# The study of gambling effect before earnings announcements: Evidence from the stock market

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# The study of gambling effect before earnings announcements: Evidence from the stock market

**Abstract:** Previous studies have found a gaming effect in the stock market, that is, the degree of stock gaming is negatively correlated with expected return. However, the gaming effect may change at different time. This paper examines investors' speculative behavior on gaming stock from the perspective of earnings announcement by analyzing China's listed firms from 2000-2023. This paper finds that due to the mechanism of investors' gaming speculative behavior, stocks with a high degree of gaming are subject to higher demand and prices, which in turn lead to higher pre-earnings announcement return, means that the degree of stock gaming has a significant positive impact on pre-earnings announcement return. Meanwhile, this phenomenon is more pronounced in groups with higher investor attention.

**Keywords:** Gaming stocks; Gaming speculative preference; Stock return; Earnings announcement

**JFE classification:** G12; G14

## 1. Introduction

Previous studies have found that there is a demand for gaming not only in gambling, but also in stock investment, and the stock gaming effect has been found in the U.S., European (Annaert et al.,2013). Compared to these countries, the gaming psychology of Chinese residents is more deeply rooted (Bali et al.,2014). In recent years, Chinese regulatory authorities have been reforming and improving in guiding investors to invest in long-term and value investments, but the reality is still not optimistic, and the speculative and gambling atmosphere of the Chinese stock market are still very serious.

However, there are variability in investors' investment demand for gaming stocks in different time. Some studies have found that the performance of the stock gaming effect is more significant in January (Doran et al., 2012), bull markets (Liao et al., 2019), or when investor sentiment is high (Chen et al., 2019).

Similarly, earnings announcement, as an important event point to publicize information related to the operating conditions, profitability, and development prospects of listed companies, play an important role in alleviating the information asymmetry between investors and listed companies (Johnson, 2018). So does the stock gaming effect differently at the event point of an earnings announcement? This is the main question examined in this paper. Specifically, in the pre-earning announcement period, due to the attributes of gaming stocks with a relatively large short-term price rise, the uncertainty of the fundamental information of the earnings announcement, and the smaller short-term holding risk, does this induce a gaming speculation mentality among investors, boosting the demand for gaming stocks and causing their pre-earnings announcement return to rise (i.e., the degree of stock gaming has a significant positive impact on pre-earnings announcement return)? Does investors' betting speculation play an intrinsic mechanism role?

In addition, based on the theory of limited investor attention, there exists limited investor attention to stocks, while analyst research and media reports play the role of information production. Then, there exists a greater degree of stock gaming speculation by investors in firms where analyst research or media reports exist prior to earnings announcement and where investors' short-term attention is higher? That is, is there a stronger positive correlation between the degree of stock gaming and pre-earnings announcement return? This is the second question examined in this paper.

This paper's primary contributions and innovations are as follows. Firstly, previous studies have found the stock gaming effect, but there is no in-depth discussion on the changes in the investor's demand for gaming on stocks and the performance of stocks' returns at different time points. From the perspective of the earnings announcement, we discuss the changes in the relationship between the degree of stock gaming and the return before earnings announcement, and the difference in performance before and after the earnings announcement is distinguished. Secondly, this paper explores the intrinsic mechanism of the positive correlation between the degree of stock gaming and the return before the earnings announcement from the perspective of the investor's gaming speculation preference, and further validates the theory of limited investor attention.

## 2. Literature review and research hypotheses

### 2.1 Literature review

The demand for gaming originated in the gambling sector (Thaler and Ziemba, 1988). There are some gaming-oriented stocks in the stock market. These stocks may experience substantial short-term increases in price, and therefore investors have preference for such stocks. However, this preference often leads to the overvaluation of gaming stocks, which in turn leads to the future underperformance (Bali et al., 2014). Kumar (2009) used demographic data to demonstrate that investors who buy lottery tickets are more likely to invest in gaming stocks. Annaert et al. (2013) found that the phenomenon of demand for gaming stocks investments is in the U.S. and European markets. Barberis et al. (2014) also demonstrated the existence of gaming effect in the China.

However, on the one hand, investors' investment demand for gaming stocks changes accordingly at different points in time, and there is variability in stock returns. Doran et al. (2012) found that the gaming stock effect performs better in January. Liao et al. (2019) found that the betting effect is more significant in the Chinese stock market during a bull market. In addition, when the market is in high investor sentiment, the negative correlation between the degree of stock gaming and expected return is more significant (Chen, et al.,2019).

On the other hand, the earnings announcement as an important event point for announcing the fundamental information and development prospects of listed companies, most of the anomalies tend to be change during the earnings announcement period. La et al. (1997) found that value

strategies perform better during the earnings announcement. Berkman and Mckenzie (2009) found that firms with large analysts' opinion divergence in the earnings announcement period earn significantly lower returns than firms with small differences in opinion. Similarly, Engelberg et al. (2018) use a large number of stock return anomalies to find that returns in earnings announcement periods are six times higher than in non-earnings announcement periods.

**2.2 Research state analysis**

However, there are two shortcomings in the existing literature. First, as the earnings announcement is an important event for releasing the fundamental information and development prospect of listed companies, there is a lack of research related to the difference in the gaming effect between the earning and the non-earnings announcement period. Second, although there is part of the literature that explores the difference in some anomalies during the earnings announcement period, it does not make a careful distinction between before and after the earnings announcement. There is an obvious difference in the corporate information received by investors before and after the earnings announcement, which may change their investment demand for gaming stocks.

