect of other events during the event window.

3.1.2 Application Steps

Event study methodology has three main steps. First, the selection of the event day, the event window and the estimation window. Since the release date of the "China VI" standard is still about 4 years away from the specific implementation date, automobile companies often make predictions about the future in advance, so that the market would react on the release date of the "China VI" standard. Therefore, referring to the practice of Liu et al. [21], in the research of this paper, the standard release date of December 23, 2016 was selected as the event date, and recorded as T ; Second, due to the long time span between the release of the standard and the implementation of the standard (July 1, 2020), the market's reaction will not be too drastic, and the abnormality of corporate profitability is often not reflected in a short period of time. Therefore, this article selects the 10 trading days before and after the event day as the event window, namely $[T - 10, T + 10]$; Third, according to the method of Boehmer et al. [22], combined with this study, 200 trading days before the time window are selected as the estimation window, namely $[T - 210, T - 11]$.

Second, calculate abnormal returns. The purpose of this step is to predict the company's rate of return in the absence of the economic event, and to make a difference between the actual rate of return and it, so as to measure the change in the rate of return caused by the event, that is, the abnormal rate of return. For the calculation of expected rate of return, most of the studies such as Chen [23] use the market model for estimation. To enhance the robustness and estimation goodness of the model, this paper innovatively adopts Fama-French 5 Factors Asset Pricing Model to estimate the expected return of each stock without the "China VI" standard. The indicators are listed in Table 1.

Table 1. Description of Each Factor in Fama-French 5 Factors Asset Pricing Model

Variable	Meaning	Measure Method
$R_{m,t}$	Market Risk Premium Factor of day t	Difference between daily market return and daily risk-free interest rate.
SMB_t	Market Value Factor of day t	The difference of the daily returns of small-cap and large-cap portfolios.
HMI_t	Book-to-Market Ratio Factor of day t	The difference of the returns of high book-to-market ratio and low book-to-market ratio portfolios.
RMW_t	Profitability Factor of day t	The difference of the returns of high profitability stock portfolios and low profitability stock portfolios.
CMA_t	Investment Pattern Factor of day t	The difference of the returns of conservative stock portfolios and aggressive stock portfolios.

The estimated model is as follows:

$$ER_{k,t} = a_k + b_k R_{m,t} + s_k SMB_t + h_k HMI_t + r_k RMW_t + c_k CMA_t + e_k$$

$$AR_{k,t} = R_{k,t} - ER_{k,t}$$

Among them, $ER_{k,t}$, $R_{k,t}$, $AR_{k,t}$ are the expected rate of return, actual rate of return, and abnormal rate of return of the kth enterprise on day t, respectively, and e_k is the regression residual term of the kth enterprise.

Third, the abnormal return rate of the event window is firstly summed vertically, and the cumulative abnormal return rate is obtained, namely:

$$CAR_{k,t} = \sum_{i=1}^t AR_{k,i}$$

Due to the influence of uncertainty among automakers, their performance and profitability are often determined by their own operating models, and not entirely dependent on policy shocks. In order to reduce this effect, the abnormal rate of return of each enterprise is averaged horizontally to obtain the average abnormal rate of return; then the average abnormal rate of return is summed vertically to get the cumulative average abnormal rate of return, namely:

$$AAR_i = \frac{1}{n} \sum_{k=1}^n AR_{k,i}$$

$$CAAR_t = \sum_{i=1}^t AAR_i$$

Among them, n represents the number of enterprises, AAR_i represents the average abnormal rate of return on the i th day, and $CAAR_t$ represents the cumulative average abnormal rate of return accumulated to the t th day. Finally, assuming that the returns of each company are independent and satisfy a normal distribution, test whether there is a significant difference between $CAAR_t$ and 0. If $CAAR_t$ is significantly < 0 , it means that the establishment of the "China VI" standard has a negative impact on the company's performance; If $CAAR_t$ is significantly > 0 , it means that there is a positive impact on company performance.

3.2 Heterogeneity Analysis

In this paper, the samples are classified according to different standards, and the Skewness-Kurtosis test and the Shapiro-Wilk W test are performed on the overall cumulative abnormal return sample to determine whether the sample has normality. For the case where the overall sample rejects the above two tests, this paper uses a nonparametric test (rank sum test in this paper) to determine whether there is heterogeneity.

