

The Analysis of the Abnormal Return Rate of Platform Enterprises

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Abstract: It is a definite trend that AI technology has become a new important factor of production. This study will be mainly through the event research method, the use of Shanghai, Shenzhen and Hong Kong listed companies panel data, combined with the relevant platform enterprise financial performance data, establish a mathematical model, study the latest introduction of the new technology of artificial intelligence (LLM, etc.) on the company stock yield, according to different enterprises set up multiple events window, fitting for stock abnormal yield, and use fundamental analysis and other financial means to estimate the future stock yield trend. As is revealed in the mathematical model, the capital market responses positively to the introduction of the artificial intelligence technology. Moreover, the informational announcements have a high degree of impact on regardless of number. The result suggests platform enterprises. The results encourage enterprises to introduce artificial intelligence technology and government to set up regulations accelerating development and productive practice. It has clarified the impact of the application of cutting-edge hot technologies such as new artificial intelligence technologies and large models that attract global attention on abnormal stock returns, which provides a reference basis for the national government to introduce relevant policies to encourage, support and guide the digital transformation of China's listed enterprises and promote the healthy development of artificial intelligence.

Keywords: Artificial intelligence, Event research method, Stock abnormal yield.

1. Introduction

Enterprises' introduction of new artificial intelligence technologies to achieve digital transformation has become an inevitable path to promote economic development, enhance international economic competitiveness, and achieve high-quality development of microeconomic entities. The introduction of new technologies provides new development impetus for companies in all walks of life. But will this bring better capital market performance for listed companies, especially platform enterprises with extensive influence? Moreover, platform enterprises are "an organizational form that can construct flexible combinations of resources, routines, and structures in new business opportunities and challenges". The research makes up for the macro perspective of previous event studies and measures the impact of the introduction of ai technology on platform-oriented enterprises on a micro level [1, 2].

1.1. Research background

Artificial intelligence technology is booming, especially the LLM large model is on the rise, the Chinese government attaches great importance to the development of artificial intelligence technology and is accelerating the deep integration of artificial intelligence and the real economy [3]. In recent years, platform companies have introduced a large number of new digital technologies, and this may have some difficulty to assess the impact on corporate capital market performance.

1.2. Literature Review

At present, the academic circle pays close attention to the economic effect of digital transformation. Some research focused on the production market performance, revealing the positive impact on enterprises' total factor productivity [4]. When it comes to some research focused on capital markets, it is proved that digital transformation effects investors' concentration, sentiment and enterprises' innovation, thus promoting the rate of stock returns [5], improving stock liquidity and exhibiting certain structural heterogeneity characteristics [6].

When it comes to more specific technology like big data and artificial intelligence, the probability of applying big data in China varies. Large scale, low proportion of tangible assets, strong profitability, and location in the market. Companies with higher levels of digitalization are more likely to apply big data. And big data applications can significantly increase the market value of companies [7]. Moreover, some research perspectives of relevant literature are mainly focused on the macro level such as the country and industry, including the impact of artificial intelligence technology on social and economic growth, industrial structure transformation, labor employment and income distribution.

However, most of the research conclusions are derived from the mathematical model at the macro level, and there is still an obvious gap in the research on the economic consequences of AI technology innovation at the micro level. In the existing about the introduction of new technology, digital transformation of the capital market performance research mainly focused on stock liquidity, synchronicity and share price crash risk direction, there is no literature exact platform enterprise artificial intelligence technology introduction, especially the big model technology introduction and abnormal returns of listed companies. Therefore, the related studies are relatively new.

2. Methodology

2.1. Study sample screening, event window period. The estimation period is determined

Refer to the platform definition and characteristics proposed by Zhu in 2016 [8], this paper have formulated four principles for the screening of this announcement:

(1) this research involved a comprehensive search for all listed company's annual report and half report in the CSRC designated the information disclosure of listed companies media a "tide of information online", and according to the criteria of the following screening samples as the definition platform type enterprise: if the enterprise in the annual report, half report mentioned "the company is mainly engaged in business", "core competitiveness analysis", "operating situation discussion analysis" several chapters clearly put forward "the company is an industry platform enterprise", then determine the company as the platform type enterprise.