**2.3 Research hypotheses**

Investors have an innate betting speculation about stocks that has been studied in several literatures. Justin and Trevor (2022) find that sentiment affects stock prices in the presence of fundamental uncertainty. Yin and Wei (2021) study that high volatility in the stock market exacerbates investor speculation, mainly in the form of a significant increase in speculative anomalies, and when there is overconfidence among investors, it similarly exacerbates speculation in the market (Shi et al.,2018). Compared to the Europe and United States, the gaming psychology of Chinese residents is more deeply rooted. The rich and the poor in Chinese society, the lack of constraints on religious beliefs, and the social custom of holiday gambling further strengthen people's preference for gaming.

Earnings announcement as an important event to release the fundamental information and development prospects of listed companies, investors have a strong demand for speculation: firstly, gaming stocks have the nature of experiencing price growth in the short term, which is in line with the psychological characteristics of some investors' "small for big", who are willing to take small losses in exchange for a possible sharp rise(Bali et al.,2017); secondly, before the announcement of

the earnings, there is a strong uncertainty about the business operation, earnings and other fundamental information, which makes it highly speculative(Chen et al.,2019); finally, the short-term position bought before the earnings announcement makes the holding cost and inventory risk of the investor relatively small, and can be sold at any time. Therefore, the above characteristics are consistent with investors' gaming speculation preferences, and their speculative and short-term demand for gaming stocks increases, which in turn increases the price of gaming stocks and generates higher pre-earnings announcement return, based on the above, this paper propose:

*H1: The degree of stock gaming shows a positive correlation with the before earnings announcement return.*

The assumption of investor cognition is that due to incomplete information in the market, it is impossible for investors to know all the stocks, and they will shift their attention to a few stocks (Aboody et al., 2010). Analysts and media as the main body of information production and transmission in the financial market play an important role in shifting investors' attention. Analysts update their research reports on a regular basis, providing professional interpretations of the listed companies, including the company's fundamentals and growth prospects. These research reports deliver effective information to the market and enhance the market efficiency. Besides, research reports increases investors' interest about firms (Ali and Hirshleifer, 2020). Similarly, the media not only provides incremental information about the listed company, but also enhances investors' attention accordingly (Ahern and Sosyura,2015). The presence of analysts' research reports on listed companies or news media releases prior to earnings announcement can enhance investors' attention to gaming stocks, resulting in stronger short-term speculative demand and higher pre-earning announcement return. Based on the above, this paper propose:

*H2: For the group with higher investor attention, the degree of stock gaming shows a more positive correlation with the before earnings announcement return.*

## 3. Data sources and definition of variables

### 3.1 Sample selection and data sources

This paper selects listed companies in China between January 2000[1] to June 2023 as the

[1] Choosing 2000 as the starting year is mainly due to two reasons: (1) China's accounting rules have only begun to be standardized since 1999; (2) it can ensure a sufficient sample size to avoid the statistical error due to the number of stocks being too small.

research samples. The samples exclude stocks with less than 15 days of trading per month and related missing values of the sample are eliminated. In addition, we winsorize the continuous variables by 1% and yield a total sample size of 474,250 for an unbalanced panel at the firm-year level, of which the non-earnings announcement is 356,746, and earnings announcement is 117,504. Except for the news media reports on listed companies and the data on company location gaming preferences from the CNRDS database, all the rest of the data come from the CSMAR database.

**3.2 Definition and description of main variables**

**1 Explanatory variables:** the degree of stock gaming (Score), according to Bali et al. (2011), Chen et al. (2019), three measures are selected:

(1) Maximum daily return (MaxRet), which is equal to the maximum value of the previous month's daily return. The greater the maximum daily return, the higher the degree of gambling.

(2) Idiosyncratic skew (IdioSkew), measured as follows:

$$\mathrm{IdioSkew}_{i,t} = \frac{1}{n}\sum_{t=1}^{n} \varepsilon_{i,d}^{3} / \left(\frac{1}{n}\sum_{t=1}^{n} \varepsilon_{i,d}^{2}\right)^{3/2} \quad (1)$$

In model (1), $\mathrm{IdioSkew}_{i,t}$ is the idiosyncratic skewness of stock i in month t, and $\varepsilon_{i,t}$ is the residual obtained from the regression of the Fama and French (1993) three-factor model:

$$r_{i,d} = \alpha_i + \beta_{MKT,i}\mathrm{MKT}_d + \beta_{SMB,i}\mathrm{SMB}_d + \beta_{HML,i}\mathrm{HML}_d + \varepsilon_{i,d} \quad (2)$$

In model (1), $\mathrm{MKT}_d$, $\mathrm{SMB}_d$ and $\mathrm{HML}_d$ are the market factor, size factor and value factor for day d, respectively. The greater the idiosyncratic skew, the higher the degree of gambling.

(3) Idiosyncratic volatility (IdioVol), measured as follows:

$$\mathrm{IdioVol}_i = \mathrm{std}(\varepsilon_{i,d}) * \sqrt{n_t} \quad (3)$$

In model (3), $\varepsilon_{i,d}$ is also the residual obtained from the regression of the three-factor model (same as above), and std is the standard deviation, and $n_t$ is the total number of trading days in month t. The greater the idiosyncratic volatility, the higher the degree of gambling.