3.3 Data Sourcing and Cleaning

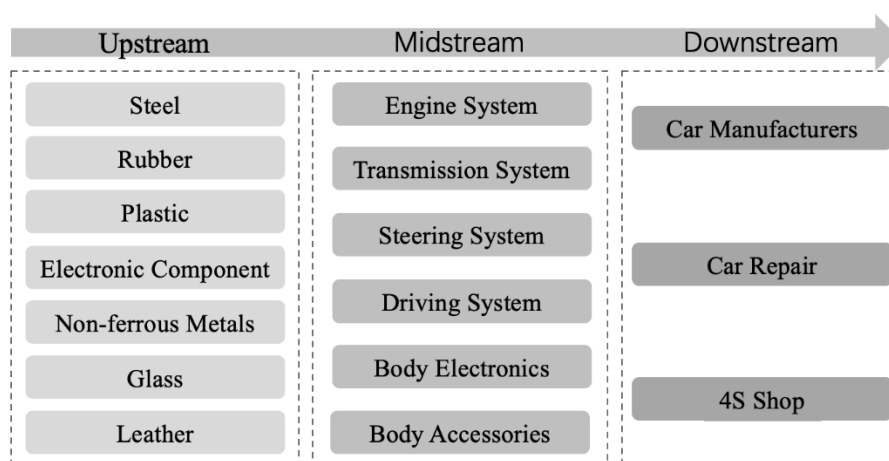


Fig. 1 Automobile Industry Chain

As shown in Figure 1, the automobile industry is generally divided into three parts: upstream, midstream and downstream. The upstream mainly includes lithium ore, nickel ore, steel, glass and other resource industries, the midstream includes battery packs, engine systems, transmission systems, and the auto parts industry, while the downstream is mainly composed of the vehicle industry. Since the business of the upstream industry is not limited to automobiles, it can compensate for the

fluctuations in the business of the automobile industry by increasing or decreasing the business of other industries. Therefore, the research on the impact of the "National VI" standard on the automobile industry will focus on the mid- and downstream enterprises of the automobile, and for the analysis of heterogeneity, the upstream enterprises of the automobile can be added for further explanation.

This article downloads and filters 93 companies listed on A-shares in the automotive mid-stream and downstream industries from the CSMAR database and python's tushare function package. We download all closing price data from January 1, 2016 to December 31, 2017 and calculate the daily rate of return. Fama-French 5 Factors data for the same period is also downloaded.

4. Results and Discussion

4.1 CAAR Test Results

Figure 2 shows the trend chart of the average abnormal return rate and the average cumulative abnormal return rate of 39 auto industry companies in the event window of the release of the "China VI" emission standards. Before the event day, both AAR and CAAR showed irregular fluctuations around 0, which indicated that the stock price return showed a "random walk" trend in the efficient market and without the influence of other policies [24]. Abnormal returns will fluctuate as shown, which is also consistent with the two conditions for using event study methodology. After the event day, the cumulative abnormal rate of return first stabilized and then rose rapidly, which verifies the "Porter Hypothesis", that is, enterprises will speed up their technological innovation after being subject to such mandatory environmental regulations, thereby increasing their profits. At the same time, the market quickly realized this after the country issued the "China VI" standard, so a large amount of funds poured into the automobile industry, which promoted the rise of the stock yield.