(2) if the enterprise business covers more than two industry, the company annual report, half annual report of one or a few industry business conditions mentioned in the introduction of "the main mode of operation is to establish / operating platform" or "company is the platform in the field of business enterprise", and this or this business in the past year the operating income accounted for more than 70% of the total revenue, or explicitly this or this business is the core business of the enterprise, determine the company as the platform type enterprise.

(3) for retail, hypermarkets, commercial real estate, leasing intermediary itself has the nature of platform of traditional industry, only the annual report, half report shows that the company has formed or initially formed a complete online management system, pay attention to the operation mode of the "Internet +", to pay attention to online operations, can determine the company as a platform enterprise.

(4) in the electric business enterprise, only the enterprise has proprietary online platform, not only relying on ali, jingdong, WeChat third party platform for their own online marketing, and has a large number of suppliers, not limited to a single or a few suppliers, which really open in the face of society, rather than only open a link of their supply chain, such electricity enterprise can be defined as a platform enterprise.

In accordance with the above screening rules, there are more than 200 platform enterprises can be identified. follow, this study thoroughly investigate the technology introduction announcements of the select enterprises since (LLM large model technology, etc.), Further select Meituan, Alibaba, Tencent, Baidu and other influential platform enterprises for research, And respectively selected after the corresponding technical announcement and input as the event date, Select the event of 15 trading days before and after the event, Event window period, $T = (-15, 15)$, Select 21 trading days before the event to 121 trading days before the event as the estimated window period, To conduct an empirical study on the impact of technological innovation reports on the value of the company.

2.2. Model establishment and event day selection

According to Mahmood's research in 2010, the stock markets in Shanghai and Shenzhen have entered the effective period of weak levels, so this paper chooses the market model for analysis [9]. This topic selects a general market model to calculate abnormal stock returns under the event occurrence window. It reflects the linear function between the rate of return of the sample stocks in the event window and the market rate of return. The expression of this single exponential model is as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} R_{it} \quad (1)$$

In the model, the return of the stock i on day t is taken as the dependent variable. R_{mt} represents the yield of the market securities portfolio, used as an independent variable. The α_i is the intercept of the stock i , and the β_i is the slope, the error term of the stock on day t . The $\beta_i R_{mt}$ shows the part of the change in stock yields that can be explained by market volatility, while it shows the part of special corporate events that cannot be explained by market volatility.

This paper converts the calendar time of each sample event into event time according to certain rules: setting the day of the announcement, the trading day as the first day, the trading day after the event as the first day, and so on. If the day when the platform enterprise releases the announcement of the introduction of AI technology is not the normal trading day of the stock market (weekends, legal holidays, etc.), the normal trading day after the event will be set as the 0 day.

If a platform enterprise issues an announcement of the introduction of artificial intelligence technology on the normal trading day of the stock market and the announcement is later than the closing time of the stock market (this study is 15:00 of each stock trading day, this section set the trading day after the actual release date of the announcement as the 0 day.

Because this paper's study is a platform enterprise CSR announcement short-term market reaction rather than long-term market reaction (long-term market reaction affected by various factors comprehensive and difficult to accurately assess, so this topic is not considered), after the stock market after announcement made the corresponding processing, the day after the release as the event day, so in order to better research platform enterprise artificial intelligence technology introduced the announcement of the stock market short-term response to the event, the topic also choose event day on the same day as the window period of research market reaction.

Thus, the event study of 214 announcements on the introduction of new technologies such as artificial intelligence from 176 platform-type enterprises was conducted

2.3. Calculation of abnormal stock returns

In order to facilitate the analysis of the abnormal yield rate of the samples, in this paper, the 200 trading days before the announcement is selected as an estimation period to calculate the variance of i , i and ε_{it} . In order to increase the accurate and effective results of the estimation, the estimation period and event date need to be separated by two weeks, that is, the estimation period starts on day-220 and ends on day-11. In addition, this paper eliminated the samples with less than 40 valid stock data in the estimated period of 200 trading days to ensure the reliability of parameter estimation. This section used the least squares method to produce the estimates β_i , i , and \hat{S}_ε^2 . The expression for the abnormal yield of the stock i on day t is:

$$A_{it} = R_{it} - (\alpha_i + \beta^i R_{mt}) \quad (2)$$

The average abnormal yield of the samples on day t is:

$$\bar{A}_t = \sum_{i=1}^N \frac{A_{it}}{N} \quad (3)$$

The result of the sum of the average anomaly returns over several days is the cumulative anomaly yield of the sample:

$$\overline{CAR}[t_1, t_2] = \sum_{t=t_1}^{t_2} \bar{A}_t \quad (4)$$

2.4. Model significance test

This study selected 214 technical introduction announcements from 176 Chinese platform listed companies in China from 2020 to 2024 as research samples for the event study. Assuming that the anomalous yields of the samples are independent of each other and have mean 0 and variance S . According to the central limit theorem, the result of the significance test of the average abnormal yield for a certain day is :

$$T\bar{A} = \sum_{i=1}^N \frac{\frac{A_{it}}{\hat{S}_\varepsilon^2}}{\sqrt{N}} \sim N(0,1) \quad (5)$$

The significance test expression for the cumulative abnormal gain in the window period is as follows:

$$T\bar{A} = \sum_{i=1}^N \frac{A_{it}}{\hat{S}_\varepsilon^2} \sim N(0,1) \quad (6)$$

3. Empirical Results

3.1. Base Line

Under the general assumption of the abnormal returns of the stock market, the four supposed adjustment variables H1-H4 in this paper are H1: type of platform enterprise (trading platform or information platform), H2: degree of information disclosure of technology announcement, H3: technology introduction for ToB / ToC, H4: technology introduction into the operation state of enterprises. They are now hypothesis-tested separately.

To test the overall hypothesis, an examination of the average anomalous gain was conducted. Since the anomalous returns under the null hypothesis, and according to the central limit theorem, to test the effect of anomalous gain values, this section refer to Xia'research in 2016 [10], two non-parametric tests were applied to exclude the influence of outliers on the test results. On the one hand, the Wilkerson signed rank test was selected to test whether the median value of abnormal gains is significantly non-zero. On the other hand, the binomial sign test was employed to assess whether the

probability of abnormal returns is significantly higher than 50%. For the technology introduction announcement of platform enterprises, it is speculated that it can produce a positive market response, prompting the selection of a one-sided T-test to evaluate the abnormal returns in this research.

For regulatory effects, to test H 1 to H 4, this paper tested by cross-sectional regression model. The dependent variable in the model is the cumulative abnormal rate of return on the day of announcement (Day0), and the independent variables are the four variables and control variables related to hypothesis H1~H4. Among these, the four variables corresponding to those from H 1 to H 4 are shown below.

Types of platform enterprise (X1):

This is an indicator variable. If the trading platform enterprise, the value is 0, if the information platform enterprise, the value is 1, so as to control the potential impact of the platform enterprise type on abnormal earnings.

Information disclosure degree of technical announcements of platform enterprises (X2):

This is an indicator variable. Past studies have shown that the level of detail of information disclosure has an impact on stock returns [11].

The company's sustainable operations disclosure is measured by using whether the company issues regular technology introduction announcements. This variable is used to control the impact of different company disclosure conditions. If the company has regularly issued regular technology introduction announcements for the past three years, to assign a value of 1, otherwise 0.

Application type of technology introduction described in the announcement (X3):

This is an indicator variable. If the calculated value is 1, it means that the technology introduces a platform enterprise suitable for ToB, and 0 means that it is suitable for ToC. It is expected that the coefficient of this variable to be positive.

Announcement of the enterprise operation status introduced by the technology (X4):

The return on assets in the accounting quarter before the event shows the company's operating performance before the announcement of technology introduction. If ROA is 0, the coefficient is 0. The computational analysis was performed using the following cross sectional regression.

The computational analysis is performed with the use of the following cross-sectional regression model:

$$CAR_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_i \quad (7)$$

This section used the market model to get the CAR of LLM and others after the release of other AI technical announcements and conducted statistical tests to verify the overall hypothesis.

The abnormal revenue results of the technology introduction announcements on event days are shown below.