For preventing the single measure bias, we construct a composite indicator (Score) based on the above three indicators to measure the degree of gaming stock, and the method is as follows:

$$z = (r - \mu_r) / \delta_r \quad (4)$$

In model (4), r is the values of each indicator, $\mu_r$ and $\delta_r$ are the cross sectional mean and standard deviation, and finally the z value of the above three indicators are averaged to obtain a composite score index.

**2 Explained variable:** the cumulative return (Return), during the earnings announcement window period[2] , which is categorized into the cumulative return before and after the earnings announcement (Before and After). We use [-5,5] window period, in which [-5, -1] and [0, 5] are the before and after earnings announcement window period[3] respectively.

**3 Control variables:** this paper selects factors (Fama and French, 1993; Amihud, 2002; Diether, 2002; Fama and French, 2015; Hou et al., 2015) that have been widely interpreted by prior studies to affect the expected stock return. The specific variable definitions are shown in Table 1.

Table 1 Definition and metrics of the control variables

| Variables | Definition |
|---|---|
| Beta | For market exposures, 36-month rolling regression coefficients of individual stock returns on index returns. |
| Size | Firm size, which is equal to the natural logarithm of the firm's total market capitalization. |
| Bm | Book-to-market ratio, which is equal to the ratio of book value to market value. |
| Rev | reversal effect, the Rev of an individual stock in month t is the stock's return in month t-1. |
| Mom | Momentum effect, Mom for month t of an individual stock is the cumulative return of the stock from month t-12 to t-2. |
| Invest | Asset growth rate, which is equal to the ratio of (closing value of total assets-opening value of total assets) to the opening value of total assets. |
| Roe | Return on net assets, which is equal to the ratio of a company's ending earnings to its net assets. |
| Illiq | illiquid type, equal to the illiquidity indicator proposed by Amihud (2002). |
| Lev | Financial leverage, which is equal to the ratio of total liabilities at the end of the period to total assets at the end of the period. |
| Analyst | Analyst disagreement, takes the standard deviation of all analysts' EPS forecasts for the listed company during the year and divides it by the absolute value of the mean. |

### 3.3 Model setup

For the test of hypothesis H1, two methods are used[4]:

First, portfolio analysis method, according to the degree of stock gaming from large to small each month is divided into five groups, and find out the market capitalization-weighted rate of return of each portfolio, and then find out the mean value and the corresponding t-statistic for the time series of the portfolio return, and test whether it presents a certain degree of regularity variability.

[2] The sample excludes stocks with major event trading halts, resumptions, and announcements other than earnings announcements during the earnings announcement window.
[3] The asymmetric window period is chosen primarily because, day 0 is the day of the earning announcement, for market trading after investors react to the earning announcement.
[4] Both methods are more mainstream in empirical asset pricing.

Second, the fixed effects regression, the model is as follows:

$$Return_{i,t+1} = \alpha + \beta_1 Score_{i,t} + \sum_{i=2}^{11} \beta_i Control_{i,t} + Time_t + Firm_i + \varepsilon_{i,t} \quad (5)$$

In model (5), $Return_{i,t+1}$ is the five-factor adjusted return of stock i in period t+1[5], denoting the cumulative return before and after the earnings announcement (Before and After), respectively. $Score_{i,t}$ is the degree of gaming of stock i in period t, and $Control_{i,t}$ are control factors that may affect the stock expected return. $Time_t$ and $Firm_i$ are the time and individual effect, $\alpha$ is the intercept term, $\varepsilon_{i,t}$ is the residual term. Since hypothesis H1 assumes that the degree of stock gaming shows a positive relationship with the pre-earnings announcement cumulative return, it is expected that the coefficient $\beta_1$ is positive.

## 4. Empirical test and analysis of results

### 4.1 Descriptive statistics

Table 2 Descriptive Statistics

| Variables | N | Mean | Median | Std | Min | P25 | P75 | Max |
|---|---|---|---|---|---|---|---|---|
| Score | 117,504 | -0.006 | -0.101 | 0.639 | -1.412 | -0.464 | 0.375 | 2.175 |
| Before | 117,504 | 0.004 | -0.002 | 0.079 | -0.467 | -0.044 | 0.041 | 0.547 |
| After | 117,504 | -0.002 | -0.002 | 0.068 | -0.407 | -0.037 | 0.034 | 0.466 |
| Beta | 117,504 | 1.042 | 1.040 | 0.664 | -3.730 | 0.700 | 1.380 | 4.980 |
| Size | 117,504 | 14.967 | 14.957 | 1.192 | 11.189 | 14.206 | 15.684 | 19.092 |
| Bm | 117,504 | 0.633 | 0.639 | 0.244 | 0.051 | 0.448 | 0.824 | 1.281 |
| Rev | 117,504 | 0.018 | 0.014 | 0.137 | -0.482 | -0.059 | 0.089 | 1.461 |
| Mom | 117,504 | 0.141 | -0.016 | 0.616 | -0.801 | -0.234 | 0.324 | 7.661 |
| Invest | 117,504 | 0.030 | 0.015 | 0.099 | -0.545 | -0.011 | 0.052 | 1.517 |
| Roe | 117,504 | 0.053 | 0.066 | 0.167 | -2.281 | 0.022 | 0.118 | 0.747 |
| Illiq | 117,504 | 0.112 | 0.037 | 0.283 | 0.001 | 0.016 | 0.088 | 6.724 |
| Lev | 117,504 | 0.456 | 0.458 | 0.208 | 0.026 | 0.196 | 0.613 | 1.015 |
| Analyst | 117,504 | 0.264 | 0.204 | 0.301 | -2.024 | 0.000 | 0.407 | 2.871 |