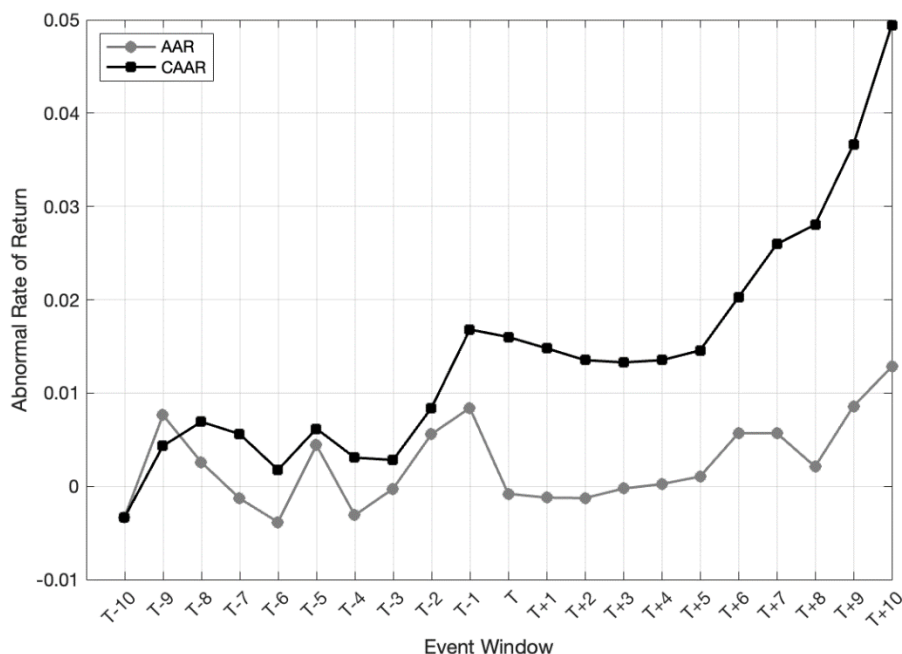


Fig. 2 Changes in AR and CAR in the automotive industry

Since the sample size is sufficient (39 samples), according to the central limit theorem, the daily average cumulative abnormal return can be regarded as obeying a normal distribution. The t-test results of CAAR within the event window are shown in Table 2. Before the event day, the difference between the average cumulative abnormal return and 0 was not significant (except for the 1st day and the 10th day, the P value was greater than 0.1 for each day), which verifies the "random walk" state mentioned above. The CAAR on and after the event day were all significantly greater than 0 at a

significance level of 0.1, proving the correctness of “Porter Hypothesis” in the study of automobile companies.

Table 2. Hypothesis Test Result for CAAR

Time	CAAR	t-statistic	P-value
T-10	-0.003310	-2.0000	0.0263
T-9	0.004328	0.7184	0.2384
T-8	0.006910	1.0674	0.1463
T-7	0.005605	0.7917	0.2167
T-6	0.001760	0.2336	0.4083
T-5	0.006177	0.9912	0.1639
T-4	0.003075	0.4908	0.3132
T-3	0.002816	0.4505	0.3275
T-2	0.008407	1.2038	0.1181
T-1	0.016804	2.1604	0.0186
T	0.016007	2.0170	0.0254
T+1	0.014791	1.7485	0.0442
T+2	0.013527	1.5402	0.0659
T+3	0.013282	1.4783	0.0738
T+4	0.013519	1.5102	0.0696
T+5	0.014560	1.6624	0.0523
T+6	0.020245	1.8687	0.0347
T+7	0.025948	2.2373	0.0156
T+8	0.028053	2.1267	0.0200
T+9	0.036642	2.4942	0.0085
T+10	0.049449	2.9585	0.0026

4.2 Heterogeneity Test Results

The results of the normality test for the overall cumulative abnormal return sample are shown in Table 3. The P-value of both Skewness-Kurtosis test and Shapiro-Wilk W test is less than 0.0001. The null hypothesis is rejected when it assumes that the overall sample is normally distributed, which significantly indicates that the original sample cannot be tested for heterogeneity by traditional methods such as t-test or ANOVA, and a non-parametric test should be used instead.

Table 3. Results of the Normality Test for the Overall Sample

Types of Hypothesis Tests	Test Statistics	P-value
Skewness-Kurtosis test	$\chi^2 > 100$	0.0000
Shapiro-Wilk W test	$z = 9.447$	0.0000

For the nonparametric test, this paper distinguishes the samples according to two criteria: whether they are state-owned enterprises, whether they belong to the upstream industry of automobiles or the middle and downstream industries. We plot the respective cumulative returns, and complete two rank sum tests. As shown in Figure 3, the CAAR of SOEs (State-Owned Enterprises) and non-SOEs are staggered before the event day, but after the event day, the CAAR of SOEs is much higher than that of non-SOEs. In addition, there was no significant difference in the profitability of upstream and mid-downstream companies before the event day, and the two were staggered. However, after the event day, the impact on mid- and downstream companies was significantly greater than that of upstream companies.