Table 1: Statistical Data of Abnormal Returns on Day 0

Indicator	Value
Mean	0.010693427450980392
Median	0.0022821
Positive Rate	0.5555555555555556
t-Statistic	3.478846315006499
Wilcoxon Signed-Rank Test	2.56

As shown in Table 1, the t-statistic at day 0 was 3.4788, which indicates that the abnormal gain for that day was statistically significant and significantly different from zero. This could mean that the introduction of new AI technologies has a significant impact on stock prices. At day 0, more than

half the time abnormal gains was positive. This suggests that the market in Shanghai and Shenzhen had a significant positive reaction on the day of the event.

Later, some independent variables and control variables are added to test whether the several factors mentioned in the hypothesis H1-H4 will affect the market response of the announcement of technology introduction by platform enterprises. First, the study by Jacobs and Singhal in 2014 is referenced to employ cross-sectional regression models for testing the impact of the variables mentioned in H1 to H4 on the response of stock markets in Shanghai and Shenzhen of technology introduction events [12]. The dependent variable is the average abnormal return of the sample on the day of the announcement, and the independent variable includes the variable one-to-one corresponding to the hypothesis and the control variable.

Table 2: Coefficient estimate

	variable	Symbol expectation	Parameter estimate	saliency
Type of Platform Enterprise Technology Announcement	X1	+	0.556	0.011989
Information Disclosure Degree	X2	+	0.428	0.122110
Introduction of technology	X3	+	-0.887	0.000795
Analysis of Operation Status of Enterprises Introducing Technology	X4	+	0.611	0.059789

According to Table 2, the type coefficient of platform enterprises is positive, which indicates that the technology introduction announcements issued by different types of platform enterprises will significantly adjust the market response, and the market responds more positively to the events issued by information platform enterprises. So the H1 was established.

The coefficient of the degree of information disclosure is positive, which indicates that the degree of sustainable operation information disclosure of the company will significantly adjust the market response, and the market is more actively to the technology introduction announcement issued by companies with high degree of information disclosure, so H2 was established.

The coefficient of the technology introduction is negative, which indicates that the different introduction of technology will significantly adjust the market response, and the market is more positively to the application of T o C-end AI technology. Therefore, H3 is rejected, but its coefficient has a certain degree of significance, which shows that the coefficient of the technology introduction purpose of the announcement is opposite to the expectations.

The announcement of the introduction of enterprises, and at the level of 10% significant, which shows that the announcement for good operation of enterprises will significantly adjust the market response. Show that the H4 assumption holds.

Through the above calculation, the research has preliminarily drawn the conclusion of the overall hypothesis of the model and the four hypotheses of H1, H2, H3 and H4, which provide the basis for further research.

3.2. Robustness test

In addition, to determine that the market model chosen in this paper is not limited, an alternative model is employed for validation (see Table 3). The common models adjust the market models to conduct sensitivity analysis. The comparison of the computational results of the two methods can exclude the influence of the computational method and test the robustness of the results.

Table 3: Robustness test

Indicator	Value
Mean	0.008655648554566
Median	0.0032449
Positive Rate	0.6123657854548
t-Statistic	4.238473846295
Wilcoxon Signed-Rank Test	4.29

4. Conclusion

The research examines the reaction of China's capital markets to the announcement of the introduction of new AI technologies for platform-based enterprises. This paper selected 214 technology introduction announcements from 176 Chinese platform-based listed companies from 2020 to 2024. Combined with the market efficiency hypothesis, this paper revealed that on the day of the introduction of new ai technologies, the market would produce a significant positive response, with an average abnormal return of 0.011 and a positive rate of 56%. The research results are relatively significant. In addition, this paper also found that the market responds more positively to announcements made by companies that are informational, have a high degree of information disclosure, use of AI technology at the ToC end, and are in good operating condition.

Finally, there are some limitations to our study. First, our sample is limited to China's Shenzhen and Shanghai stock markets and lacks data on Chinese platform companies listed in Hong Kong and the United States. Our announcement samples are mainly from the information of the Shanghai Stock Exchange and the Shenzhen Stock Exchange, and the number of announcement samples is insufficient.

In addition, some studies suggest that the market may overreact to the release of technical announcements, and stakeholders may produce large feedback in a short period of time, which will directly affect the market value of enterprises. In addition, this study is to conduct market research on platform enterprises introduced by new artificial intelligence technologies in the past five years. For example, a more detailed division of time nodes and exploration of the influence mechanism may be another good research direction.

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