Table 2 reports the descriptive statistics of the main variables in the month of earning announcement. For the explanatory variable gaming composite index (Score), the minimum and maximum value are -1.412 and 2.175 relatively, indicates that some listed companies are relatively more gaming. For the explained variable cumulative returns before earnings announcement (Before), the mean value is 0.004, while the mean value of the cumulative returns after earnings announcement (After) is -0.002, which may be due to the fact that before the earning announcement, the overall return is relatively high due to the rise in investor preference and demand for gaming

[5] The gaming stock proxy variable is lagged by two periods. if the surplus announcement is published in the first five days of each month, mainly to address the aspect of front-loading bias, and by one period if the surplus announcement is published on the other days of the month.

stocks. Among the control variables, the mean value of book-to-market ratio (Bm) is 0.633, and the mean value of gearing ratio (Lev) is 0.456, which is basically in line with the reality.

**4.2 Degree of stock gaming and return before and after earning announcement**

In the pre-earnings announcement period, investors' demand for investment in gaming stocks increases due to investors' own betting speculative preferences, as well as the uncertainty and lower stock risk associated with the earnings announcement itself. This leads to an increase in the price and return of gaming stocks, which in turn leads to a significant positive correlation between the degree of stock gaming and pre-earnings announcement return. Hypothesis H1 test steps are: firstly, based on the full sample, earnings and non-earnings announcement month to test whether there is the gaming effect; then the relationship between the degree of stock gaming and cumulative return before and after the earnings announcement is examined.

1 Group analysis method

The full-sample test is as shown in columns (1)-(4), that shows a decreasing trend in the risk-unadjusted return from 0.017 to 0.002, as the stock portfolios gaming degree become increased. The difference between the high and low portfolio return is -0.015, which was significant at 1% level. The difference between the high and low portfolio returns after factor risk adjustment is -0.015, -0.016, and -0.015, also significant at the 1% level, which indicates that there is a significant gaming effect in China, and the investor's current period of gaming stocks are price overvaluation, which makes a negative relationship between the degree of stock gaming and the expected return, above result is consistent with the existing studies (Bali et al.,2014). The results for earning and non-earnings announcement months remain robust as shown in columns (5)-(8) and (9)-(12).

The test results of hypothesis H1 are shown in columns (13)-(24) of Table 3. The results of the pre-earnings announcement are shown in columns (13)-(16), as the portfolio degree of stock gaming increases, the cumulative return of the unadjusted portfolio pre-earnings announcement ranges from -0.005 to 0.024, showing an increasing trend. The difference between the high and low portfolio returns is 0.029, which was significant at 1% level. The difference between the high and low portfolio returns after factor risk adjustment is 0.028, 0.029, and 0.029, the degree of stock gaming and the cumulative pre-earnings announcement return show a significant positive correlation relationship. For ensuring the reliability of the main findings of this paper, the corresponding

placebo test with replacement samples is conducted[6] , as shown in columns (17)- (20), the high and low portfolio returns do not present significant difference.

The results of post-earnings announcement as shown in columns (21)-(24), the difference between the high and low portfolio returns is -0.005, -0.005, -0.005, and -0.004, also significant. As the portfolio degree of stock gaming increases, the post-earnings announcement portfolio returns show a decreasing trend. This implies that the earnings announcement discloses the fundamental information of the company, which reduces the investors' demand for gaming, resulting in a negative relationship between the degree of gaming and the post-earnings announcement return.