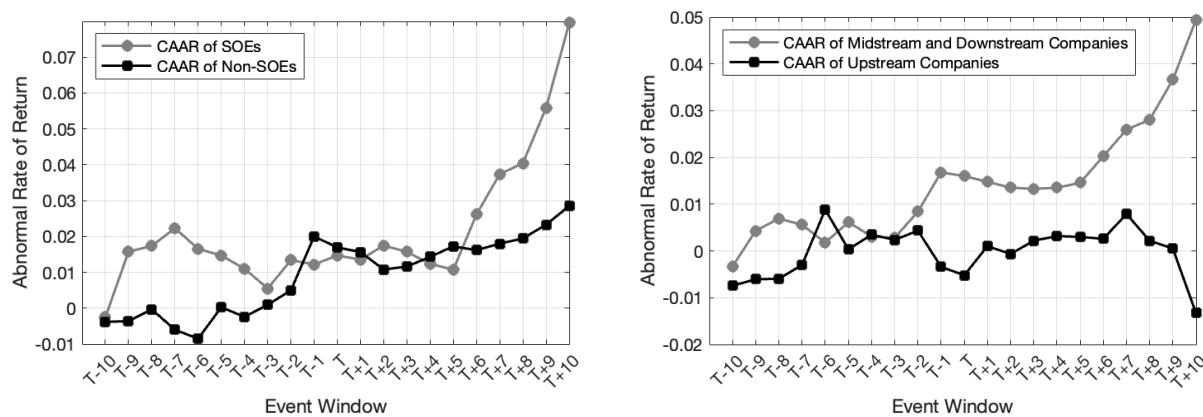


Fig. 3 Comparison Chart of CAAR under Two Standards

The results of the rank sum test are shown in Table 4. The two types of standards also show significant heterogeneity. First, the cumulative abnormal rate of return of state-owned enterprises is significantly higher than that of non-state-owned enterprises. This is because the "China VI" standard is a new emission standard issued by the state. Compared with private enterprises, SOEs are often supported by a lot of reforms, making their yields higher. Second, the cumulative abnormal return rate of upstream enterprises is significantly lower than that of mid- and downstream enterprises, which indicates that the business of the upstream industry is not limited to automobiles, and its policy impact will be less than that of mid- and downstream ones.

Table 4. Heterogeneity test results

Antecedent variables	CAAR	Test Statistic	P-value
SOEs or non-SOEs	$CAAR_{SOE}=0.07954$	$z = 2.164$	0.0304
	$CAAR_{nonSOE}=0.02852$		
Mid- and Downstream or Upstream	$CAAR_{mid\&down}=0.04945$	$z = 4.382$	0.0000
	$CAAR_{up}=-0.01330$		

5. Further Analysis

Regarding the different cumulative abnormal returns among companies and the heterogeneity under different standards calculated above, this paper focuses on the factors that lead to the above cumulative abnormal returns for mid- and downstream enterprises in the automotive industry. Referring to the practices of Yang [25], Feng [26], this paper will establish a multiple regression model after selecting indicators.

5.1 Building a Regression Model

Considering the characteristics of event study methodology and the data of the company's financial indicators are all quarterly frequency, the influence of macroeconomic indicators is not considered in the selection of macroeconomic variables. The explanatory variable is selected as the cumulative abnormal return rate ($CAAR_k$) of each listed company within the time window estimated by event study methodology. For explanatory variables, referring to the research of Fu et al. [27], this paper selects cash ratio, equity multiplier, and net assets per share to measure the solvency; total asset growth rate and net profit growth rate are selected to measure the company's development ability; financial leverage is used to measure the company's risk level; accounts payable turnover ratio, total asset turnover ratio, and shareholders' equity turnover ratio are used to measure operating capability; net profit margin on total assets, EBIT, and operating net profit margin are selected to measure a company's profitability; the proportion of minority shareholders' equity is used to measure the equity concentration; and finally, the comprehensive tax rate is used to measure the company's external environment. Among them, for indicators like EBIT with a large order of magnitude difference, this

paper takes the logarithm with the base 10 to ensure the stability of the data. The specific design and variable symbols are shown in Table 5.

Table 5. Variables in Regression Model

Variables	Name of Variables	Symbols	Meaning of Variables
Explained Variable	Cumulative Abnormal Return	CAR	/
	Cash Ratio	X_1	Solvency
	Equity Multiplier	X_2	Solvency
	Net Assets per Share	X_3	Solvency
	Total Asset Growth Rate	X_4	Development Ability
	Net Profit Growth Rate	X_5	Development Ability
Explanatory Variables	Financial Leverage	X_6	Risk Level
	Accounts Payable Turnover Ratio	X_7	Operating Capability
	Total Asset Turnover Ratio	X_8	Operating Capability
	Shareholders' Equity Turnover Ratio	X_9	Operating Capability
	Net Profit Margin on Total Assets	X_{10}	Profitability
	(log ₁₀) EBIT	X_{11}	Profitability
	Operating Net Profit Margin	X_{12}	Profitability
	Prop of Minority Shareholders' Equity	X_{13}	Equity Concentration
	Comprehensive Tax Rate	X_{14}	External Environmen