Table 3 Group analysis method

| Score | Return | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Un-Adj | $\alpha_3$ $\alpha_3$ is the<br>- adjusted e<br>- market rat<br>- adjusted e<br>- factor mo | $\alpha_4$ | $\alpha_5$ | Un-Adj | $\alpha_3$ | $\alpha_4$ | $\alpha_5$ |
| | All | | | | Before | | | |
| | （1） | （2） | （3） | （4） | （13） | （14） | （15） | （16） |
| Q1 | 0.017*** | 0.005*** | 0.006*** | 0.007*** | -0.005* | -0.007*** | -0.008*** | -0.007*** |
| | （3.00） | （3.86） | （4.29） | （5.26） | （-1.65） | （-2.66） | （-2.63） | （-2.70） |
| Q2 | 0.015*** | 0.004*** | 0.004*** | 0.005*** | 0.000 | -0.002 | -0.004 | -0.003 |
| | （2.65） | （2.93） | （3.22） | （4.26） | （0.09） | （-0.75） | （-1.15） | （-0.88） |
| Q3 | 0.014** | 0.003** | 0.003** | 0.004*** | 0.007* | 0.004 | 0.003 | 0.004 |
| | （2.35） | （2.07） | （2.02） | （3.29） | （1.74） | （1.23） | （1.01） | （1.30） |
| Q4 | 0.010 | -0.002 | -0.002 | -0.000 | 0.008** | 0.006* | 0.005* | 0.006* |
| | （1.63） | （-1.34） | （-1.38） | （-0.26） | （2.23） | （1.76） | （1.71） | （1.96） |
| Q5 | 0.002 | -0.010*** | -0.010*** | -0.008*** | 0.024*** | 0.021*** | 0.022*** | 0.021*** |
| | （0.29） | （-7.43） | （-7.26） | （-6.57） | （5.80） | （5.34） | （5.55） | （5.69） |
| Q5-Q1 | **-0.015*** | **-0.015*** | **-0.016*** | **-0.015*** | **0.029*** | **0.028*** | **0.029*** | **0.029*** |
| | **（-9.07）** | **（-10.15）** | **（-10.32）** | **（-9.82）** | **（8.58）** | **（8.39）** | **（9.33）** | **（8.92）** |
| | Earning | | | | Before Placebo | | | |
| | （5） | （6） | （7） | （8） | （17） | （18） | （19） | （20） |
| Q1 | 0.029*** | 0.012*** | 0.014*** | 0.014*** | 0.003*** | 0.003** | 0.003** | 0.003 |
| | （3.36） | （3.80） | （4.60） | （4.94） | （2.63） | （2.38） | （2.21） | （2.62） |
| Q2 | 0.028*** | 0.011*** | 0.012*** | 0.013*** | 0.005*** | 0.005*** | 0.005*** | 0.005 |
| | （3.09） | （3.70） | （3.99） | （4.68） | （4.10） | （3.74） | （3.27） | （3.76） |
| Q3 | 0.024*** | 0.008*** | 0.010*** | 0.010*** | 0.003*** | 0.003*** | 0.002** | 0.003 |
| | （2.75） | （2.66） | （3.09） | （3.44） | （2.90） | （2.71） | （2.12） | （2.55） |
| Q4 | 0.024*** | 0.006 | 0.007 | 0.007* | 0.004*** | 0.003*** | 0.004*** | 0.004*** |
| | （2.57） | （1.42） | （1.38） | （1.76） | （2.86） | （2.60） | （2.72） | （2.83） |
| Q5 | 0.017* | -0.001 | 0.001 | 0.001 | 0.004*** | 0.004*** | 0.003** | 0.003*** |
| | （1.79） | （-0.15） | （0.12） | （0.24） | （2.62） | （2.62） | （2.32） | （2.52） |
| Q5-Q1 | **-0.012*** | **-0.013*** | **-0.014*** | **-0.013*** | **-0.001** | **-0.001** | **-0.001** | **-0.000** |
| | **（-2.93）** | **（-3.29）** | **（-3.12）** | **（-3.42）** | **（-0.29）** | **（-0.69）** | **（-0.45）** | **（-0.30）** |
| | Non-Earning | | | | After | | | |
| | （9） | （10） | （11） | （12） | （21） | （22） | （23） | （24） |
| Q1 | 0.017*** | 0.006*** | 0.006*** | 0.007*** | 0.008*** | 0.004 | 0.004 | 0.004 |
| | （3.06） | （3.96） | （4.30） | （4.98） | （2.83） | （1.42） | （1.52） | （1.56） |

[6] The main methodology used for the placebo test is to replace the sample by the non-earnings announcement month and thus to test whether the level of gaming on a stock exhibits a positive correlation with the pre-surplus announcement cumulative return as set in the placebo.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Q2 | 0.015*** | 0.004*** | 0.004*** | 0.005*** | 0.008** | 0.002 | 0.003 | 0.003 |
| | （2.62） | （2.82） | （3.08） | （3.66） | （2.50） | （1.07） | （1.02） | （1.28） |
| Q3 | 0.014** | 0.003*** | 0.003*** | 0.004*** | 0.007** | 0.002 | 0.003 | 0.003 |
| | （2.46） | （2.65） | （2.65） | （3.64） | （2.41） | （0.99） | （0.99） | （1.14） |
| Q4 | 0.010* | -0.001 | -0.001 | 0.000 | 0.007** | 0.003 | 0.004 | 0.003 |
| | （1.70） | （-0.76） | （-0.80） | （0.30） | （2.00） | （0.69） | （0.73） | （0.80） |
| Q5 | 0.001 | -0.010*** | -0.010 | -0.008*** | 0.003 | -0.001 | -0.001 | -0.001 |
| | （0.25） | （-6.97） | （-6.764） | （-6.28） | （1.02） | （-0.54） | （-0.20） | （-0.18） |
| Q5-Q1 | **-0.015*** | **-0.015*** | **-0.016*** | **-0.015*** | **-0.005** | **-0.005*** | **-0.005** | **-0.004** |
| | **（-8.90）** | **（-9.66）** | **（-9.91）** | **（-9.54）** | **（-2.43）** | **（-2.80）** | **（-2.12）** | **（-2.33）** |

2 Fixed effects regression test

Column (1) of Table 4 demonstrates the results of the full-sample test, and the coefficient between the degree of stock gaming and expected return is -0.009, which shows a significant negative correlation. The coefficients between market capitalization (Size), book-to-market ratio (Bm) and expected return are -0.001 and -0.008, which present a significant negative correlation, suggesting that there is a significant size and value effect in China, which is consistent with Liu et al. (2018). Columns (2)(3) demonstrate the test results of non-earnings and earnings announcement months, which also show a significant negative correlation.

Table 4 Fixed effect test

| | Return | Non-Earning | Earning | Before | After | Eps |
|---|---|---|---|---|---|---|
| | （1） | （2） | （3） | （4） | （5） | （6） |
| Score | **-0.009*** | **-0.008*** | **-0.011*** | **0.013*** | **-0.003*** | **0.090** |
| | **(-29.60)** | **（-23.75）** | **（-20.38）** | **（35.40）** | **（-8.50）** | **（0.94）** |
| Beta | -0.001*** | -0.001** | -0.001 | -0.001*** | -0.002*** | -0.066 |
| | （-2.68） | （-2.02） | （-1.23） | （-3.61） | （-5.12） | （-0.62） |
| Size | -0.008*** | -0.008*** | -0.007*** | 0.001*** | -0.003*** | -0.159*** |
| | （-35.66） | （-30.97） | （-15.80） | （4.57） | （-13.18） | （-2.66） |
| Bm | -0.055*** | -0.063*** | -0.034*** | -0.002 | -0.009*** | 0.759* |
| | （-58.52） | （-57.98） | （-18.24） | （-1.37） | （-8.91） | （1.84） |
| Rev | -0.049*** | -0.062*** | -0.006 | -0.010*** | 0.007*** | -0.494 |
| | （-27.21） | （-30.32） | （-1.57） | （-4.64） | （3.65） | （-0.39） |
| Mom | -0.024*** | -0.027*** | -0.015*** | -0.009*** | -0.004*** | 1.367*** |
| | （-48.16） | （-48.59） | （-13.66） | （-12.82） | （-6.84） | （2.65） |
| Invest | 0.020*** | 0.021*** | 0.026*** | 0.007*** | 0.008*** | 0.014 |
| | （10.79） | （10.27） | （6.12） | （2.77） | （3.54） | （0.02） |
| Roe | 0.046*** | 0.0443*** | 0.054*** | 0.012*** | 0.033*** | 9.805*** |
| | （33.95） | （27.67） | （20.06） | （6.12） | （21.71） | （13.11） |
| Illiq | 0.011*** | 0.011*** | 0.010*** | 0.004*** | -0.001 | -0.372** |
| | （13.89） | （13.24） | （5.36） | （3.77） | （-0.57） | （-2.32） |
| Lev | 0.026*** | 0.029*** | 0.019*** | 0.001 | 0.004*** | 0.177 |
| | （24.84） | （23.47） | （9.25） | （0.75） | （3.53） | （0.41） |
| Analyst | 0.010*** | 0.012*** | 0.006*** | 0.000 | 0.002*** | 0.110 |
| | （13.78） | （13.50） | （4.05） | （0.41） | （2.56） | （0.33） |
| Time | Yes | Yes | Yes | Yes | Yes | Yes |
| Firms | Yes | Yes | Yes | Yes | Yes | Yes |
| Intercept | 0.156*** | 0.155*** | 0.473*** | 0.021*** | 0.076*** | 13.905*** |
| | （41.97） | （37.09） | （50.74） | （3.49） | （17.83） | （7.70） |
| Adj-$R^2$ | 0.117 | 0.118 | 0.174 | 0.055 | 0.044 | 0.004 |
| N | 474,250 | 356,746 | 117,504 | 117,504 | 117,504 | 117,504 |

Note: ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively, with robust t-statistics in parentheses, and standard errors made to adjust for the subsequent 6 periods of Newey and west (1987).

Column (4) demonstrates the test results of hypothesis H1, and the coefficient between the

degree of stock gaming (Score) and the cumulative return before earnings announcement (Before) is 0.013, which presents a significant positive relationship. Column (5) shows that the coefficient between the degree of stock gaming and cumulative return after earnings announcement (After) is -0.003, which shows a significant negative correlation. Column (6) shows that the coefficient between the degree of stock gaming and earnings per share (Eps) is 0.090(not significant), which verifies that the fundamentals of the gaming stocks did not exceed the expectations, which made the return reversal after the earnings announcement.

### 4.3 Robustness testing

Table 5 Robustness testing

| | Return | Non-Earning | Earning | Before | After | Eps |
|---|---|---|---|---|---|---|
| | （1） | （2） | （3） | （4） | （5） | （6） |
| MaxRet | **-0.006*** ** | **-0.005*** ** | **-0.009*** ** | **0.012*** ** | **-0.003*** ** | **0.136** |
| | **（-19.23）** | **（-14.98）** | **（-12.20）** | **（30.73）** | **（-7.02）** | **（0.84）** |
| Intercept | 0.152*** | 0.151*** | 0.466*** | 0.028*** | 0.139*** | 13.834*** |
| | （41.03） | （36.26） | （49.81） | （4.66） | （27.60） | （7.46） |
| Adj-$R^2$ | 0.116 | 0.117 | 0.192 | 0.051 | 0.044 | 0.004 |
| | （7） | （8） | （9） | （10） | （11） | （12） |
| IdioSkew | **-0.002*** ** | **-0.003*** ** | **-0.002*** ** | **0.008*** ** | **-0.000*** | **0.037** |
| | **（-13.76）** | **（-12.40）** | **（-6.40）** | **（34.26）** | **（-1.67）** | **（0.39）** |
| Intercept | 0.149*** | 0.148*** | 0.448*** | 0.048*** | 0.134*** | 14.103*** |
| | （40.24） | （35.63） | （48.51） | （8.24） | （26.89） | （7.87） |
| Adj-$R^2$ | 0.116 | 0.116 | 0.190 | 0.053 | 0.043 | 0.004 |
| | （13） | （14） | （15） | （16） | （17） | （18） |
| IdioVol | **-0.006*** ** | **-0.006*** ** | **-0.008*** ** | **0.005*** ** | **-0.002*** ** | **0.030** |
| | **（-28.21）** | **（-23.29）** | **（-16.88）** | **（16.55）** | **（-7.56）** | **（0.30）** |
| Intercept | 0.159*** | 0.158*** | 0.488*** | 0.035*** | 0.142*** | 14.008** |
| | （42.74） | （37.72） | （51.25） | （5.80） | （27.87） | （8.25） |
| Adj-$R^2$ | 0.117 | 0.118 | 0.193 | 0.047 | 0.044 | 0.004 |
| | （19） | （20） | （21） | （22） | （23） | （24） |
| Score | **-0.009*** ** | **-0.008*** ** | **-0.011*** ** | **0.015*** ** | **-0.004*** ** | **0.090** |
| | **（-29.60）** | **（-23.75）** | **（-20.38）** | **（29.18）** | **（-9.79）** | **（0.94）** |
| Intercept | 0.156*** | 0.015*** | 0.473*** | 0.052*** | 0.280*** | 13.905*** |
| | （41.97） | （37.09） | （50.74） | （6.87） | （42.04） | （7.70） |
| Adj-$R^2$ | 0.117 | 0.118 | 0.193 | 0.074 | 0.111 | 0.004 |
| | （25） | （26） | （27） | （28） | （29） | （30） |
| Score | **-0.006*** ** | **-0.006*** ** | **-0.009*** ** | **0.011*** ** | **-0.003*** ** | **0.083** |
| | **（-13.09）** | **（-11.23）** | **（-17.23）** | **（17.40）** | **（-7.28）** | **（0.57）** |
| Intercept | 0.372*** | 0.068*** | 0.873*** | 0.103*** | 0.672*** | 8.244*** |
| | （12.31） | （15.92） | （13.94） | （8.39） | （23.45） | （5.30） |
| Adj-$R^2$ | 0.097 | 0.098 | 0.103 | 0.068 | 0.099 | 0.031 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Time | Yes | Yes | Yes | Yes | Yes | Yes |
| Firms | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 474,250 | 356,746 | 117,504 | 117,504 | 117,504 | 117,504 |