According to the selection of the above indicators, the following multiple regression model is established:

$$CAR = k_0 + \sum_{i=1}^{14} k_i X_i + \varepsilon$$

Among them, k_0 is the constant term, k_i is the coefficient of each index, and ε is the residual term. Variables such as net assets per share, growth rate of total assets, and financial leverage are used as basic variables for regression first, and then the form of gradually adding variables is considered and the significance of the regression coefficients is observed, which is conducive to improving the robustness of the model.

5.2 Results of the Regression Model

Table 6 shows the multiple regression results of the above models. Compared with Model 1, Model 2 adds equity multiplier, net profit growth rate, and accounts payable turnover ratio. Compared with Model 2, Model 3 adds cash ratio, shareholders' equity turnover ratio, proportion of minority shareholders' equity, and comprehensive tax rate. Since the coefficients in model 1 have more significant proportions, and R^2 is almost the same as the other two, model 1 is selected.

To demonstrate the excellent explanatory properties of the model, we performed the multicollinearity test and White test for Model 1. After calculation, the average VIF value is 5.65, and the VIF value of each variable is less than 12, so it can be considered that there is no multicollinearity; the P value of White test is 0.4215, which cannot reject the hypothesis of homoscedasticity, and it can also be considered that the overall sample is homoscedastic; R^2 reaches 0.488, so the model is highly explanatory. The above three points of evidence prove the excellent properties of the model.

We select the variables with significant regression coefficients in the three models as the final explanatory variables, and get the conclusion: the size of the cumulative abnormal return rate of an enterprise caused by the "National VI" emission standard will be determined by an enterprise's net assets per share, growth rate of total assets, net profit margin of total assets, EBIT and operating net profit margin.

Specifically, the regression coefficient of net assets per share (that is, the company's solvency) is significantly positive, so a company's solvency will positively affect its abnormal rate of return. This is because after the promulgation of the "China VI" standard, companies with strong solvency will have more liquidity for technology research and development, thereby increasing their productivity.

This was accurately predicted by the market, leading to higher abnormal returns. The regression coefficient of the growth rate of total assets (that is, the development level of the enterprise) is negative, indicating that a faster growth rate of total assets will lead to lower abnormal returns. The reason for this is that when the total assets of enterprises grow rapidly, they cannot replace inventories quickly, which inhibits the motivation of their technological innovation. Net profit margin on total assets, EBIT, and operating net profit margin indicate the profitability of a business. The regression coefficient of net profit margin on total assets is positive, indicating that the higher the profit per unit asset, the higher the abnormal rate of return, which means that the higher profit per unit asset makes the enterprise have a stronger tendency to update products; the coefficients of EBIT and operating net profit margin are negative, because when the profit is larger as a total amount, companies are often satisfied with the status quo and hinder the development of technological innovation.

Table 6. Regression Results under Three Models

Explanatory Variables	Model 1		Model 2		Model 3	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Constant	1.268	0.000	1.371	0.000	1.530	0.000
Net Assets per Share	0.010	0.058	0.011	0.070	0.016	0.011
Total Asset Growth Rate	-0.122	0.078	-0.147	0.068	-0.191	0.023
Financial Leverage	0.031	0.496	0.003	0.959	0.273	0.040
Total Asset Turnover Ratio	-0.124	0.331	-0.140	0.325	-0.446	0.050
Net Profit Margin on Total Assets	3.120	0.034	3.143	0.059	3.826	0.045
(log ₁₀) EBIT	-0.146	0.001	-0.151	0.002	-0.186	0.000
Operating Net Profit Margin	-1.592	0.056	-1.690	0.066	-1.951	0.052
Equity Multiplier			0.002	0.745	-0.111	0.028
Net Profit Growth Rate			0.001	0.775	0.000	0.945
Accounts Payable Turnover Ratio			-0.003	0.792	-0.009	0.401
Cash Ratio					-0.012	0.821
Shareholders' Equity Turnover					0.152	0.022
Prop of Minority Shareholders' Equity					0.121	0.652
Comprehensive Tax Rate					1.837	0.291
R^2	0.488		0.520		0.647	
Adjusted- R^2	0.360		0.320		0.399	
Average VIF	5.65		4.88		31.04	

6. Robustness Test

6.1 Changing the Event Window

In this paper, the event windows $[T - 5, T + 5]$ and $[T - 15, T + 15]$ are added, the cumulative abnormal return is calculated in the same way as above, and the t test is completed. The results show that the cumulative abnormal rate of return results of the two are similar to the original event window. They both show that there was no significant difference from 0 before the event day, and it was significantly greater than 0 and increased continuously after the event day, indicating that the original results were robust when the window changed.