For ensuring the robustness of hypothesis H1, this paper conduct the following robustness checks: (1) Replacement of explanatory variable measures: using the individual indicators maximum daily return (MaxRet), idiosyncratic skewness (IdioSkew), and idiosyncratic volatility (IdioVol) to the fixed effects test, and the test results are presented in columns (1)-(6), (7)-(12), and

(13)-(18) of Table 5. (2) Replacement of explained variable measure: [-10,10] is used as the window period to compute the pre-earnings announcement [-10, -1] and the post-earnings announcement [0, 10] cumulative return with the fixed effects test, and the test results are presented in columns (19)-(24).(3) Replacement test method: the main hypothesis was tested using group analysis and fixed effects test, we replace the Fama-Macbeth regression, and the results are shown in columns (25)-(30). The above results show that the hypothesis H1 remain robust.

### 4.4 Alleviation of endogeneity problems

The main research conclusions of this paper may have problems with omitted variables (that is, before earnings announcements, there may be other company announcements or factors that have an impact on stock returns) and sample selection bias (some samples are missing or eliminated). In order to alleviate this problem, this paper conducted three aspects of testing: (1) In the previous sample selection process, samples with other company announcements (which may have an impact on earnings before earnings announcements) during the earnings announcement period were eliminated. (2) The placebo test(selecting randomly sample of non-earnings announcements) with replacement samples was conducted and column (1) of Table 6 shows that the coefficient between the degree of stock gaming and cumulative return is -0.000, which does not show a significant correlation. In addition, for the individual indicators maximum daily return (MaxRet), idiosyncratic skewness (IdioSkew), and idiosyncratic volatility (IdioVol), this paper also conducted the placebo test, and the results are shown in columns (2) (3) (4). (3)Instrumental variable method，this paper selects the gambling culture where the company is located as an instrumental variable. Kumar et al. (2011) find that investors have certain preferences for stocks of locally listed companies. The stronger the local culture of gaming and speculation, the stronger the investor preference for gaming and speculation on local listed companies. The gaming preference of the company's location is equal to the sum of the annual welfare lottery and sports lottery sales and the GDP of the province. The test results are shown in columns (5) and (6). The regression coefficient between the instrumental variable (Preference) and the degree of stock gambling (Score) is 0.159, which is significant at the 1% level; after performing the instrumental variable, the regression coefficient of the degree of stock gambling (Score) and earnings before earnings announcement (Before) is 0.032, which is still significantly positively related. In addition, this paper conducted an over-identification

test, and the p-value was 0.461. The instrumental variables (Preference) were not related to the disturbance terms, which verified the exogeneity of the instrumental variables. At the same time, a Wald test was conducted, and the minimum eigenvalue statistic was 26.17, is greater than the minimum eigenvalue statistic 18.52, the hypothesis of "weak instrumental variable" can be rejected, that is, the instrumental variable is a "strong instrumental variable".

Table 6 Alleviation of endogeneity problems

| | Before Placebo | | | | Score | Before |
|---|---|---|---|---|---|---|
| | （1） | （2） | （3） | （4） | （5） | （6） |
| Score | -0.000<br>（-1.38） | | | | | 0.032***<br>（13.15） |
| MaxRet | | -0.000<br>（-0.59） | | | | |
| IdioSkew | | | 0.000<br>（0.29） | | | |
| IdioVol | | | | -0.000<br>（-0.13） | | |
| Preference | | | | | 0.159***<br>（5.32） | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Time | Yes | Yes | Yes | Yes | Yes | Yes |
| Firms | Yes | Yes | Yes | Yes | Yes | Yes |
| Intercept | 0.108***<br>（35.72） | 0.107***<br>（35.69） | 0.107***<br>（35.92） | 0.109***<br>（35.42） | 1.268***<br>（13.25） | 0.203***<br>（29.02） |
| Adj-$R^2$ | 0.018 | 0.018 | 0.018 | 0.018 | 0.137 | 0.062 |
| N | 117,504 | 117,504 | 117,504 | 117,504 | 117,504 | 117,504 |

## 5 Analysis of intrinsic mechanism

Based on the previous analysis, this paper argue that investors' gaming speculative preferences play an intrinsic mechanistic role in the positive relationship between the degree of stock gaming and pre-earnings announcement return. For investor gaming speculative preference, there does not exist a direct measure, this paper verify this indirectly in several ways: (1) Investor sentiment: in the high period, investors have stronger speculative preference demand for gaming stocks. The investor sentiment index is from Baker et al. (2006). (2) Institutional investors: retail investors usually have a lower sense of risk and are more inclined to engage in speculative trading. This makes them have higher speculative demand for gaming stocks. (3) Earnings forecasts: for listed companies that do not have earnings forecasts, the uncertainty is higher, which leads to a higher speculative demand for gaming stocks before earnings announcement.

Based on the above analysis, if investors' gaming speculative preferences plays an intrinsic mechanism role, the positive relationship between the degree of stock gaming and the before-

earnings announcement return is more significant in the groups of higher investor sentiment, lower institutional ownership, and the absence of earnings forecasts. The test model is as follows:

$$Before_{i,t+1} = \alpha + \beta_1 Score_{i,t} + \beta_2 D_{i,t} + \beta_3 Score_{i,t} * D_{i,t} + \sum_{i=4}^{13} \beta_i Control_{i,t} + Time_t + Firms_i + \varepsilon_{i,t} \quad (6)$$

In model (6), $D_{i,t}$ is the intrinsic mechanism variable, $Score_{i,t} * D_{i,t}$ is the interaction term between the degree of the stock gaming and the investor sentiment (Sentiment), institutional holdings (Insti), and the presence of earnings announcement (Foreshow). Except for these interaction terms, the remaining variables are the same as in model (5).

Column (1) of Table 7 shows that the coefficient of interaction term Sentiment*Score is 0.001, which presents a significant positive effect, means that the degree of stock gaming positively affects the pre-earnings announcement return more in periods of high investor sentiment. Column (2) presents a significant negative effect, means that the positive effect of degree of stock gaming on pre-earnings announcement return is greater in the group with low institutional ownership. Column (3) presents a significant negative effect, means that the positive effect is greater in the group with no forecast. The above verifies the inherent mechanism in hypothesis H1, that investors' preference for gaming speculation makes the degree of stock gaming positively correlated with pre-earnings announcement return.

Table 7 Intrinsic mechanism test

| | Before return | | |
|---|---|---|---|
| | （1） | （2） | （3） |
| Score | 0.013*** | 0.014*** | 0.014*** |
| | （21.90） | （27.99） | （20.07） |
| Sentiment | 0.017*** | | |
| | （15.75） | | |
| Sentiment*Score | **0.001**** | | |
| | **（2.34）** | | |
| Insti | | 0.003*** | |
| | | （5.50） | |
| Insti*Score | | **-0.001*** | |
| | | **（-1.90）** | |
| Foreshow | | | -0.001** |
| | | | （-2.23） |
| Foreshow*Score | | | **-0.003***** |
| | | | **（-2.85）** |
| Intercept | 0.018*** | 0.024*** | 0.038*** |
| | （2.99） | （3.86） | （4.84） |
| Adj-$R^2$ | 0.057 | 0.055 | 0.062 |
| N | 114,976 | 115,977 | 84,046 |
| Controls | Yes | Yes | Yes |
| Time | Yes | Yes | Yes |

| | | | |
|---|---|---|---|
| Firm | Yes | Yes | Yes |

## 6. Further analysis

Media and report attention (Media/Report) equal the number of news and analyst reports coverage for this listed company in the [-5, -1] days prior to the earnings announcement. For the group without report attention (Non-Report), column (1) of Table8 shows that the coefficient of the degree of stock gaming and the return before earnings announcement is 0.013. For the group with report attention, column (2) show that the coefficient is 0.020, means that the positive effect of the degree of stock gaming on the return before the earnings announcement is significantly higher for the group with the presence of research report attention. Columns (3)(4) verify the existence of media attention results. The above results validate the hypothesis H2.

Table 8 Heterogeneity Analysis

| | Before return | | | |
|---|---|---|---|---|
| | Report | Non-Report | Media | Non-Media |
| | （1） | （2） | （3） | （4） |
| Score | **0.020***** | **0.013***** | **0.015***** | **0.008***** |
| | **（19.99）** | **（30.13）** | **（30.32）** | **（18.95）** |
| Intercept | 0.004 | 0.035*** | 0.006 | 0.012* |
| | （0.23） | （5.30） | （0.68） | （1.71） |
| Adj-$R^2$ | 0.042 | 0.014 | 0.057 | 0.064 |
| N | 19,027 | 98,477 | 76,904 | 40,600 |
| Controls | Yes | Yes | Yes | Yes |
| Time | Yes | Yes | Yes | Yes |
| Firms | Yes | Yes | Yes | Yes |

## 7. Main conclusions

Based on the samples of China's listed firms, this paper examines the investors' speculative behavior on gaming stocks before earnings announcement. This paper find that due to the mechanism of investors' gaming speculative behavior, stocks with a high degree of gaming are subject to higher demand and prices, which in turn lead to higher pre-earnings announcement return, and this phenomenon is more pronounced in groups with higher investor attention. Whether earning announcement affects other common market effects, that needs to be further studied.

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