6.2 Changing the Calculation Method of Expected Rate of Return

This paper uses the traditional CAPM model to calculate the expected return and the corresponding cumulative abnormal return, and compares it with the CAAR calculated by Fama-French 5 Factors Asset Pricing Model above, namely:

$$ER_{k,t} = \alpha_k + \beta_k R_{m,t} + \varepsilon_k$$

The results show that the CAARs calculated by the two methods are generally similar in trend, which are also the fluctuations near the 0 value before the event day and the continuous rise after the event day. As shown in Table 7, the t-test results show that the CAAR calculated by CAPM was significantly less than 0 and was not significantly different from 0 before the event day, but remained significantly greater than 0 after the event day. This is the same as that calculated with the Fama-French 5 Factors Model, demonstrating the robustness of the results under different estimation methods.

Table 7. CAAR under Different Estimation Methods

Time	$CAAR_{CAPM}$	$CAAR_{Fama5}$
T-10	-0.011653***	-0.003310**
T-9	-0.017720***	0.004328
T-8	-0.012001**	0.006910
T-7	-0.010518*	0.005605
T-6	0.003383	0.001760
T-5	0.015067**	0.006177
T-4	0.013710**	0.003075
T-3	0.019098***	0.002816
T-2	0.019124***	0.008407
T-1	0.025967***	0.016804**
T	0.024388***	0.016007**
T+1	0.023118***	0.014791**
T+2	0.027394***	0.013527*
T+3	0.028849***	0.013282*
T+4	0.028652***	0.013519*
T+5	0.027659***	0.014560*
T+6	0.030497***	0.020245**
T+7	0.036719***	0.025948**
T+8	0.037368***	0.028053**
T+9	0.043827***	0.036642***
T+10	0.054740***	0.049449***

Note: *** means $P < 0.01$, ** means $P < 0.05$, * means $P < 0.1$

7. Conclusion and Policy Suggestions

Through event study methodology and multiple regression model, this paper explores the changes in the economic performance of automobile companies caused by the release of the "China VI" emission standards and the factors that determine these changes. The research results show that the cumulative abnormal return rate of automobile mid-stream and downstream enterprises shows irregular fluctuations around 0 before the event date, which is in line with the random walk model in the efficient market hypothesis. After the event day, the cumulative abnormal rate of return continued to rise, indicating that the "China VI" standard, as a mandatory means of environmental regulation, can promote technological innovation of enterprises, thereby improving the economic performance of enterprises, that is, the "Strong Porter Hypothesis". Enterprises of different natures also have different performances under this policy. The impact of mid- and downstream automobile enterprises is significantly stronger than that of automobile upstream resource enterprises, and the economic performance improvement of SOEs is also significantly higher than that of non-SOEs. What's more, in the research on the influencing factors of policy effect, this paper finds that the solvency, development ability and profitability of enterprises will have different degrees of influence on it.

Stronger solvency, weaker development capacity, and stronger profitability can all lead to stronger incentives for technological innovation, which in turn lead to greater policy impact.

The research of this paper has certain environmental policy significance. The stock prices of listed companies reflect changes in investor sentiment and investor expectations, so the issuance of policies will have a direct impact on investor sentiment. According to the research in this paper, the command-type environmental regulation policy has already shown an incentive effect in the auto industry, which means that investors have been aware of the corporate innovation incentives brought about by strict environmental regulations. Therefore, in the formulation of environmental policies in the future, the government may not need to consider the issue that the environmental performance and economic performance of enterprises cannot have both. Such mandatory production technical standards may lead to an improvement in the economic performance of enterprises in the capital market, and the government should consider continuing to use such control orders to regulate pollution control and guide the improvement of the economic value of enterprises at the same time. At the same time, for enterprises, they should strengthen their technological innovation and progress, effectively improve the quality of their products, and adapt to policies, so that investor sentiment and their own economic performance can enter a virtuous circle. This is also the guiding direction that should be considered in policy formulation.

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